United States
Department of
Agriculture

Forest
Service

March 2006

Kelsey
Vegetation Management Project

Draft
Environmental Impact Statement

Bend-Fort Rock Ranger District, Deschutes National Forest
Deschutes County, Oregon

KELSEY VEGETATION MANAGEMENT PROJECT

Draft Environmental Impact Statement

United States Department of Agriculture – Forest Service
Pacific Northwest Region – Deschutes National Forest

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Abstract:

This Draft Environmental Impact Statement (DEIS) describes the effects of implementing each of the three (3) proposed alternatives, a no action alternative and 2 action alternatives, which address hazardous fuels and tree stand density on National Forest System lands in the Deschutes National Forest in Central Oregon. Project activities would occur across approximately 42,655 acres of the Kelsey project area on the Bend-Fort Rock Ranger District (Figure 1, Page 1-5). The project area includes Wildland Urban Interface with both Bend and Sunriver. The proposed projects are focused on moving resource conditions closer to the goals and desired future conditions identified in the Deschutes National Forest Land and Resource Management Plan.

The alternatives vary in the extent of activities proposed, between 0 and 10,505 acres. Fuels reduction (prescribed burning and mechanical shrub treatment), non-commercial and commercial thinning, reforestation and associated herbicide application, and road reconstruction, temporary road development, road closure, and road decommissioning are included in each action alternative. Each action alternative also includes two non-significant Forest Plan amendments. The first amendment addresses big game thermal cover standards. The amendment is necessary to treat hazardous fuels in areas where thermal cover is lacking. The second amendment addresses the removal of trees to create small openings that will promote structural diversity within single story black bark ponderosa pine stands within deer habitat.

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DOCUMENT ORGANIZATION

The Forest Service has prepared this Environmental Impact Statement in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and other alternatives. The document is organized into four chapters and appendices:

Chapter 1. Purpose and Need for Action: The chapter includes information on the history of the project proposal, the purpose of and need for the project, a summary of the agency's proposal for achieving that purpose and need, the public process that was involved and the key issues that were identified around which the third alternative was developed, the planning framework, and the scope of the project and decision framework.

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 for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the proposed activities associated with each alternative.

Chapter 3. Affected Environment and Environmental Consequences**:** This chapter describes the affected environment, the current conditions of the resources involved, and the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by individual resource specialties.

Chapter 4. Consultation and Coordination: This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement. This section also provides a glossary of terms and literature cited, and index.

Appendices (A through D): The appendices provide more detailed information to support the analyses presented in the environmental impact statement.

Additional documentation, including more detailed analyses of project-area resources, may be found in the Project Record located at the Bend-Fort Rock Ranger District.

Precision of Information and Adjustments

Quantifiable measurements, such as acres and miles, and mapped unit boundaries that are used to describe the alternatives and effects are based on the best available information. The analysis presented in this DEIS is based on consideration of the full extent of the acres, miles, and other quantities depicted in the alternatives. Information used in designing the alternatives was generated from a mix of field reconnaissance, use of aerial photos, use of global positioning system (GPS) technology, and various resource-specific databases.

CHAPTER 1

PURPOSE AND NEED

CHAPTER 1 – PURPOSE AND NEED

INTRODUCTION

The Forest Service has prepared this Draft Environmental Impact Statement (DEIS) for proposed forest vegetation management within the Kelsey planning area. This DEIS addresses the proposed action and two (2) additional alternatives, including no action; the major issues associated with the proposal; and the direct, indirect, and cumulative effects of implementation of any of the alternatives.

The analysis of the 46,175-acre Kelsey planning area (Figure 1, page 1-4), including 570 acres of private land, was initiated in 1999. The area of analysis was redefined following the 18 Fire (3,520 acres removed from the Kelsey Vegetation Management Project analysis area) of July 2003, and now totals approximately 42,655 acres. The area within the fire perimeter was analyzed separately in the 18 Fire Salvage Recovery Project EIS. Elevations range from 3,900 to 6,000 feet. Table 1 provides the legal location of the area of analysis.

Table 1: Legal Location – Deschutes County, Oregon - Willamette Meridian
Township 18 South, Range 11 East, Sections 26-28, 33-36
Township 18 South, Range 12 East, Sections 26-29, 32-36
Township 19 South, Range 11 East, Sections 1-4, 8-28, 33-36
Township 19 South, Range 12 East, Sections 2-11, 14-23, 26-33
Township 20 South, Range 11 East, Sections 1-5, 11-14,
Township 20 South, Range 12 East, Sections 3-11, 14-22, 28, 29

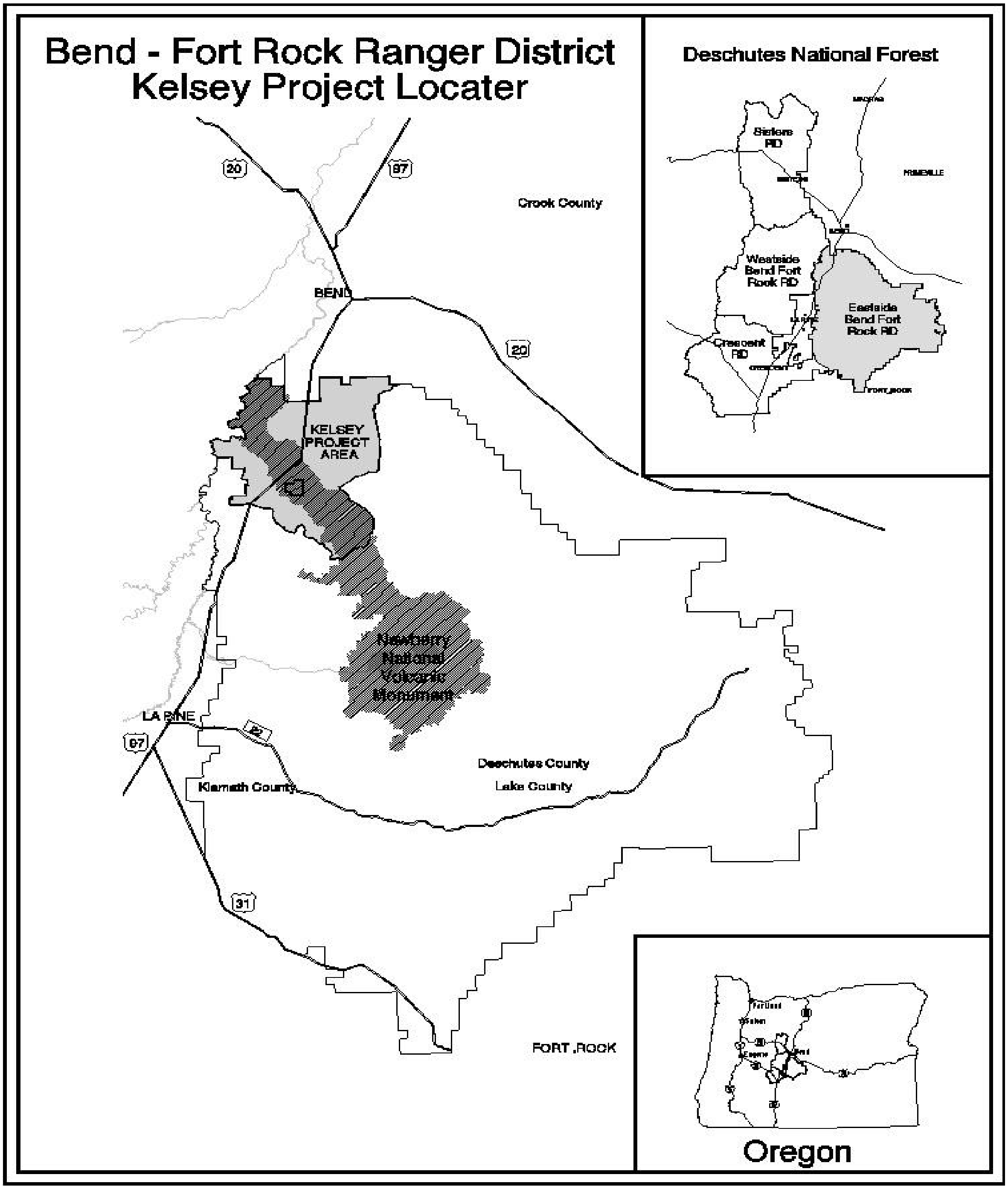
The project area includes: Deer Habitat, Key Elk Habitat, General Forest, Scenic Views, Old Growth, approximately 10 miles of the east bank of the Deschutes River within the Upper Deschutes Wild and Scenic River boundary from Sunriver to the southern urban growth boundary of Bend, Oregon and a portion of the Newberry National Volcanic Monument (NNVM). Refer to Figure 3, page 1-22 for the various management areas.

There are no inventoried roadless areas within the project area. The project area is east of the Northwest Forest Plan boundary (owl line).

The project area includes portions of the Bend southern urban growth boundary Wildland Urban Interface (WUI) as identified in the Greater Bend Community Wildfire Protection Plan (planned to be signed March 2006) and Sunriver Wildland Urban Interface as identified in the Sunriver Community Wildfire Protection Plan (signed July 2005).

Sunriver developed a Community Wildfire Protection Plan (CWPP) in collaboration with federal, state, and local governments as well as private entities which was signed March 25, 2005. Currently the city of Bend is collaborating and developing a similar CWPP with a proposed signing date in the spring of 2006. In preparing CWPPs, communities define their respective WUI boundaries, which could be different from the one and one-half mile buffer. Both Sunriver and Bend CWPP boundaries overlap portions of the project area, totaling 20,860 acres, 15,203 forested acres (Figures 7a and 7b and Figures 8a and 8b).

Figure 1: Kelsey Project Locator Map



PURPOSE AND NEED FOR ACTION

Background and Existing Condition

The planning area is located within the dry eastside forests of central Oregon. Prior to the start of active fire suppression in the early 1900s, low intensity wildfire frequently burned this ecosystem reducing stand density and natural fuels. Historic fire intervals were generally less than 30 years, and as often as every seven (7) years. Large ponderosa pine (greater than 21 inches in diameter) dominated the landscape. Figure 2 depicts vegetation conditions likely found within mature ponderosa pine stands where low intensity wildfires frequently occurred.

Figure 2: Photo of mature Ponderosa pine / Antelope bitterbrush / Idaho fescue plant community, circa 1905. Note natural fire line and lack of a duff layer around the base of trees. There is very little pine regeneration, bitterbrush is estimated less than 5 percent (Bill Hopkins research in similar plant communities), and there is a very small component of Idaho fescue. Frequent low intensity fire maintained this vegetative condition.

During the 1930s and 1940s, this area was owned and clearcut by private commercial enterprises. These activities left few residual large trees and very few small stands of larger, older ponderosa pine. The Forest Service acquired these private lands during the ensuing years. These lands reforested primarily through the natural regeneration of ponderosa pine. Extensive thinning has since occurred to increase the growth and vigor of the regenerated pine stands.

Stand structure is relatively uniform across the planning area (Figure 3). The area is dominated by large stands of even-aged, single story ponderosa pine that are 50 to 80 years old. The average size of the ponderosa pine is approximately 12 inches in diameter-at-breast-height (dbh), with much of the tree size within the 9 to 16 inch dbh range. Less than two (2) percent of the planning area is currently classified as late or old structure (LOS) (Table 30 page 3-24). With relatively large, uniform stand conditions, forage and cover areas for big game are generally not in close proximity, limiting optimum use by big game.

Figure 3: Within Planning Area at the Base of Bessie Butte Prior to 18 Fire

Photo courtesy of USDA, Forest Service, Central Oregon Area Ecology Program

Large contiguous areas of dense shrubs, primarily bitterbrush (Figure 3) and greenleaf manzanita, have developed in the absence of low intensity wildfire. These highly flammable shrubs have potential for flame lengths of up to 20 to 30 feet. With existing shrub conditions, potential exists for fire to spread into the tree canopy, allowing for high intensity, stand replacement crown fire and for long distance spotting. The 18 Fire, which occurred during relatively moderate wildfire conditions, provided a vivid demonstration of the potential for high intensity wildfire behavior (Figure 4) and long distance spotting in these vegetations conditions. Past mechanical shrub and prescribed fire treatments have reduced shrub canopy cover and height within portions the planning area, however, large contiguous areas of dense shrubs remain. Re-growth of shrubs in the intervening years is increasing the potential for fire to spread into the tree canopy, reducing the resiliency of these treated areas to wildfire.

Figure 4 illustrates the impacts associated with the 18 Fire in stands of black bark ponderosa pine, including a complete loss of understory and overstory vegetation. It is expected that shrubs would not return to pre-burn conditions within the burned areas for at least 20 years. Fuel loadings would be expected to increase over time as trees killed by the fire begin to fall, with higher fuel loadings in the more severely burned areas. Dead trees would be expected to begin falling within 3 to 5 years, with larger diameter trees, greater than 9 inches dbh, continuing to stand for 15 years or longer. Although, overtime downed wood would exhibit some decay, the potential for increased fuel loading would occur overtime in severely burned areas.

Figure 4: Photo Taken at Same Location as Figure 3 Following 18 Fire

Photo courtesy of USDA, Forest Service, Central Oregon Area Ecology Program

In portions of the planning area, competition for limited site resources is resulting in reductions in diameter growth rates. Dwarf mistletoe infection is also contributing to reductions in tree vigor and growth. The following discussion regarding stand density is from Hall, 1987. Stand density is a measure of tree crowding or competition. Competition occurs whenever several organisms require the same things in the same environment. Intensity of competition depends on the amount by which demand exceeds supply. With increasing stand densities, there is a decreasing availability of some essential environmental factors, such as water. The result is decreasing tree vigor and growth. Rate of diameter growth is one measure of tree vigor, growth and competition. In portions of the planning area, competition for limited site resources is resulting in reductions in diameter growth rates. Dwarf mistletoe infection is also contributing to reductions in tree vigor and growth.

Currently, stand density is high enough to make stands susceptible to bark beetle attack on approximately 50 percent of the forested portion of the planning area. Areas of high stand density include areas that have not been previously thinned, as well as previously thinned areas where tree diameter growth during the intervening years has increased stand density. Tree mortality from insects is occurring in some of these high density stands. High stand density is a consistent characteristic of second-growth ponderosa pine stands severely infested by mountain pine beetle (Barrett, 1979). Commonly, an outbreak of mountain pine beetle in ponderosa pine results in death of about half the trees and loss of about two-thirds of the stem basal area (Barrett, 1979). Depending on the amount of mortality, the structure and character of the affected stands could be changed. Such stand changes could be inconsistent with management objectives identified for many of the land allocations.

Desired Condition and Management Direction

Desired Condition

The Forest Plan (as amended by the Eastside Screens), the Newberry National Volcanic Monument (NNVM) Comprehensive Management Plan, and the Upper Deschutes Wild and Scenic River Comprehensive Management Plan describe desired conditions for lands within the Deschutes National Forest. Recent national direction addressing wildland fire risk describes desired conditions within the wildland urban interface and across the broader landscape.

Size and age diversity is present on a landscape level, created by a mosaic of even-aged stands, as well as on a stand level, created by uneven-aged management practices within many ponderosa pine stands (Forest Plan, Desired Condition, Vegetation, 50 years and beyond, page 4-5). Within Deer Habitat, cover and forage areas ideally are in close proximity for optimum use by big game, with cover making up 40 percent of the land area (Forest Plan, General Theme and Objectives, page 4-113). Within Scenic Views, there are views to distant peaks, unique rock forms, unusual vegetation, or other features of interest (Forest Plan, General Theme and Objectives). Late or old structural stage conditions across the landscape are within the Historic Range of Variability (Eastside Screens, Regional Forester's Forest Plan Amendment #2).

Undesirable impacts from forest pests on resource objectives are greatly reduced. Where they occur, they are a result of scoping, analysis and a decision framework that considers the desirable and undesirable roles of pests in the context of integrated resource management objectives (Forest Plan, Desired Condition, Forest Health, 50 years and beyond, page 4-5).

There is a reduced risk of catastrophic wildfire to people, communities, and natural resources (National Fire Plan 2000). The forest and rangeland ecosystems closely match their historical structure, function, diversity and dynamics (National Fire Plan 2000). Fuel conditions on the landscape are such that when wildland fires occur they are generally of low intensity. Fuel conditions that would support high intensity wildland fires are discontinuous across the landscape.

Management Direction for Newberry National Volcanic Monument

NNVM Management Plan Standard and Guideline M-15: Where practical in light of other resource objectives, reestablish "historic" ponderosa pine old growth (over time) on a substantial portion of the ponderosa pine sites. The intent is to create (over time) fuel conditions that allow stands to be maintained and perpetuated solely with prescribed fire (or where appropriate, prescribed natural fire) rather than through mechanical treatments. While prescribed fire or natural prescribed fire is the preferred treatment method, some mechanical treatments may be needed before fire can be used safely. The choice of which sites to manage for this condition should be integrated with other resource objectives such as wildlife habitat, scenic quality, and recreation.

NNVM Management Plan Standard and Guideline M-8: Overall, any projects to alter existing vegetation should respond to one or more of the following needs

- Protect existing large, old trees and provide for the perpetuation of the genetic heritage they represent,
- Reestablish conditions that allow natural ecological succession of vegetation to the maximum extent practical,
- Protect public health and safety,
- Enhance wildlife or sensitive plant habitat, scenic quality, or recreational values,
- Reduce serious threats from insects, fire, or disease to resources outside the Monument.

NNVM Legislation (Public Law 101-533-Nov. 5, 1990, Sec 2 (e) (1)): Timber removal is permitted to achieve the purposes of the Monument legislation. Timber within the Monument shall not be considered part of the allowable sale quantity for the Deschutes National Forest.

Management Direction for the Upper Deschutes Wild and Scenic River (WSR)

Within the Upper Deschutes Wild and Scenic River Management Area (Area 17a) the management goal is to protect and enhance Outstandingly Remarkable Values, including resources which are significant elements of those values.

Management Direction for Hazardous Fuels Reduction Management

The National Fire Plan (2000) was developed with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capacity for the future. The National Fire Plan addresses five key points: 1) firefighting, 2) rehabilitation, 3) hazardous fuels reduction, 4) community assistance, and 5) accountability. Among other things, the Fire Plan established an intensive, long-term hazardous fuels reduction program. Hazardous fuels reduction treatments are designed to reduce the risks of catastrophic wildland fire to people, communities, and natural resources while restoring forest and rangeland ecosystems to closely match their historical structure, function, diversity and dynamics. Such treatments accomplish these goals by removing or modifying wildland fuels to reduce the potential for severe wildland fire behavior, lessen the post-fire damage, and limit the spread or proliferation of invasive species and diseases. (citation from an overview of the plan on National Forest Plan website).

In August 2001, the Secretaries of Agriculture and the Interior joined the Western Governors' Association of State Foresters, National Association of Counties, and the Intertribal Timber Council to endorse *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the*

Environment: A 10-Year Comprehensive Strategy. The 10-year Comprehensive Strategy (2001) outlines a comprehensive approach to the management of wildland fire, hazardous fuels, and ecosystem restoration and rehabilitation. The primary goals of the 10-Year Comprehensive Strategy are: 1) Improve prevention and suppression, 2) reduce hazardous fuels, 3) restore fire adapted ecosystems, and 4) promote community assistance. The Comprehensive Strategy identified the following guiding principles for reducing hazardous fuels and restoring fire adapted ecosystems:

Hazardous Fuel Reduction: Prioritize hazardous fuels reduction where the negative impacts of wildland fire are the greatest,

Restoration: Restore healthy, diverse, and resilient ecological systems to minimize uncharacteristically severe fires on a priority watershed basis through long-term restoration.

The Comprehensive Strategy identified a number of actions for each goal and include, in part, the following:

Reduce the total number of acres at risk to severe wildland fire,

Develop strategies to address fire-prone ecosystem problems that augment fire risk or threaten sustainability of these areas,

Assure maintenance of areas improved by fuels treatment by managing activities permitted on restored land to maintain their resiliency, and

Ensure local environmental conditions are factored into hazardous fuels treatment planning.

The following actions were identified, in part, for restoring fire adapted ecosystems:

Promote research and effective use of restoration treatments,

Research interactions between fire, land management actions, and other disturbances, and apply lessons learned to future management decisions.

The Implementation Plan (2002) for the 10-Year Comprehensive Strategy provides tools to deliver national goals at the local level in an ecologically, socially, and economically appropriate manner. Parties that endorsed the implementation plan agreed that to reduce the treat of wildland fire to people, communities, and ecosystems will require a number of actions, some of which include:

Management activities, both in the wildland-urban interface and in at-risk areas across the broader landscape,

Active forest and rangeland management, including thinning that produces commercial or pre-commercial products, biomass removal and utilization, prescribed fire and other fuels reduction tools to simultaneously meet long-term ecological, economic, and community objectives.

Management Direction for Timber Production

A purpose of National Forests identified in the Organic Administration Act (June 4, 1897) was to furnish a supply of timber for the use and necessities of the citizens of the United States. This purpose was affirmed in the Multiple-Use Sustained Yield Act (1960), and the National Forest Management Act (1974). The Deschutes Forest Plan (1990) scheduled timber harvest from suitable forest lands within a number of management areas including: deer habitat, general forest, and scenic views (Forest Plan, page 4-11).

Within deer habitat, timber harvest is appropriate when required to regenerate new cover stands, maintain tree vigor for resistance to stand-threatening insect damage, or encourage desirable forage in deficient areas (Forest Plan S&G M7-3).

Within general forest, the objective of timber management is to convert unmanaged stands to managed stands. The aim of a managed forest is to have stands in a variety of age classes with all stands utilizing the site growth potential. This is achieved by controlling stocking levels; maintaining satisfactory growth rates; protecting stands from insects, disease, and damage; controlling species composition; and regenerating stands that are no longer capable of optimum growth performance.

Within the scenic view management area, vegetation management, including the removal of trees, can occur where necessary to: 1) perpetuate the desired visual condition, 2) control insect and disease problems, 3) create vista points or enhance a unique landscape feature, such as a rock outcrop or unique vegetation, 4) provide for safety along travel routes and in recreation use areas, and 5) provide access for special uses, mineral activities, and administrative purposes (Forest Plan S&G M9-5, M9-16, M9-24, and M9-41).

The Forest Plan lists information and research needs that would be desirable to fill prior to preparation of the next Forest Plan (Forest Plan, pages 2-11 through 2-14). The following are research needs associated with uneven-aged timber management:

How does uneven-aged management meet the habitat requirement of deer and elk?

How does uneven-aged management meet the habitat requirements for old-growth dependent species?

What is the effectiveness of natural regeneration in uneven-aged stands?

What are compaction problems associated with uneven-aged management practices?

What is the role of prescribed fire in uneven-aged management?

How can stands be managed to provide for old-growth characteristics?

Need for Action

Within the Newberry National Volcanic Monument (NNVM): there is a need for sustainable and resilient ecosystems where natural ecological succession of vegetation can occur to the maximum extent possible. Specifically there is a need for:

Fire (prescribed and prescribed natural) which plays a key role in natural ecological processes, and

Stands of fire-based, park-like, old-growth ponderosa pine similar to those present before EuroAmerican settlement.

Within the Upper Deschutes Wild and Scenic River (WSR) management area: there is a need for upland vegetation conditions which mimic conditions present with the periodic occurrence of small, low intensity fires. Specifically there is a need for:

Reduced natural fuel loads, and

Reduced competition to ponderosa pine within areas historically forested with ponderosa pine.

Within Deer Habitat, General Forest, and Scenic View management areas: there is a need for fuels reduction and timber production consistent with management area goals and objectives, environmental constraints, and economic efficiency. Specifically, there is a need for:

A landscape characterized by discontinuous hazardous fuels. Hazardous fuels are broken up by fuel conditions unlikely to support high-intensity wildland fire. Reduced-hazard fuels are arranged strategically across the landscape and are of a size and orientation that reduces the likelihood of large fire spread, lessens post-wildfire damage, and/or facilitates successful fire suppression under severe wildfire conditions. Strategic locations include those:

- adjacent to private property
- adjacent to primary travel routes that provide safe egress or ingress including: Highway 97, County Road 40, the Cottonwood Road and Forest Service Roads 18, 9702, and 9720;

Timber production, including:
- o Maintained or accelerated tree diameter growth rates,
- o Sawtimber and other wood products to support local and regional economies;

Increased sunlight on Cottonwood Road in the winter so driving is less hazardous, and

An empirical study in even-aged, second growth ponderosa pine stands that scientifically evaluates the short and long term effects of the following silvicultural treatments: a) wide thinning, b) uneven-aged management using single tree selection, and c) uneven-aged management using group selection.

Tables 2, 3, 4, 5, 6, and 7 in Chapter 2 provide a comprehensive display of actions proposed in Alternative 2 to respond to the purpose and need for action.

PROPOSED ACTION

Within NNVM, the Forest Service proposes to thin trees, mechanically treat shrubs, and use prescribed fire, separately or in combination, on approximately 991 acres. Treatments are proposed to create conditions that: 1) allow fire to play a key role in ecological processes and 2) protect existing large, old trees and provide for the re-establishment of "historic" ponderosa pine old growth over time. Thinning would be from below to a relatively wide spacing, cutting trees from the lower crown classes to favor those in the upper crown classes. Commercial forest products would be removed from the site. Non-commercial size trees would be retained on site and treated as slash.

Within the Deschutes WSR Corridor, the Forest Service proposes to thin trees and mechanically treat shrubs on approximately 29 acres. Treatments are proposed to create upland vegetation conditions which would withstand periodic, small, low intensity fires, including: 1) reduced natural fuel loads and 2) reduced competition to ponderosa pine. Thinning would be from below. Commercial forest products would be removed from the site. Non-commercial size trees would be retained on site and treated as slash.

Within Deer Habitat, General Forest, and Scenic View allocations, the Forest Service proposes to remove commercial forest products, thin non-commercial size trees (precommercial thinning), mechanically treat shrubs, and use prescribed fire, separately or in combination, on approximately 8,308 acres. Treatments are proposed to provide for: 1) fuels reduction within the Wildland Urban Interface, adjacent to primary travel routes, and in other strategic locations, 2) timber production, 3) increased sunlight along on the Cottonwood Road, and 4) an empirical study in even-aged, second growth ponderosa pine stands. Commercial harvest includes the use of intermediate and regeneration cutting methods. Thinning, an intermediate cutting method, is the harvest method proposed most extensively. Type of thinning varies depending on stand conditions (such as species composition and disease) and wildlife habitat needs. Majority of thinning treatments would retain trees at relatively wide spacing. Regeneration cutting is proposed less extensively. Regeneration cutting methods include: clearcutting, clearcutting with seed trees reserved, and uneven-aged management using single tree selection and group selection.

To facilitate removal of commercial wood products, connected actions include: 1) construction of temporary roads, 2) road reconstruction, and 3) road maintenance. To reforest areas proposed for regeneration cut treatments, connected actions include: 1) felling of submerchantable whips, 2) planting of ponderosa pine seedlings, 3) protecting planted seedlings from big game browse and gophers, and 4) spot application of herbicides if unwanted vegetation grows sufficiently to threaten tree seedling survival or growth.

To mitigate impacts to big game, approximately 49.7 miles of roads are proposed for either road closure (42.0 miles) or decommissioning (7.7 miles). Additionally, within approximately the northern two-thirds of the project area, motorized access would be restricted during a four-month period, from December 1 to March 31.

Two amendments to the Forest Plan are associated with the proposed action. One amendment addresses thermal cover standards in Deer Habitat. The other amendment addresses interim wildlife standards pertaining to the maintenance and/or enhancement of late or old structure components (Regional Forester's Forest Plan Amendment #2).

For additional information pertaining to Alternative 2 (Proposed Action) refer to Chapter 2

SCOPING AND PUBLIC INVOLVEMENT

The complete record of the public involvement process to date is available for review in the project file at the Bend-Fort Rock Ranger Station. The project was listed in the ***Schedule of Projects for the Deschutes and Ochoco National Forests and the Prineville District of the BLM*** beginning with the summer 1999 issue, reaching approximately 3,200 interested individuals and groups through quarterly mailings. The SOP is now posted to the Forest Service website and mailed to approximately 90 individuals or groups. The original project included a fish habitat improvement and a non-motorized trail project that were implemented separately. Off highway vehicle (OHV) use was also originally addressed, removed from analysis within the scope of this DEIS and will likely be analyzed at a later time.

The Kelsey Vegetation Management Project was initially presented to the public in a letter in October 2001. This letter was sent to approximately 220 individuals, businesses, and organizations that have expressed an interest in the project development process. Included in this mailing were the Confederated Tribes of Warm Springs, Burns Paiute Tribe, and The Klamath Tribe. The Bend Bulletin, the local newspaper, reported on the original Proposed Actions and the scoping letter was placed on the Deschutes and Ochoco National Forest web site. In addition, a field trip to the NNVM, to review a portion of the project area within the monument, was provided for interested members of the public that commented on proposed activities within the Monument during initial scoping.

Following the July 2003 18 Fire that occurred within the planning area, the analysis area outside of the 18 Fire was reanalyzed and a letter was again provided to the public for comments in May of 2004 (Summarized, DEIS, Appendix D). A decision was made on a Final Environmental Assessment, which was mailed to the public and placed on the Forest website, in September 2004. The decision was later withdrawn and a determination was made to analyze and present the Kelsey Vegetation Management Project as an EIS.

The latest scoping letter for the Kelsey Vegetation Management Project EIS was sent to the Bend-Fort Rock Ranger District's Kelsey mailing list of 170 individuals, groups, including the Confederated Tribes of Warm Springs, Burns Paiute Tribe, and The Klamath Tribe, and agencies (Refer to DEIS, Chapter 4, page 4-4) on March 25, 2005. A Notice of Intent to Prepare an Environmental Impact Statement was published in the Federal Register on March 18, 2005 (Vol. 70, No. 52).

Written comments, letters, electronic mail responses or phone calls were received from 12 individuals, agencies, businesses, and organizations in response to this scoping effort initiated on March 25, 2005.

The scoping letter made note that comments received during the original scoping or 30-day comment periods are a part of the Project Record. Members of the public that submitted comments during either of the previous comment periods would not need to comment again unless the comments had changed or they wished to provide additional comments. All comments received during the latest scoping period were read to ensure consideration of all comments during the analysis process. No written or verbal communication regarding the project from any of the three mentioned tribes has been received during any scoping or 30-day comment period.

Additional scoping and public involvement occurred with interested parties as follows:

- December 19, 2000: Meeting with Ray Miao, Woodside Ranch Homeowners Association.
- April 24, 2001: Meeting with Woodside Ranch Homeowners Association.
- October 9, 2001: Scoping summary published in ***Bend Bulletin***;
- November 1, 2001: Meeting with Tom Sedgwick, ONRC.
- November 13, 2001: Meeting with Jim Bergman, Sunriver Homeowners Association
- November 14, 2001: Meeting with Joyce Bucks, Deschutes River Woods.
- November 14, 2001: Meeting with Sunriver Homeowners Association board.
- September 5, 2002: Three (3) members of the public (Stuart G. Garrett, Paul Dewey, and Tom Sedgwick) who commented during the initial public scoping and 30-day comment period on project activities within NNVM participated in a field trip to NNVM Visitor Center and Lava River Cave. The purpose of the field trip was to discuss the proposal to reintroduce fire into the NNVM without the use of mechanical treatments, mechanical shrub treatment and thinning;
- April 14, 2003: Field trip with Helen Cross regarding the Annette Dodds memorial site;
- February 3, 2004: Meeting with Oregon Department of Fish and Wildlife to discuss proposed activities and big game thermal cover;
- May 6, 2004: 30-day public comment for Draft Environmental Assessment – ***Bend Bulletin*** legal notice, posted on Forest web site, sent to public;
- September 29, 2004: Decision Notice and Finding of No Significant Impact – ***Bend Bulletin*** legal notice, posted on Forest web site, sent to public.
- April 5, 2005: An article describing the EIS proposal appeared in the ***Bend Bulletin***.
- April 7, 2005: The EIS proposed action was posted on the Deschutes National Forest's web site.

IDENTIFICATION OF ISSUES

Issues are points of discussion, debate, or dispute about environmental effects that may occur as a result of the proposed action. Issues provide focus and influence alternative development, including development of mitigation measures to address potential environmental effects, particularly potential negative effects. Issues are also used to display differing effects between the proposed action and the alternatives regarding a specific resource element.

Many of the public comments received were used to focus the analysis in areas where the public desired a specific resource to be addressed. All comments received have been assessed as to their relevance to each of the resources being addressed within the Kelsey planning area. Many of the comments have been addressed in the Proposed Action, alternative development, and analysis of the effects of actions. These comments were used to formulate issues and to design alternative activities and mitigations. Some comments were used to explore alternatives that were not further developed. Responses to specific public comments may be located in DEIS Appendix C. Internal Forest Service comments and analysis were also used in the development of alternatives.

Comments received during the various scopings were placed into categories to help track issues and responses. The issues are categorized as follows:

Key issues: Issues used to develop alternatives or specific activities of the action alternatives. These are issues that respond to the Purpose and Need that cannot be resolved without some consideration of the trade-offs involved. Trade-offs can be more clearly understood by developing alternatives and displaying the relative impacts of these alternatives.

The key issues and concerns were the basis for designing an additional action alternative other than the proposed action. Each key issue statement is followed by a more detailed explanation and has a unit of measure developed for the reader to easily distinguish between each alternative and how it responds to the issue. A comparison of the alternatives is located in Chapter 2.

- **Analysis issues:** In addition to the key issues, other environmental components are considered in the analysis in Chapter 3, though they did not result in differing design elements between alternatives. These issues are important for providing the Responsible Official with complete information about the effects of the project.

Key Issues

The action alternatives respond to the following key issues identified during initial project scoping, both public and internal. The key issues are specific to the proposed actions and the project area. Attributes and measures for each issue will help to evaluate how each of the alternatives addresses issues. Evaluations of each attribute and measure are provided in the Comparison of Alternatives section of Chapter 2.

Key Issue #1: Wildland Urban Interface Fuels Reduction

Issue Statement: Public and internal concerns identified additional areas where fuels treatments are needed. Without treatment, these areas within the Wildland Urban Interface (WUI) would continue to have hazardous fuels, a risk for high intensity, stand replacement wildfire, and provide a greater risk of wildfire moving from Forest Service land to private lands.

Unit of Measure: Acres proposed for fuels treatment that would reduce fuels hazard adjacent to the Wildland Urban Interface and along defensible space corridors.

Key Issue #2: Stand Density

Issue Statement: Within the General Forest Management Area, thinning to a wide spacing (DEIS, Appendix D, Prescription 2) is proposed. A General Forest management objective is to have all stands utilizing site growth potential. Thinning to a tighter spacing may more fully utilize site growth potential, while meeting the purpose and need to provide timber and reduce the likelihood of large fire spread. More acres of reduced stand density would be more resistant to insect infestation.

Unit of Measure: Acres proposed for thinning to a wide spacing of 30 to 35 feet.

Key Issue #3: Reforestation Costs

Issue Statement: On approximately 330 acres, harvest methods necessitating reforestation treatments are proposed to either: 1) promote deer hiding cover; 2) reduce level of dwarf mistletoe infection; or 3) increase ponderosa pine stocking. Proposed reforestation treatments would cost approximately $500 per acre ($830 per acre with administrative costs). Different harvest methods may meet the stated need without incurring reforestation costs. Varying reforestation treatments may reduce reforestation costs.

Unit of Measure: Total acres proposed for reforestation.

Unit of Measure: Estimated reforestation costs.
- Cost per acre
- Total cost

Key Issue #4: Protection of Forest Investments

Issue Statement: Previously pruned areas are in need of thinning so that growth and commodity value are not lost. To meet the goals and objectives within the General Forest Management Area identified within the analysis area there is a need to have a more intense management. Thinning these areas is needed to optimize growth and commodity value for timber production (Forest Management Goals, Forest Plan 4-2).

Unit of Measure: Total acres proposed for thinning previously pruned stands.

Analysis Issues

Other issues that did not result in different alternatives or design elements were considered during the analysis process and are discussed in the various sections of Chapter 3, beginning on page 3-2. These issues: 1) are generally less focused on the elements of Purpose and Need, than are the Key Issues and 2) reflect the discussions of the effects of the proposed activities.

Wildlife: The following items were analyzed and compared by alternative:

Threatened, Endangered, Candidate and Sensitive Species
Management Indicator Species
Migratory Landbirds
Hiding and Thermal Cover
Open Road Density
Shrub Habitats
Late and Old Structure Forest Habitat
Late and Old Structure Connectivity
Snags, Coarse Woody Material, and Green Tree Replacements

Water Quality and Fish Habitat: The Deschutes River is listed on the 2002, 303(d) list as "Water Quality Limited" by the Oregon Department of Environmental Quality for dissolved oxygen, chlorophyll A (June 1 through September 30), temperature (September 1 through June 30), sedimentation, and turbidity (spring/summer). The 2002, 303(d) list is presently being updated, and is available in the Draft 2004, 303(d) list. The Draft 2004 list proposes to extend the water temperature parameter from 9 months to all year. This portion of the river is regarded as having Outstandingly Remarkable Values (ORV) for geologic, vegetation, wildlife, cultural, scenic, and recreation river values (UDWSR, page 6). The fisheries resource is also to be treated as Outstandingly Remarkable because of the presence of redband trout (Oncorhyncus mykiss gairdneri), listed on the Regional Foresters Sensitive Species List and by the State of Oregon. As stated in the Wild and Scenic EIS is "Determination of the value of redband trout in segment 4 has been deferred until a review of the genetic status has been completed." Until that time, the redband population is to be treated as an ORV The analysis area is located approximately 50 miles upstream from bull trout populations, a federally Threatened species. Commercial thinning activities near streams or within riparian areas have the potential to impact water quality and fish habitat. In the design of the proposed action for the Kelsey Vegetation Management Project, approximately 11 acres would be hand thinned between 150 and 300 feet from the Deschutes River, within upland vegetation of the RHCA.

Botany and Invasive Plants: Potential effects to Proposed, Endangered, Threatened, and Sensitive (PETS) plant species were considered and no PETS plants were found in the project area. Proposed management activities have the potential to introduce or spread existing populations of invasive plants and invader species. Potential spread of invasive plants is a concern across the project area.

Cultural Resources: Proposed activities may have an effect on cultural resources. Activities are proposed in areas that have previously had harvest activities. Portions of the analysis area have been identified with cultural resource sites. Proposed ground-disturbing activities such as harvest, fuels treatments, and planting of vegetation has the potential to disturb unknown sites and compromise the recovery of information. Known sites would be avoided.

Recreation: Three (3) developed recreation sites are within the planning area, Lava Lands Visitor Center (and associated developments), Lava River Cave, and Benham Falls Day Use Area. The Sunriver-Lava Lands Trail and dispersed camping sites are also located in the project area. Proposed activities would provide for public safety.

Transportation and Unroaded Areas: A roads analysis was completed on all system roads within the planning area. Present and desired road densities are addressed for the various management areas. Roads were identified to remain open, be closed, or be decommissioned and the final road density for the management areas was determined. The net benefit to wildlife is discussed. Unroaded areas, as identified by the Roadless FEIS are separate from Inventoried Roadless Areas (IRAs). There are no Inventoried Roadless Areas within the project. There are no areas with units proposed that are in areas without roads or that have not had previous management activities. Substantial areas of lava are unroaded. No new permanent roads are proposed in this project area.

Scenery: Foreground views from Highway 97 and Forest roads 40 (South Century Drive), 9702, 9710, and 9720, and other visually sensitive areas, such as recreation sites, would have proposed vegetative activities. The activities would emphasize large trees and more distant views.

Range and Permits: There are presently no active range allotments or permits within or adjacent to the project area. The Cinderhill Allotment EA, signed Decision Notice and Finding of No Significant Impact in 2004, would allow limited grazing within the Kelsey planning area and the adjacent Fuzzy planning area, east of the project area.

Economic and Social Analysis: Consideration must be given to the financial efficiency of the proposed action and alternatives. Economic and social analysis focuses on the communities of Central Oregon and their ties to forest management through employment, income, and recreation.

PLANNING FRAMEWORK

Current Laws

Development of this Environmental Impact Statement follows implementing regulations of the National Forest Management Act (NFMA); Title 36, Code of Federal Regulations, Part 219 (36 CFR 219); Council of Environmental Quality, Title 40; CFR, Parts 1500-1508, National Environmental Policy Act (NEPA). Many federal and state laws, including the Forest and Rangeland Renewable Resources Act (RPA), Endangered Species Act, Clean Air Act, and Clean Water Act also guide this analysis. The following is a brief explanation of each of these laws and their relation to the current project planning effort.

The American Antiquities Act of 1906: The American Antiquities makes it illegal to appropriate, excavate, injure, or destroy any historic, prehistoric ruin or monument, or any object of antiquity, situated on lands owned by the Government of the United States, without permission of the Secretary of the Department of the Government having jurisdiction over the lands on which said antiquities are situated.

The National Historic Preservation Act of 1966, as amended: The National Historic Preservation Act requires Federal agencies to consult with American Indian Tribes, State and local groups before nonrenewable cultural resources, such as archaeological and historic structures, are damaged or destroyed. Section 106 of this Act requires Federal agencies to review the effects project proposals may have on the cultural resources in the Analysis Area.

The Endangered Species Act of 1973, as amended: The Endangered Species Act is to "provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such tests as may be appropriate to achieve the purpose of the treaties and conventions set forth in subsection (a) of this section." The Act also states "It is further declared to be the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act."

The Migratory Bird Treaty Act of 1918: The Migratory Bird Treaty Act is to establish an international framework for the protection and conservation of migratory birds. The Act makes it illegal, unless permitted by regulations, to "pursue, hunt, take, capture, deliver for shipment, ship, cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, including in this Convention…for the protection of migratory birds…or any part, nest, or egg of any such bird" (16USC 703). The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada). Later amendments implemented treaties between the Unites States and Mexico, Japan, and the Soviet Union (now Russia).

The National Environmental Policy Act (NEPA) of 1969, as amended: The National Environmental Policy Act is "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damaged to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nations; and to establish a Council on Environmental Quality" (42 U.S.C. Sec. 4321). The law further states "it is the continuing policy of the Federal Government, in cooperation, to use 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 the present and future generations of Americans. This law essentially pertains to public participation, environmental analysis, and documentation.

The Council on Environmental Quality (CEQ) promulgated the regulations for implementing NEPA (40 CFR parts 1500-1508). The CEQ has recently provided guidance on considering past actions in cumulative effects analysis (Memo to Heads of Federal Agencies, June 24, 2005).

The National Forest Management Act (NFMA) of 1976: The National Forest Management Act guides development and revision of National Forest Land Management Plans and has several sections to it ranging from required reporting that the Secretary must submit annually to Congress to preparation requirements for timber sale contracts. There are several important sections within the act, including Section 1 (purpose and principles), Section 19 (fish and wildlife resources), Section 23 (water and soil resources), and Section 27 (management requirements).

The Clean Water Act, as amended in 1977 and 1982: The primary objective of The Clean Water Act is to restore and maintain the integrity of the Nation's waters. This objective translates into two fundamental national goals: 1. Eliminate the discharge of pollutants into the nation's waters; and 2. Achieve clean water quality levels for fishing and swimming. Under Section 303(d) of the Clean Water Act, the State has identified water quality-limited water bodies in Oregon. The Deschutes River is the only water body in the project area that is on the 303(d) list. The following executive orders are included within the Clean Water Act:

Executive Order 11988: requires agencies to avoid adverse impacts associated with the occupancy and modification of floodplains.

Executive Order 11990: requires agencies to avoid adverse impacts associated with the destruction or modification of wetlands.

Executive Order 12088: requires Federal compliance with pollution control standards (such as the Clean Water Act).

The Clean Air Act, as amended in 1990: The purposes of The Clean Air Act are "to protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population; to initiate and accelerate a national research and development program to achieve the prevention and control of air pollution; to provide technical and financial assistance to state and local governments in connection with the development and execution of their air pollution prevention and control programs; and to encourage and assist the development and operation of regional air pollution prevention and control programs."

Multiple-Use Sustained-Yield Act of 1960: The Multiple Use – Sustained Yield Act of 1960 requires the Forest Service to manage National Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). 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 re-established and grown in again if the productivity of the land is not impaired.

Migratory Bird E.O. 13186: On January 10, 2001, President Clinton signed an Executive Order (E.O. 13186) titled “Responsibilities of Federal Agencies to Protect Migratory Birds.” This E.O. requires the *“environmental analysis of Federal actions, required by NEPA or other established environmental review processes, evaluates the effects of actions and agency plans on migratory birds, with emphasis on species of concern.”*

Forest Order 12962 (aquatic systems and recreational fisheries): This 1995 order’s purpose is to conserve, restore, and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide. It requires federal agencies to evaluate the effects of federally funded actions on aquatic systems and document those effects relative to the purpose of this order.

Executive Order 13112 (invasive species): This 1999 order requires Federal agencies whose actions may affect the status of invasive species to identify those actions and within budgetary limits, “(i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species… (iii) monitor invasive species populations… (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded;…(vi) promote public education on invasive species… and (3) not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species… unless, pursuant to guidelines that it has prescribed, the agency had determined and made public… that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.”

2005 Pacific Northwest Preventing and Managing Invasive Plants Record of Decision: The 2005 Pacific Northwest Preventing and Managing Invasive Plants Record of Decision provides Goals, Objectives, and Management Direction (Standards) for prevention and treatment of invasive plant species on National Forest Lands in Region 6.

Newberry National Volcanic Monument Comprehensive Management Plan: The Newberry National Volcanic Monument Plan (NNVM, 1994) guides all management and restoration activities within the Monument. It also requires the management plan to consider a program to reestablish old-growth ponderosa pine ecosystems. The Monument Plan takes precedence over the Forest Plan. The Monument legislation requires natural ecological succession of vegetation to the maximum extent practical. The Monument has three (3) management zones within the Kelsey planning area:

> ***River Zone:*** Minimize disturbance to wildlife habitats, while ensuring their long-term sustainability and diversity.
>
> ***Lava Butte Zone:*** Manage vegetation to provide high quality scenery, with some emphasis on preserving and sustaining large, old growth ponderosa pines, and to provide some habitat that allows for deer migration.
>
> ***Transition Zone:*** Work to reduce fuel loads enough to allow safe reintroduction of fire (prescribed) without endangering large, old growth ponderosa pine.

Upper Deschutes Wild and Scenic River and State Scenic Waterway – Comprehensive Management Plan (UDWSR): The Upper Deschutes Wild and Scenic River and State Scenic Waterway Comprehensive Management Plan (*River Plan, 1996*) designates the section of river forming that portion of the western boundary of the Kelsey planning area from the north boundary of

Sunriver to the southern urban growth boundary of Bend. This section includes sections 4a and 4b of the Recreational Opportunity Spectrum and is designated as Scenic.

Section 4a – Roaded Natural: The landscape appears natural, but roads and trails access the area, and some facilities are present. Visitors can expect less interaction with other people. Modifications to the landscape generally harmonize with the environment.

Section 4b – Rural: Aquatic, riparian, and upland vegetation all have a significant effect on all other river values and is an outstandingly remarkable river value. Native riparian vegetation will be healthy and dominate the periodically inundated and saturated areas within the river corridor. Riparian areas will be managed to support riparian dependent species. Upland vegetation will continue to be dominated by ponderosa and lodgepole pine. The forest will be characterized by disturbances, which mimic the effects of periodic occurrence of small, low intensity fires to perpetuate a mosaic of stand structures and ages and reduce the risk of high intensity fires. This mosaic will provide wildlife with thermal and breeding cover, dispersal habitats, and connection to water sources (Page 29, UDWSR).

Deschutes National Forest Land and Resource Management Plan Direction: The Deschutes National Forest Land and Resource Management Plan of 1990 (Forest Plan) as amended, provides guidance for management activities. The Forest Plan establishes goals, objectives, standards, and guidelines for each specific management area of the Forest, as well as Forest-wide standards and guidelines. Management Areas and associated standards and guidelines are described in Chapter 4 of the Forest Plan. Management Areas within the project area are included in Figure 6, page 1-24, with percentages in Figure 5, page 1-23.

M1: Special Interest Area (approximately 7,620 acres; 18 percent of the project area): The goal of Special Interest Areas is to preserve and provide interpretation of unique geological, biological, and cultural areas for education, scientific, and public enjoyment purposes, where the primary benefiting uses will be for developed and dispersed recreation, research, and education opportunities (Forest Plan, page 4-90). The Newberry National Volcanic Monument contains the Special Interest Areas.

M2: Research Natural Area (approximately 1,315 acres; 3 percent of the project area): The Moske Butte Research Natural Area is located adjacent to the southeast boundary and within the project area. The goal is to preserve examples of naturally occurring ecosystems in an unmodified condition for non-manipulative research and education. There are no proposed vegetative activities within this Management Area (Forest Plan, page 4-92).

M7: Deer Habitat (approximately 10,880 acres; 26 percent of the project area): Vegetation management within Deer Habitat is to provide optimum habitat conditions on deer winter and transition ranges while providing some domestic livestock forage, wood products, visual quality and recreation opportunities. Vegetation will be managed to provide optimum habitat considering the inherent productivity of the land. Herbaceous vegetation will be managed to provide a vigorous forage base with a variety of forage species available. Forage conditions may be improved where conditions are poor. Foraging areas will be created where forage is lacking, maintained when in proper balance, or reduced when overabundant and more foraging areas are needed. Long-term tree or shrub cover to moderate cold weather conditions is equally important. Ideally, cover and forage areas should be in close proximity for optimum use by big game, with cover making up 40 percent of the land area. Approximately three-quarters of cover areas should be thermal cover with the remainder being hiding areas (Forest Plan, page 4-113).

M8: General Forest (approximately 11,570 acres; 27 percent of the project area): Within the General Forest MA, timber production is to be emphasized while providing forage production, visual quality, wildlife habitat, and recreational opportunities for public use and enjoyment. The objective is to continue to convert unmanaged stands to managed stands with the aim of having stands in a variety of age classes with all stands utilizing the site growth potential (Forest Plan, page 4-117).

M9: Scenic Views (approximately 10,135 acres; 24 percent of the project area): The project area contains foreground and midground scenic views. The goal of scenic views management areas is to provide high quality scenery representing the natural character of central Oregon. Landscapes seen from selected travel routes and use areas are to be managed to maintain or enhance their appearance. To the casual observer, results of activities either will not be evident, or will be visually subordinate to the natural landscape (Forest Plan, page 4-121).

M15: Old Growth (approximately 465 acres; 1 percent of the project area): Old Growth Management areas are intended to provide naturally-evolved old growth forest ecosystems for (1) habitat for plant and animal species associated with old growth forest ecosystems, (2) representations of landscape ecology, (3) public enjoyment of large, old tree environments, and (4) the needs of the public from an aesthetic spiritual sense. They will also contribute to the biodiversity of the Forest. There are no proposed vegetative activities within this Management Area (Forest Plan, page 4-149).

M17: Wild and Scenic Rivers (approximately 480 acres; 1 percent of the project area): The goal within the Wild and Scenic Rivers Management Area is to maintain and enhance those outstandingly remarkable values that qualified segments of the Deschutes River for inclusion in the National Wild and Scenic Rivers System. A portion of the Deschutes River forms approximately nine (9) miles of the west boundary of the planning area (Forest Plan, page 4-155).

Ryan Ranch Key Elk Area (KEA) (Approximately 4,600 acres; 10 percent of the planning area): Elk are found in certain key habitat areas, within which management will provide conditions needed to support certain numbers of summering and wintering elk. The Ryan Ranch Key Elk Area (21,460 acres), is divided by the Deschutes River, with less than one-third located within the planning area and overlapping other management allocations. Standards and Guidelines address recreation, road, and vegetation management (Forest Plan, page 4-55).

FIGURE 5: Distribution Of Management Areas In Kelsey Analysis Area

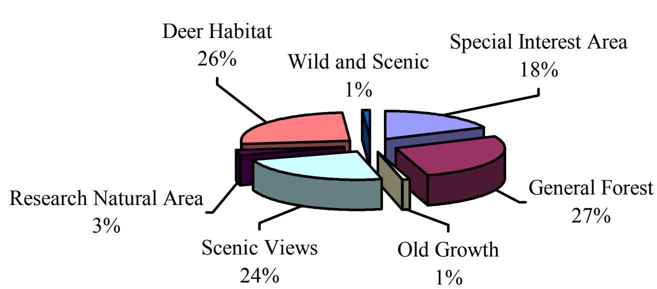
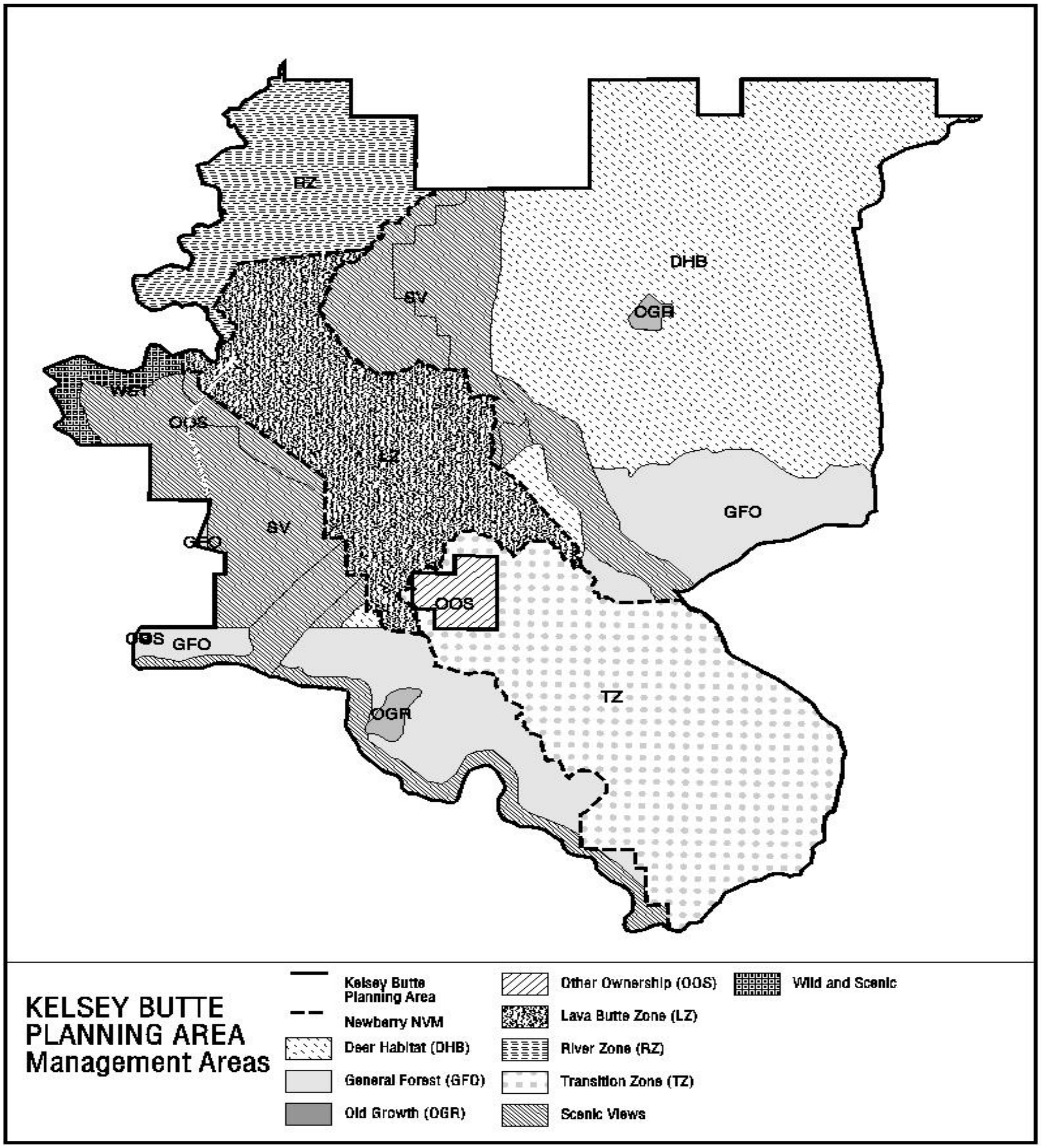


FIGURE 6: Deschutes National Forest Management Areas



Eastside Screens: The Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales, or Eastside Screens, amended the Forest Plan in 1995. It applies to the design and preparation of timber sales on eastside Forests, is often referred to as "Regional Forester's Forest Plan Amendment #2" or as the "Eastside Screens."

Management Indicator Species (MIS): The Deschutes National Forest Land and Resource Management Plan (USDA 1990) identifies various species of wildlife as management indicator species (MIS). These species were selected because their welfare could be used as an indicator for other species dependent upon similar habitat conditions. Indicator species can be used to assess the impacts of management actions on habitat requirements. These species are not assigned Management Areas; rather, Standards and Guidelines are applicable Forest-wide. The species selected for the Deschutes National Forest are listed in Chapter 3, under the Wildlife section, Management Indicator Species.

Riparian Habitat Conservation Areas (RHCA): The Inland Native Fish Strategy (*INFISH, 1995*) provides criteria and guidance for delineation of Riparian Habitat Conservation Areas (RHCAs) for riparian-dependent resources to receive primary emphasis. These areas are portions of watersheds that have been delineated, occurring along the Deschutes River and overlapping the Wild and Scenic River corridor and the NNVM River Zone. These RHCAs include traditional riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems. These areas are to be managed to maintain or restore water quality, stream channel integrity, channel processes, sediment regimes, instream flows, diversity and productivity of plant communities in riparian zones, and riparian and aquatic habitats to foster unique genetic fish stocks that evolved within the specific region. No thinning is proposed within 100 feet of riparian vegetation only. Most thinning would occur in upland vegetation (Ponderosa pine, lodgepole pine, and understory shrubs and grasses). Some thinning could occur in areas with interspersed riparian vegetation. **PACFISH** does not apply here because, historically, anadromous fish did not make it past Big Falls on the Deschutes River, approximately 50 miles downriver of the Kelsey planning area.

Local Assessments

Roads Analysis: According to the Forest Service Road Management Policy published January 12, 2001, a Roads Analysis must inform all NEPA decisions signed after January 12, 2002, which involve certain changes in the transportation system. A project-level Roads Analysis was completed in 2002 for the Kelsey Planning Area (Project Record, Appendix T). Roads were reanalyzed in 2004 following the 18 Fire that occurred mostly within the planning area. A Roads Analysis is an interdisciplinary process that provides the decision maker information on the needs, opportunities, and priorities for the road system. The report concluded that a sufficient transportation system can be kept in place while at the same time road closures and decommissioning can move towards Forest Plan standards and guidelines for road density, providing net benefits for wildlife and associated habitat. The roads analysis addressed concerns about wildlife habitat effectiveness, access that allows efficient response for fire suppression activities, impacts to streamside habitat, historical use, and management considerations. The analysis provides the Decision Maker with recommendations that may be a part of the decision. The analysis was consistent with the Forest-wide Roads Analysis Report that analyzed the transportation system on the Deschutes and Ochoco National Forests focusing on major roads.

1998 Deschutes National Forest Integrated Fuels Management Strategy: "The Integrated Fuels Management Strategy (IFMS) provides guidance for prescribed fire, mechanical brush mowing, and small diameter tree thinning and release...” “The IFMS Recommended Strategic Actions were developed to assist the Forest with program development towards meeting long term fuels management goals in an integrated, adaptable and effective manner.”

2000 Bend-Fort Rock Plantation Herbicide EA: The Bend-Fort Rock Plantation Herbicide EA analyzed herbicide use for the reduction of noxious weeds (invasive plants) on several projects located on the Bend-Fort Rock Ranger District.

2005 Sunriver Community Wildfire Protection Plan (CWPP) and 2006 (Expected) Greater Bend Community Wildfire Protection Plan (CWPP): The two urban areas that are adjacent to the planning area defined their WUI boundaries. These boundaries have been used to provide a distinctive boundary used for analysis purposes. The Greater Bend CWPP is expected to be signed in approximately March 2006. Refer to Chapter 2, Figures 7a and 7b, pages 2-10 and 2-11 and Figures 8a and 8b, pages 2-17 and 2-18.

PROJECT RECORD

This EIS hereby incorporates by reference the Project Record (40 CFR 1502.21). The Project Record contains Specialist Reports and other technical documentation used to support the analysis and conclusions in this EIS. Chapter 3 provides a summary of the Specialist Reports in adequate detail to support the decision rationale; appendices provide supporting documentation.

Incorporating these Specialist Reports and the Project Record help implement the Council on Environmental Quality (CEQ) Regulations provision that agencies should reduce NEPA paperwork (40 CFR 1500.4), that EISs shall be “analytic rather than encyclopedic,” and that EISs “shall be kept concise and no longer than absolutely necessary” (40 CFR 1502.0). The objective is to furnish adequate site-specific information to demonstrate a reasoned consideration of the environment impacts of the alternative and how these impacts can be mitigated, without repeating detailed analysis and background information available elsewhere. The Project Record is available for review at the Bend-Fort Rock District Office, 1230 NE Third Street, Suite A-242, Bend, Oregon, Monday through Friday 7:45 a.m. to 4:30 p.m.

SCOPE OF PROJECT AND DECISION FRAMEWORK

The scope of the project and the decision to make are limited to: two non-significant Forest Plan amendments; fuels reduction; non-commercial thinning, and commercial thinning and regeneration cut; reforestation; and mitigation and monitoring. Chapter 2 details the designs of these actions. The project is limited to National Forest System lands within the project area. Connected actions to be included in the decision include: road reconstruction; road closure and decommissioning; temporary road development and subsequent subsoiling; and herbicide treatment used in connection with reforestation.

The Responsible Official for this proposal is the Forest Supervisor of the Deschutes National Forest. Based on response to the Draft EIS, changes made to the Draft EIS, and the analysis disclosed in this Draft EIS, the Responsible Official will make a decision and document it in a Record of Decision (ROD). The Responsible Official can decide to:

Select the proposed action alternative or preferred action alternative that have been considered in detail, or

Modify an action alternative, or
Select the no-action alternative.
Identify what mitigation measures will apply.

The decision regarding which combination of actions to implement will be determined by comparing how each factor of the project purpose and need is met by each of the alternatives and the manner in which each alternative responds to the key issues. The alternative that provides the best mix of prospective results in regard to the purpose and need and the key issues, and does so in an economically efficient manner, will be selected for implementation.

The decision will determine: Which alternative will provide the best mix for reducing hazardous fuels, reducing stand density, reducing reforestation costs, protecting Forest investments, and provide the best economic return from harvest activities.

CHAPTER 2

ALTERNATIVES
INCLUDING THE PROPOSED ACTION

CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION

INTRODUCTION

This chapter describes and compares the alternatives that were considered for the Kelsey Vegetation Management Project. A description of each of the actions, or design elements of those actions, that are proposed in varying degrees in the fully developed action alternatives is provided. This relationship is further discussed under each resource in Chapter 3, "Environmental Consequences". A unit map of each action alternative is included.

Alternatives are presented in comparative form, defining the differences between each alternative and providing a clear basis for choice among options to the decision maker and the public. The information used to compare the alternatives is based upon the design of the alternative (such as, additional units and treatment differences between alternatives) and some of the information is based upon the environmental, social and economic effects of implementing each alternative (such as, the amount of thinning in mule deer winter habitat).

Description of Activities

The following are general descriptions of activities proposed to meet the identified purpose and need, connected activities, and mitigation activities. They were prepared to provide the reader with a reference regarding the activities that would occur for the action alternatives, Alternative 2 (Proposed Action) and Alternative 3. Discussions of the following activities are also provided in more detail in Chapter 3, Environmental Consequences and the DEIS, Appendix D.

Prescribed Burning: Prescribed burning is the judicious use of fire to decrease or remove accumulated ground fuels during periods of spring like moisture, reducing the risk of an uncharacteristic high intensity wildfire.

Mechanical Shrub Treatment (MST): Use of mechanized equipment to mow, cut, chop, grind or otherwise reduce shrub or ground fuel vertical structure. Equipment and attachments would be chosen based on soils (compaction and displacement potential), terrain, other resource concerns, and cost and availability. Reducing shrub density would reduce shrub fuels continuity, wild and prescribed fire intensity, tree scorch heights, and spotting potential (airborne dispersal of burning embers) during wildfire.

Cutting of Trees: Trees would be cut using intermediate and regeneration cutting methods. With both methods, no trees greater than 21 inches dbh would be cut. Trees cut with commercial value would be sold and removed from the site. Actions connected with commercial harvest include road reconstruction, temporary road development, and hazard tree removal. Trees without commercial value would be retained on site and disposed of using a variety of slash treatment methods.

- **Intermediate Cutting:** Stand densities would be reduced to varying levels depending on identified needs, resource objectives, and stand conditions (DEIS, Appendix E, Prescriptions 0, 1, 2, 4, 11, 12, 13, and 14). Residual densities would exceed minimum stocking levels.
- **Regeneration Cutting (Even-aged Management, Clearcut):** Within stands proposed for this treatment, all trees less than 21 inches dbh would be cut to create openings of 6 to 12 acres in size, over 30 to 40 percent of the stand (DEIS, Appendix E, Prescription 8). Proposed

treatment would occur in Deer Habitat (MA7) to create new cover stands. Connected actions would include planting ponderosa pine seedling in openings, protecting planted seedlings from animal damage, and application of herbicide around planted seedlings if competing and unwanted vegetation exceeds damage thresholds.

- **Regeneration Cutting (Even-aged Management, Seed Trees Reserved):** Proposed treatment would cut lodgepole pine in excess to seed tree needs and poor vigor or diseased ponderosa pine and white fir (DEIS, Appendix E, Prescription 10).
- **Regeneration Cutting (Uneven-aged Management, Single Tree Selection):** Stand densities would be reduced to varying levels depending on identified needs, resource objectives, and stand conditions. Removal of mistletoe infected ponderosa pine (DEIS, Appendix E, Prescription 6) and lodgepole pine (DEIS, Appendix E, Prescription 7) would create openings within the stands. Connected actions include planting ponderosa pine seedlings in openings, protecting planted seedlings from animal damage, and application of herbicide around planted seedlings if competing and unwanted vegetation exceeds damage thresholds.
- **Intermediate and Regeneration Cutting (Silviculture Treatment Study):** A study would be initiated to scientifically evaluate three silvicultural treatments. Treatments would include 1) Wide thinning (DEIS, Appendix E, Prescription 91); 2) Uneven-aged management using single tree selection (DEIS, Appendix E, Prescription 92); and 3) Uneven-aged management using group selection (DEIS, Appendix E, Prescription 93). Within stands identified for group selection, areas that are from 1 to 4 acres in size would be delineated over approximately 25 percent of the stand. Control areas (no treatment would occur) would be established (EIS, Appendix E, Prescription 90). Treatments and the control would be replicated in three separate locations within the planning area. Trees excess to desired stocking levels would be cut. Within the delineated groups, all trees would be cut, except those threes over 21 inches dbh that may be present. Connected actions include planting ponderosa pine seedlings within group openings if natural regeneration is not present within 3 years of harvest; planting ponderosa pine seedling in portions of the uneven-aged single tree selection; protecting planted seedlings from big game browse and application of herbicide around planted seedlings if competing and unwanted vegetation exceeds damage thresholds.

Precision of Information and Adjustments

Quantifiable measurements, such as acres and miles, and mapped unit boundaries used to describe the alternatives and effects are based on the best available information. The analysis presented in this DEIS is based on consideration of the full extent of the acres, miles, and other quantities depicted in the alternatives. Information used in designing the alternatives was generated from a mix of field reconnaissance, use of aerial photos, use of global positioning system (GPS) technology, and various resource-specific databases.

ALTERNATIVE DESCRIPTIONS

Alternatives were developed by the Interdisciplinary Team to address the Purpose and Need and key issues that were brought forward through public and internal comment. Three (3) alternatives are analyzed in detail. Action alternatives meet the purpose and need for action in varying degrees.

Alternative 1 (No Action)

Alternative 1 is the No Action alternative. This alternative is required by law and serves as a baseline for comparison of the effects of all of the alternatives. Under Alternative 1, there would be no change in current management direction or in the level of ongoing management activities within the project area, such as road maintenance or roadside hazard tree removal.

No vegetation or fuels reduction treatments would occur. High-density stands would continue to present an elevated risk of uncharacteristic, high intensity wildfire, insect infestations, and the spread of disease vectors. All custodial activities such as road maintenance, law enforcement, and response to emergencies, including wildfire, would continue. Safety for both wildland firefighters and the public would be decreased along travel corridors where high intensity wildfire would likely be unstoppable.

Forested land within the Wildland Urban Interface (approximately 20,860 acres, which includes 15,205 forested acres and 5,655 acres of lava flow) would not have vegetation density reduced. These areas would continue to accumulate both dead and live vegetation. Fuel continuity would become more continuous without vegetation reduction and maintenance activities. The risk of wildfire spreading into adjacent urban areas would continue to increase.

Dense stands of black bark pine would continue to have slower growth rates than those that have been released through previous thinning activities. These stands would continue to be susceptible to both high intensity, stand replacing wildfire and to insect infestations. Some large dense stands would not allow optimum use by big game for forage and hiding and thermal cover.

Road Densities would not be reduced from present (3.8 miles per square mile) toward desired densities. Desired densities vary according to management area or other resource. Refer to Table 88, page 3-195, for detailed information regarding present, desired, the recommended road density following closure or decommissioning.

Alternative 2 (Proposed Action)

Tables two (2) through four (4) display the need for action and treatments proposed to meet the need. Approximately 9,330 acres are proposed for treatment. Figures 7a and 7b, pages 2-9 and 2-10, identify proposed units and treatment type. Proposed fuels treatments would treat approximately 40 to 70 percent of unit acreage, dependent upon site-specific needs. Total fiber volume from vegetative treatments (trees less than 21 inches dbh) is estimated to be 26.1 CCF (13.6 MMBF). All commercial harvest would use ground based logging methods. This could include the use of horse logging or other methods to reduce impacts to soil and vegetation within the Riparian Habitat Conservation Area (**RHCA**). For more detailed information, refer to Appendix A for unit specific information.

<table>
<tr><th colspan="5">Table 2: Alternative 2 (Proposed Action) – Proposed Actions
Within Newberry National Volcanic Monument (NNVM)</th></tr>
<tr><th rowspan="2">Need for Action</th><th colspan="3">Proposal for Action:</th><th rowspan="2">Unit[1] and Total Acreage</th></tr>
<tr><th>Commercial Harvest</th><th>Stand Improvement</th><th>Shrub/Grass/Dead Fuels Treatment</th></tr>
<tr><td rowspan="9">There is a need for:
Fire which plays a key role in natural ecological processes and
Fire-based, park-like, old-growth ponderosa pine.</td><td rowspan="2">----</td><td rowspan="2">----</td><td>Underburn</td><td>9 and 10
(62 acres)</td></tr>
<tr><td>MST separately or in combination with underburn.</td><td>25, 82, 84, 85, 90, 95, 101, and 104
(397 acres)</td></tr>
<tr><td rowspan="3">Thin from below to 40 sq. ft. of BA/Acre (Prescription 2).</td><td rowspan="2">Fell submerch trees excess to desired stocking levels.</td><td>MST/Underburn.</td><td>38, 61, 66, 88, 89, 96, and 102
(413 acres)</td></tr>
<tr><td>----</td><td>65
(11 acres)</td></tr>
<tr><td>---</td><td>MST or Underburn</td><td>11 and 94
(71 acres)</td></tr>
<tr><td rowspan="2">Thin from below to 60 sq. ft of BA/Acre, retaining as low as 20 sq. ft. where DMT infection is moderate to high (Prescription 4).</td><td rowspan="2">Fell submerch trees excess to desired stocking levels</td><td>---</td><td>97
(9 acres)</td></tr>
<tr><td>MST/Underburn</td><td>98
(8 acres)</td></tr>
<tr><td>Thin from below to 60 sq. ft. BA/Acre, thinning to wider spacing as needed to create desired scenic views (Prescription 12).</td><td>Fell submerch trees excess to desired stocking levels. Prune DMT infected branches</td><td>MST/Underburn</td><td>99 and 100
(9 acres)</td></tr>
<tr><td>Thin to highlight large diameter PP. Remove LP within 1 to 3 times the crown radius of PP (Prescription 12).</td><td>Fell submerch trees excess to desired stocking levels.</td><td>Underburn</td><td>87
(11 acres)</td></tr>
</table>

[1] Units in **BOLD** are located within the Wildland Urban Interface

Table 3: Alternative 2 (Proposed Action) – Proposed Actions Within Wild and Scenic River (WSR) Corridor				
Need for Action	**Proposal for Action:**			**Unit[1] and Total Acreage**
	Commercial Harvest	**Stand Improvement**	**Shrub/Grass/Dead Fuels Treatment**	
There is a need for: Reduced natural fuel loads, and Reduced competition to ponderosa pine.	Thin from below to 40 square feet of Basal Area per acre (Prescription 2).	Fell submerch trees excess to desired stocking levels.	MST	**78** (29 acres)

[1] Units in **BOLD** are located within the Wildland Urban Interface.

Table 4: Alternative 2 (Proposed Action) – Proposed Actions Within Deer Habitat, General Forest, And Scenic View Management Areas				
Purpose and Need	**Proposal for Action:**			**Unit[1] and Total Acreage**
	Commercial Harvest	**Timber Stand Improvement**	**Shrub/Grass/Dead Fuels Treatment**	
There is a need for: A landscape characterized by discontinuous hazardous fuels, and Timber production (Table 4 Continued on next page.)	---	----	MST or Underburn, separately or in combination	20, 24, **77, 79, 81, 83, 86, 107, 116, 133, 135, 137, 138, 139, 140, 141,** 142, 143, and 145 (2,067 acres)
				30, 123**, 132, 134, 136,** 151, **153, 154, 155, 157, 158, and 251** [3] (1,463 acres)
		Prune mistletoe infected branches.	MST	**29 and 31** (10 acres)
		Thin from below to 90 to 170 tpa. (Prescription 0)	MST	40, 46, 48, 62, 63, **106, 108, 109, 110, 114, 115,** and **131** [2] (658 acres)
		Thin from below to 90 to 170 tpa. (Prescription 0) Prune.	MST	53, 55, and 57 [2] (25 acres)

[1] Units in **BOLD** are located within the Wildland Urban Interface.
[2] All units listed are located within existing plantations.
[3] All units listed are located within past fuel reduction treatment areas.

<table>
<tr><th colspan="5">Table 4: Alternative 2 (Proposed Action) – Proposed Actions
Within Deer Habitat, General Forest, And Scenic View Management Areas</th></tr>
<tr><th rowspan="2">Purpose and Need</th><th colspan="3">Proposal for Action:</th><th rowspan="2">Unit[1] and Total Acreage</th></tr>
<tr><th>Commercial Harvest</th><th>Timber Stand Improvement</th><th>Shrub/Grass/Dead Fuels Treatment</th></tr>
<tr><td rowspan="10">There is a need for:
A landscape characterized by discontinuous hazardous fuels, and
Timber production

(Table 4 Continued on next page.)</td><td rowspan="4">Thin from below to 60 sq. feet of basal area per acre (Prescription 1).</td><td rowspan="2">Fell excess submerch trees.</td><td>----</td><td>34 and 113
(113 acres)</td></tr>
<tr><td>MST/Underburn or MST</td><td>35, 60 and 64
(63 acres)</td></tr>
<tr><td rowspan="2">----</td><td>---</td><td>119, 120, 121, and 125
(207 acres)</td></tr>
<tr><td>Underburn</td><td>126
(30 acres)</td></tr>
<tr><td rowspan="5">Thin from below to 40 sq. feet of BA/Acre (Prescription 2).</td><td rowspan="3">----</td><td>----</td><td>47
(224 acres)</td></tr>
<tr><td rowspan="2">MST/Underburn, Underburn/MST, or Underburn</td><td>12, 13, 23, 41, 42, 45, 50, 67, 105, 124, 146, 152, and 269
(1,347 acres)</td></tr>
<tr><td>147 and 156 [3]
(153 acres)</td></tr>
<tr><td rowspan="2">Fell submerch trees excess to desired stocking levels.</td><td rowspan="2">MST or Underburn, separately or in combination</td><td>37, 49, 69, 70, 71, 80, 112, and 129
(230 acres)</td></tr>
<tr><td>111, 117, and 130 [3]
(225 acres)</td></tr>
<tr><td>Thin from below to 60 sq. ft. BA/Acre, retaining as low as 20 sq. ft. where DMT infection is moderate to high (Prescription 4).</td><td>----</td><td>MST/Underburn or Underburn</td><td>39, 52, 54, and 56
(140 acres)</td></tr>
</table>

[1] Units in **BOLD** are located within the Wildland Urban Interface.
[2] All units listed are located within existing plantations.
[3] All units listed are located within past fuel reduction treatment areas.

Table 4: Alternative 2 (Proposed Action) – Proposed Actions Within Deer Habitat, General Forest, And Scenic View Management Areas				
Purpose and Need	**Proposal for Action:**			**Unit[1] and Total Acreage**
	Commercial Harvest	**Timber Stand Improvement**	**Shrub/Grass/Dead Fuels Treatment**	
There is a need for: A landscape characterized by discontinuous hazardous fuels, and Timber production. (End of Table 4 proposals to meet stated need)	Remove PP <21" dbh with moderate to high levels of DMT infection (DMTR>=3). Thin remaining portion of stand to 60 sq. ft. of BA/Acre. (Prescription 6)	Fell submerch trees excess to desired stocking (except Unit 26). Plant areas less than minimally stocked. Prune DMT infected trees within 65 ft of planted trees.	MST or Underburn	7, 8, **26, 27**, 58, and 59 (331 acres)
	Remove all LP. Remove PP less than 21" dbh with moderate to high levels of DMT infection (DMTR>=3). Thin remaining portion of stand to 60 sq. ft. BA/Acre. (Prescription 7)	Fell submerch trees excess to desired stocking levels. Plant PP where less than minimum stocked. Prune DMT infected trees within 65 ft of planted trees.	MST/Underburn	36 and **68** (60 acres)
	Create openings approximately 6 to 12 acres in size over 30 to 40% of treatment area (Prescription 8)	Plant created openings. Prune DMT infected trees within 65 ft. of planted trees. Apply herbicide if needed.	MST	21 (112 acres)
	Regenerate LP using seed tree harvest method. (Prescription 10)	Fell undesirable whips.	----	33 (14 acres)
	Thin to variable stocking. In most of stand (77%), thin from below to 60 sq. ft. of BA/Acre. Over approx 13% of area thin to wider spacing, retaining 20 tpa. No thinning in remainder of stand (10%). (Prescription 11)	----	MST	22 (172 acres)
	Thin from below to 60 sq. ft. BA/Ac. Remove PP with heavy DMT infection. (Prescription 14)	Fell excess submerch. trees. Prune DMT infected branches.	MST	**254** [3] (49 acres)

[1] Units in **BOLD** are located within the Wildland Urban Interface.
[2] All units listed are located within existing plantations.
[3] All units listed are located within past fuel reduction treatment areas.

FIGURE 7a: Alternative 2 (Proposed Action) – Proposed Units In North One–Half Of Planning Area

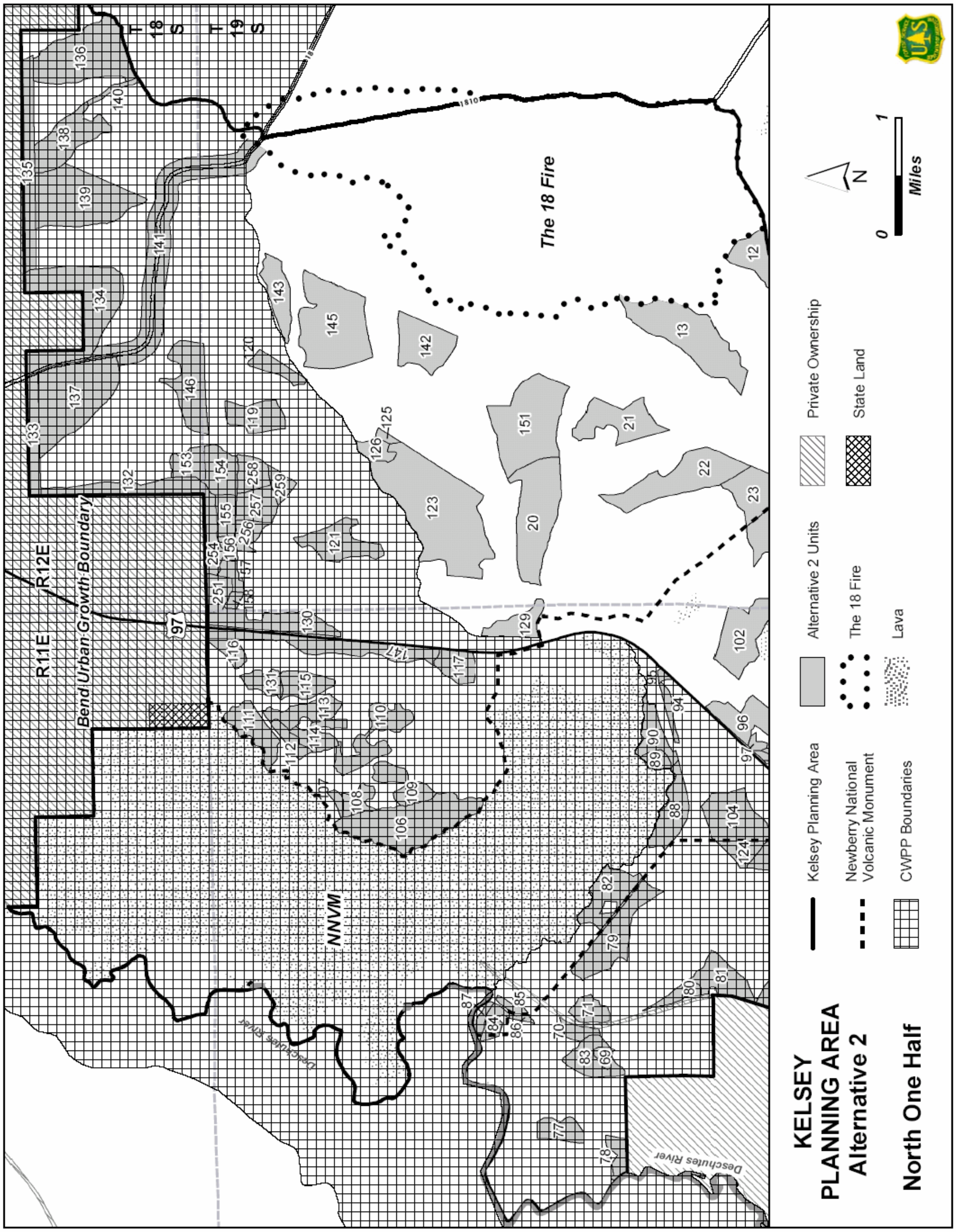
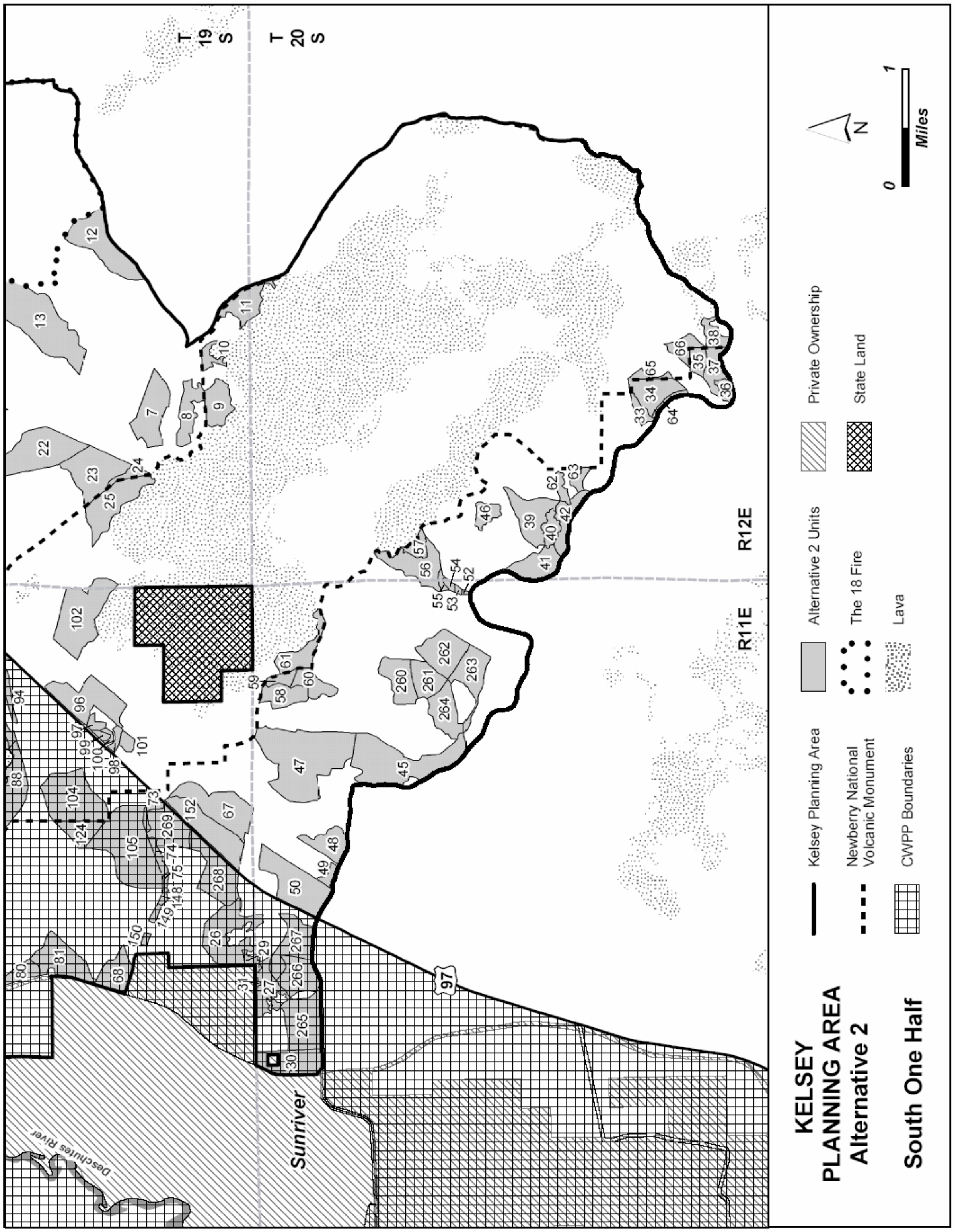


FIGURE 7b: Alternative 2 (Proposed Action) – Proposed Units In South One–Half Of Planning Area



Alternative 3

Alternative 3 was developed to address the Key Issues as discussed in Chapter 1: 1) Stand Density; 2) Wildland Urban Interface fuels reduction; 3) Reforestation costs; and 4) Protecting Forest investments. This alternative would continue to meet the purpose and need, although different from Alternative 2, by:

- Treating more acres to reduce hazardous fuels. More acres would be treated within the Wildland Urban Interface;
- More acres of thinning to moderate spacing (Prescription 1) and less to wide spaced thinning (Prescription 2). Commercial fiber would continue to be removed;
- Increase thinning acres to reduce stand density, primarily in General Forest and Wild and Scenic River corridor;
- Fewer acres, than Alternative 2, would be harvested using a regeneration method. Reforestation costs would be less;
- Treating some areas of previously pruned stands through thinning. Reducing stand density would maintain or increase growth of trees and reduce the risk of loss from wildfire. Prior investments would be protected.

Tables five (5) through seven (7), beginning on page 2-12, display the need for action and how and where that need would be addressed. Approximately 10,505 acres are proposed for treatment. Figures 8a and 8b, on pages 2-16 and 2-17, identify proposed units and treatment type. Proposed fuels treatments would treat approximately 40 to 70 percent of the acreage, dependent upon site-specific needs. Total fiber volume from vegetative treatments is estimated to be 30.3 CCF (15.8 MMBF). All commercial harvest would use ground based logging methods. This could include the use of horse logging or other methods to reduce soil and vegetation impacts within the Riparian Habitat Conservation Area (**RHCA**). For more detailed information, refer to DEIS, Appendix A for unit specific information.

Boundaries of units numbered greater than or equal to 300 are the same as boundaries of units proposed in Alternative 2. In these units, treatments have been changed from those proposed in Alternative 2. For an equivalent Alternative 2 unit number, subtract 300 from the Alternative 3 unit number (for example, Alternative 3 Unit 404 treats the same area as Alternative 2 Unit 104). Other instances of boundaries remaining the same between the two alternatives, but treatments varying, are footnoted.

Table 5: Alternative 3 – Proposed Actions Within Newberry National Volcanic Monument (NNVM)

Purpose and Need	Proposal for Action: Commercial Harvest	Proposal for Action: Stand Improvement	Proposal for Action: Shrub/Grass/Dead Fuels Treatment	Unit[1] and Total Acreage
There is a need for: Fire which plays a key role in natural ecological process, and Fire-based, park-like, old growth ponderosa pine.	----	----	Underburn	9 and 275 (67 acres)
			MST/Underburn	**82**, **90**, 234, **237**, 238, 325, and **404** (575 acres)
	Thin from below to 40 sq. ft. of BA/Acre (Prescription 2).	Fell submerch trees excess to desired stocking levels. Prune (Unit 276)	MST or MST/Underburn	**88**, **89, and 276** (99 acres)
			Underburn	*61, 96, 102,* **200**, and 338 (309 acres)
			---	65 and 366 (37 acres)
		---	Underburn	11 (54 acres)
	Thin from below to 60 sq. ft of BA/Acre, retaining as low as 20 sq. ft. where DMT infection is moderate to high (Prescription 4).	Fell submerch trees excess to desired stocking levels	---	97 (9 acres)
			MST/Underburn	98 (8 acres)
	Thin from below to 60 sq. ft. BA/Acre, thinning to wider spacing as needed to create desired scenic views (Prescription 12).	Fell excess submerch trees. Prune DMT infected branches	MST/Underburn	99 and 100 (9 acres)
		Fell excess submerch trees.	---	278 (4 acres)
	Thin to highlight large diameter PP. Remove LP within 1 to 3 times the crown radius of PP (Prescription 12).	Fell excess submerch trees.	Underburn	**87** (11 acres)

[1] Units in **BOLD** are located within the Wildland Urban Interface. Units in *ITALICS* have same unit number and boundary as Alternative 2; fuels treatment differs between alternatives.

Table 6: Alternative 3 – Proposed Actions Within Wild and Scenic River (WSR) Corridor				
Purpose and Need	**Proposal for Action:**			**Unit[1] and Total Acreage**
	Commercial Harvest	**Stand Improvement**	**Shrub/Grass/Dead Fuels Treatment**	
There is a need for: Reduced natural fuel loads, and Reduced competition to ponderosa pine.	Thin from below to 60 sq. feet of BA/acre (Prescription 1).	Fell excess submerch trees.	---	**202, 203, 204** (29 acres)
			Underburn	**201** (20 acres)
	Thin from below to 40 sq. ft. of BA/Acre (Prescription 2).	Fell excess submerch trees.	MST	**78 and 206** (36 acres)

[1] Units in **BOLD** are located within the Wildland Urban Interface.

Table 7: Alternative 3 – Proposed Actions Within Deer Habitat, General Forest, And Scenic View Management Areas				
Purpose and Need	**Proposal for Action:**			**Unit[1] and Total Acreage**
	Commercial Harvest	**Timber Stand Improvement**	**Shrub/Grass/Dead Fuels Treatment**	
There is a need for: A landscape characterized by discontinuous hazardous fuels and Timber production. (Table 7 continued on next page.)	----	----	Underburn or MST, separately or in combination	20, 24, **77, 81, 83, 107, 116,** ***133, 135, 137, 138, 139, 141***, 143, 145, **207, 208, 270, and 274** (2,040 acres)
				123, ***132, 134, 136,*** **153, 222, 223, 226,** 245, ***251***, **252, 255,** 451 [3] (1,749 acres)
		Prune mistletoe infected branches.	MST	**29 and 31** (10 acres)
		Thin from below to 90 to 170 tpa. (Prescription 0)	MST	48, 62, 63, **106, 108, 109, 110, 114, 115, 131, and 271** [2] (633 acres)
				221 [3] (16 acres)
		Thin from below to 90 to 170 tpa. (Prescription 0) Prune.	MST	53, 55, 57, 340, and 346 [2] (69 acres)

[1] Units in **BOLD** are located within the Wildland Urban Interface. Units in *ITALICS* have same unit number and boundary as Alternative 2; fuels treatment differs between alternatives.
[2] All units listed are located within existing plantations.
[3] All units listed are located within past fuel reduction treatment areas.

Table 7: Alternative 3 – Proposed Actions
Within Deer Habitat, General Forest, And Scenic View Management Areas

Purpose and Need	Proposal for Action:			Unit[1] and Total Acreage
	Commercial Harvest	Timber Stand Improvement	Shrub/Grass/Dead Fuels Treatment	
There is a need for: A landscape characterized by discontinuous hazardous fuels and Timber production. (Table 7 continued on next page.)	Thin from below to 60 sq. ft of BA/acre. (Prescription 1).	----	----	**119, 120, 121**, 125, 242, 243, 244, and 246 (409 acres)
			MST or Underburn, separately or in combination.	126, 211, 248, 312, 313, 356, 367, **405, 424, and 446** (954 acres)
				220, 253 and 447 [3] (215 acres)
		Fell excess submerch trees.	----	**113, 229**, 247, 335, and 360 (196 acres)
			MST or Underburn, separately or in combination	**224, 368, 369, and 412** (97 acres)
				411 and 430 [3] (174 acres)
	Thin from below to 40 sq. ft. of BA/Acre (Prescription 2).	----	----	213, **230, and 231** (59 acres)
		----	MST, Underburn, or MST/Underburn	23, 41, 42, 45, 152, 209, 210, 218, **269**, and 277 (705 acres)
				225 and 227 [3] (34 acres)
		Fell submerch trees excess to desired stocking levels.	MST, Underburn, or MST/Underburn	37, 49, and 129 (100 acres)
		Fell excess submerch trees. Prune	MST	**272 and 273** (5 acres)

[1] Units in **BOLD** are located within the Wildland Urban Interface. Units in *ITALICS* have same unit number and boundary as Alternative 2; fuels treatment differs between alternatives.
[2] All units listed are located within existing plantations.
[3] All units listed are located within past fuel reduction treatment areas.

Table 7: Alternative 3 – Proposed Actions
Within Deer Habitat, General Forest, And Scenic View Management Areas

Purpose and Need	Proposal for Action:			Unit[1] and Total Acreage
	Commercial Harvest	Timber Stand Improvement	Shrub/Grass/Dead Fuels Treatment	
There is a need for: A landscape characterized by discontinuous hazardous fuels and Timber production. (Table 7 continued on next page.)	Thin from below to 60 sq. ft. of BA/Acre, retaining as low as 20 sq. ft. where DMT infection is moderate to high (Prescription 4).	----	MST or Underburn	39, 352, and 354 (71 acres)
		Fell excess submerch trees.	MST or MST/Underburn	307, 308, and **327** (173 acres)
	Remove PP <21" dbh with moderate to high levels of DMT infection (DMTR>=3). Thin remaining portion of stand to 60 sq. ft. of BA/Acre. (Prescription 6)	Plant areas less than minimally stocked. Prune DMT infected trees within 65 ft of planted trees.	MST	**26** (102 acres)
	Create openings approximately 6 to 12 acres in size over 30 to 40% of treatment area (Prescription 8)	Plant created openings. Prune DMT infected trees within 65 ft. of planted trees. Apply herbicide if needed.	MST or MST/Underburn	21 and 442 (224 acres)
	Regenerate LP using seed tree harvest method. (Prescription 10)	Fell undesirable whips.	----	33 (14 acres)
	Thin to variable stocking. In most of stand (77%), thin from below to 60 sq. ft. of BA/Acre. Over approx 13% of area thin to wider spacing, retaining 20 tpa. No thinning in remainder of stand (10%). (Prescription 11)	----	MST	22 (172 acres)

[1] Units in **BOLD** are located within the Wildland Urban Interface. Units in *ITALICS* have same unit number and boundary as Alternative 2; fuels treatment differs between alternatives.
[2] All units listed are located within existing plantations.
[3] All units listed are located within past fuel reduction treatment areas.

Table 7: Alternative 3 – Proposed Actions
Within Deer Habitat, General Forest, And Scenic View Management Areas

Purpose and Need	Proposal for Action: Commercial Harvest	Proposal for Action: Timber Stand Improvement	Proposal for Action: Shrub/Grass/Dead Fuels Treatment	Unit[1] and Total Acreage
There is a need for: A landscape characterized by discontinuous hazardous fuels and Timber production. (End of Table 7 proposals to meet stated need)	Thin from below to 40 to 60 sq. ft. BA/Acre, thinning to the lower density around pruned trees. (Prescription 13).	----	----	240, 241, and 347 (291 acres)
		----	MST	239 (61 acres)
	Thin from below to 60 sq.ft. BA/Ac. Remove PP with heavy dwarf mistletoe infection. (Prescription 14)	Fell submerch. trees excess to desired stocking levels. Prune mistletoe infected branches.	MST/Underburn	***254*** [3] (49 acres)

[1] Units in **BOLD** are located within the Wildland Urban Interface. Units in *ITALICS* have same unit number and boundary as Alternative 2; fuels treatment differs between alternatives.
[2] All units listed are located within existing plantations.
[3] All units listed are located within past fuel reduction treatment areas.

FIGURE 8a: Alternative 3 – Proposed Units In North One–Half Of Planning Area

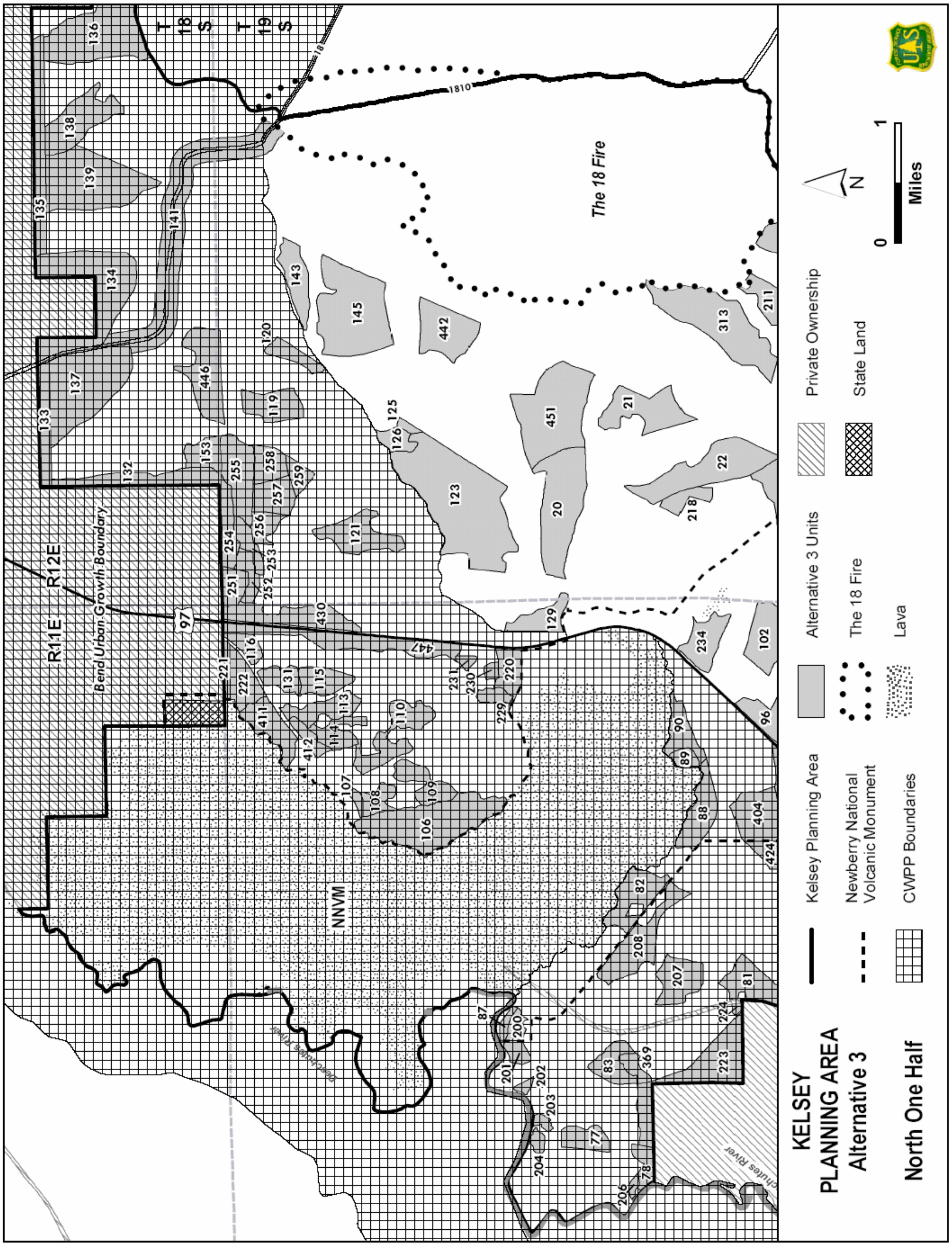
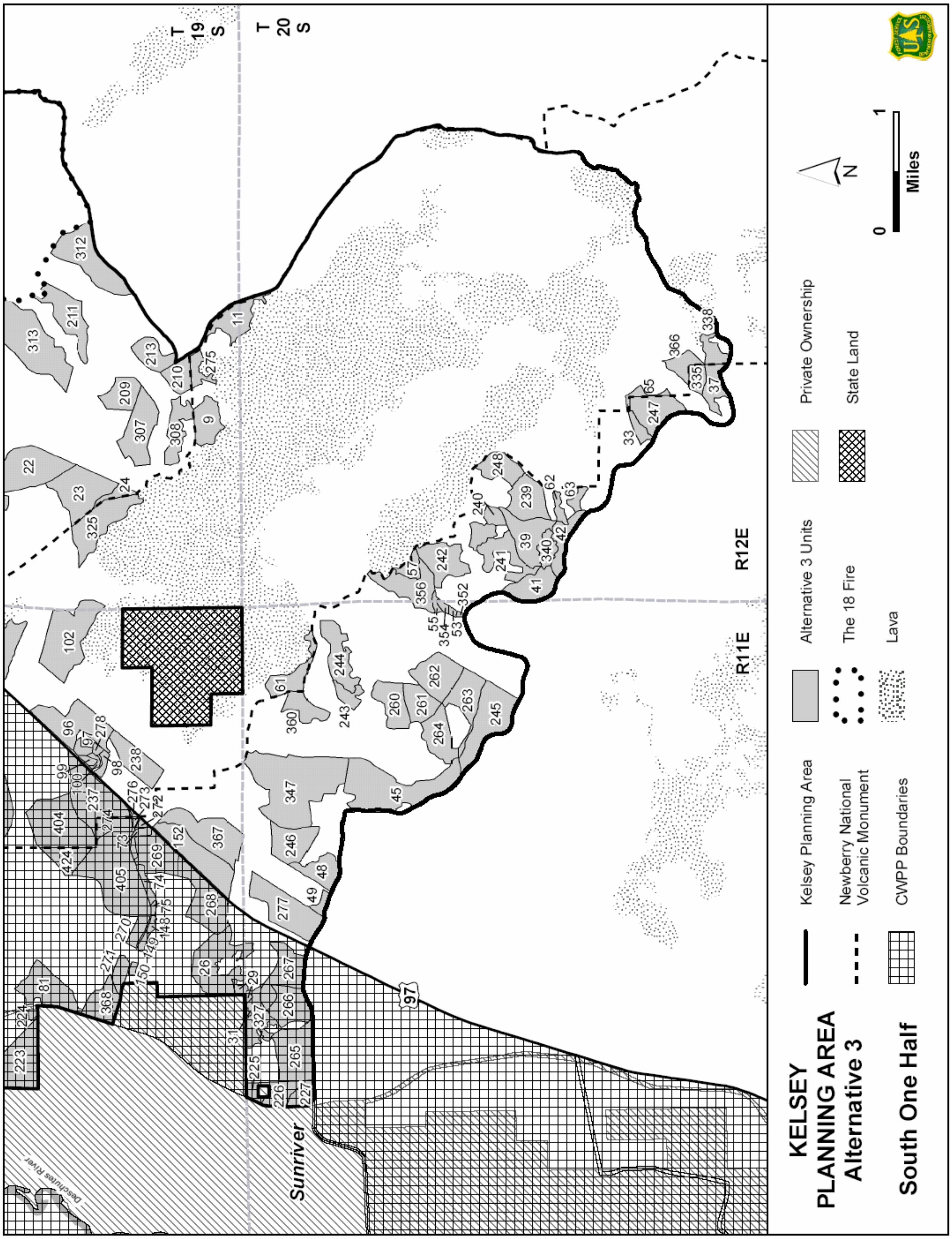


FIGURE 8b: Alternative 3 – Proposed Units In South One–Half Of Planning Area



Actions Common to Alternative 2 (Proposed Action) and Alternative 3

Table 8 displays the proposed actions that would meet the need for increasing sunlight on Cottonwood Road. Table 9 displays the proposed actions that would meet the need for an empirical study within the project area. Increasing sunlight on Cottonwood Road and the study would be consistent with other proposed activities to reduce hazardous fuels and provide timber through commercial cutting.

Table 8: Proposed Actions in Alternatives 2 and 3 to Meet Needs Along Cottonwood Road

Purpose and Need	Proposal for Action: Commercial Harvest	Proposal for Action: Timber Stand Improvement	Proposal for Action: Shrub/Grass/Dead Fuels Treatment	Unit[1] and Total Acreage
Along Cottonwood Road (FS Road 4143), there is a need for: Increased sunlight on the road in the winter, Reduced-hazard fuels, and Timber production.	Thin from below to 40 sq. feet of basal area per acre (Prescription 2)	----	MST/Underburn	**73, 74, 75, 148**, and **149** (36 acres)
		Fell submerch. trees excess to desired stocking levels.	MST/Underburn	**150** (4 acres)

[1] Units in **BOLD** are located within the Wildland Urban Interface

Table 9: Actions Proposed In Alternatives 2 and 3 To Meet The Need For An Empirical Study In Ponderosa Pine Stands

Purpose and Need	Proposal for Action: Commercial Harvest	Proposal for Action: Timber Stand Improvement	Proposal for Action: Shrub/Grass/Dead Fuels Treatment	Unit* and Total Acreage
There is a need for: An empirical study in even-aged, second growth ponderosa pine stands, that scientifically evaluates the short and long term effects of the following silvicultural treatments; 1) wide thinning, 2) uneven-aged management using single tree selection, and 3) uneven-aged management using group selection and Reduced-hazard fuels, and Timber production	Control. No treatment (Prescription 90).	---	---	**257**, 260, and **266** (170 acres)
	Thin to wide spacing. Thin from below to approx 30 to 40 tpa (Prescription 91)	Prune mistletoe infected branches.	Combination of MST, Underburn, and No Treatment.	**256**, 263, 264, and **265** (236 acres)
	Uneven-aged management using single tree selection. Thin from all size classes <21" dbh, retaining 70 to 100 tpa (Prescription 92).	Micro-plant small patches to compare natural regeneration to planting Prune mistletoe Spot apply herbicide	MST	**258**, 261, and **268** (174 acres)
	Uneven-aged management using group selection. Create openings approx. 4 acres in size on 25% of treatment area. Outside openings, thin from below. (Prescription 93)	Micro-plant small patches in openings to compare natural regeneration to planting. Prune mistletoe. Spot apply herbicide.	Underburn	**259**, 262, and **267** (165 acres)

* Units in **BOLD** are located within the Wildland Urban Interface

Connected Actions Common to Alternative 2 (Proposed Action) and Alternative 3

Connected actions are actions associated with other proposed activities. These activities would not occur unless the activities proposed in Alternative 2 (Proposed Action) or Alternative 3 occur. Proposed herbicide application would not occur unless reforestation occurs. Road reconstruction and temporary road development would not occur unless commercial harvest activities would occur. Removal of hazard trees adjacent to roads accessing activity areas would not occur unless harvest activities occur.

Hazard Tree Removal: Federal and State of Oregon safety regulations require that danger trees along project area travel routes be felled prior to activities taking place. Roadside danger trees will be felled along these travel routes and where activity units border the road system.

Herbicide Application: To reduce competition of other vegetation with tree seedlings, herbicide would be applied within areas where regeneration cutting methods are proposed. Proposed application of herbicide would occur on approximately 15 percent of each unit proposed for herbicide treatment, approximately 44 acres (Alternative 2) and 36 acres (Alternative 3). The total is less than one percent (0.1 percent) of the forested acres of the planning area.

Within one (1) to two (2) years following mechanical shrub treatment or underburning, if surveys indicate that shrubs, grasses, or sedges are re-establishing and have potential to adversely affect seedling growth, vegetation would be treated with herbicide within the units. A second application of herbicide would be done approximately two (2) years following initial treatment if surveys indicate competing and unwanted vegetation again has potential to exceed the action threshold. The action threshold is the period in time during which an action should take place to keep or reduce vegetation below the damage threshold (Project Record, Herbicide Analysis, Appendix E, page 6).

Spot application of herbicide would occur within a three foot radius of all planted ponderosa pine (200 to 250 trees per acre), a dry granular form of hexazinone (Pronone[R]MG) that inhibits photosynthesis. It is a water-dispersible, general herbicide providing both contact and residual control of many weeds, including annual and biennial weeds, brush, woody vines, and many types of perennial grasses. It can be applied over ponderosa pine without damage. Granular forms of this herbicide act through root uptake and movement in an upward direction through the plant. Approximately 13 percent to 16 percent of an acre would receive an application of herbicide. The proposed application rate of the product (0.26 to 0.30 active ingredient, pounds per acre) is at the low end of the application rates (0.3 to 2.5 active ingredient, pounds per acre) displayed in the risk assessment (SERA {Syracuse Environmental Research Associates} 1997, Page 2-6, Table 2-3).

Application would occur either in the spring after the ground thaws or in the fall before snowfall. A summary of the herbicide analysis can be found in Chapter 3. Table 10 displays total acreage for units proposed for reforestation, reforestation acres within those acres, and proposed herbicide treatment acres within reforestation acres.

Table 10: Units And Acres Proposed For Herbicide Treatment					
Unit	Unit Acreage (Gross)	Alternative 2		Alternative 3	
		Reforestation Acres (Net[1])	Acres of Herbicide Treatment (Net[2])	Reforestation Acres (Net[1])	Herbicide Treatment on Reforestation Acres (Net[2])
7	80	32	5	0	0
8	46	18	3	0	0
21	112	39	6	39	6
26	102	41	6	41	6
27	47	19	3	0	0
36	14	6	1	0	0
58	41	16	2	0	0
59	15	6	1	0	0
258	46	12	2	12	2
259	27	7	1	7	1
261	44	11	3	11	3
262	69	17	2	17	2
267	69	17	2	17	2
268	84	21	3	21	3
442	110	0	0	40	6
Total	**906**	**262**	**40**	**205**	**31**

[1]For group regeneration cut, net acreage is 25 to 35% of gross unit acreage.
For stand regeneration cut, net acreage is 40% of gross unit acreage.
[2]Assumes 15% of net reforestation acres.

Animal Damage Control: Within areas where regeneration cutting methods are proposed, establishing tree seedlings would be protected from big game browse and gopher damage. To protect seedlings from big game browse, repellant would be applied to seedlings or tubing would be installed. Gopher baiting would occur to minimize damage to seedlings.

Slash Treatment: Slash generated by cutting trees would be treated by a combination of treatments. Treatments would include whole tree yarding, hand piling, and machine piling (Table 11). Refer to Appendix A for details.

Table 11: Proposed Slash Treatment – Gross Acres		
Proposed Treatments	Alternative 2 (Proposed Action)	Alternative 3
Whole Tree Yarding	4,733	5,342
Hand Piling	1,386	1,110
Machine Piling	100	276

Road Reconstruction: Approximately 22.0 miles of open Forest system roads would be reconstructed (Table 12). Road reconstruction activities would include the restoration of drainage features, slope stabilization, guardrail replacement, applying spot surfacing, a multi-layer bituminous surface treatment, or resurfaced with crushed aggregate prior to hauling products from commercial harvest activities on identified roads. Reconstruction activities on Road 1801 would include the restoration of drainage features and applying spot surfacing as required. Intersections with Roads 1801100, 1801460, and 1801540 would be straightened or realigned. Road 9710 and Road 9720 would be resurfaced with crushed aggregate and have drainage features restored.

In addition to road reconstruction work, other roads that would be used for timber haul would require maintenance, primarily blading and shaping of the roadbed and brush removal.

Table 12: Road Reconstruction Activities
Milepost Location and Total Miles per Road Segment

Road Number	Reconstruction Location	Alternative 1 (Miles)	Alternatives 2 and 3 (Miles)
1801	Milepost 0.0 (jct. 18) to Milepost 3.4 (jct. 97)	0.0	3.4
9710	Milepost 0.00 (jct. 97) to Milepost 8.4 (jct. 9720)	0.0	8.4
9720	Milepost 0.3 to Milepost 10.5 (jct. 9710)	0.0	10.2
Total Miles		**0.0**	**22.0**

Temporary Road Development: Commercial harvest operations are expected to require the use of temporary roads, roads built to facilitate ground-based harvest systems for the singular purpose of removing forest products from a treated stand. After use, temporary roads would be subsoiled (tilling soil for road rehabilitation) following the project activities. The amount of temporary roads varies by alternative and is displayed with the alternative descriptions. Actual temporary road locations are determined through agreement by the Forest Service during timber sale contract administration. These roads would be built on relatively flat ground slopes (less than 30 percent) and would be constructed to the lowest possible standard capable of supporting log haul in order to minimize ground disturbance. In most instances, temporary roads would be constructed on top of previously established skid trails to minimize additional soil compaction associated with use of heavy equipment. This would result in little extra disturbance within the unit beyond what would already be experienced as a result of the employment of ground-based yarding systems.

Approximately 6.5 miles of temporary road would be needed for the removal of logs from the following commercially thinned and harvested units in Alternative 2 (Figures 9a – 9d): 8, 13, 21, 22, 23, 34, 35, 37, 39, 47, 50, 64, 105, 113, 119, 120, 269. These roads would be subsoiled following completion of harvest and associated activities.

Approximately 7.0 miles of temporary road would be needed for the removal of logs from the following commercially thinned and harvested units in Alternative 3 (Figures 10a – 10d): 21, 22, 23, 37, 39, 113, 119, 120, 211, 220, 230, 241, 242, 246, 247, 269, 277, 308, 313, 335, 347, 405. These roads would be subsoiled following completion of harvest and associated activities.

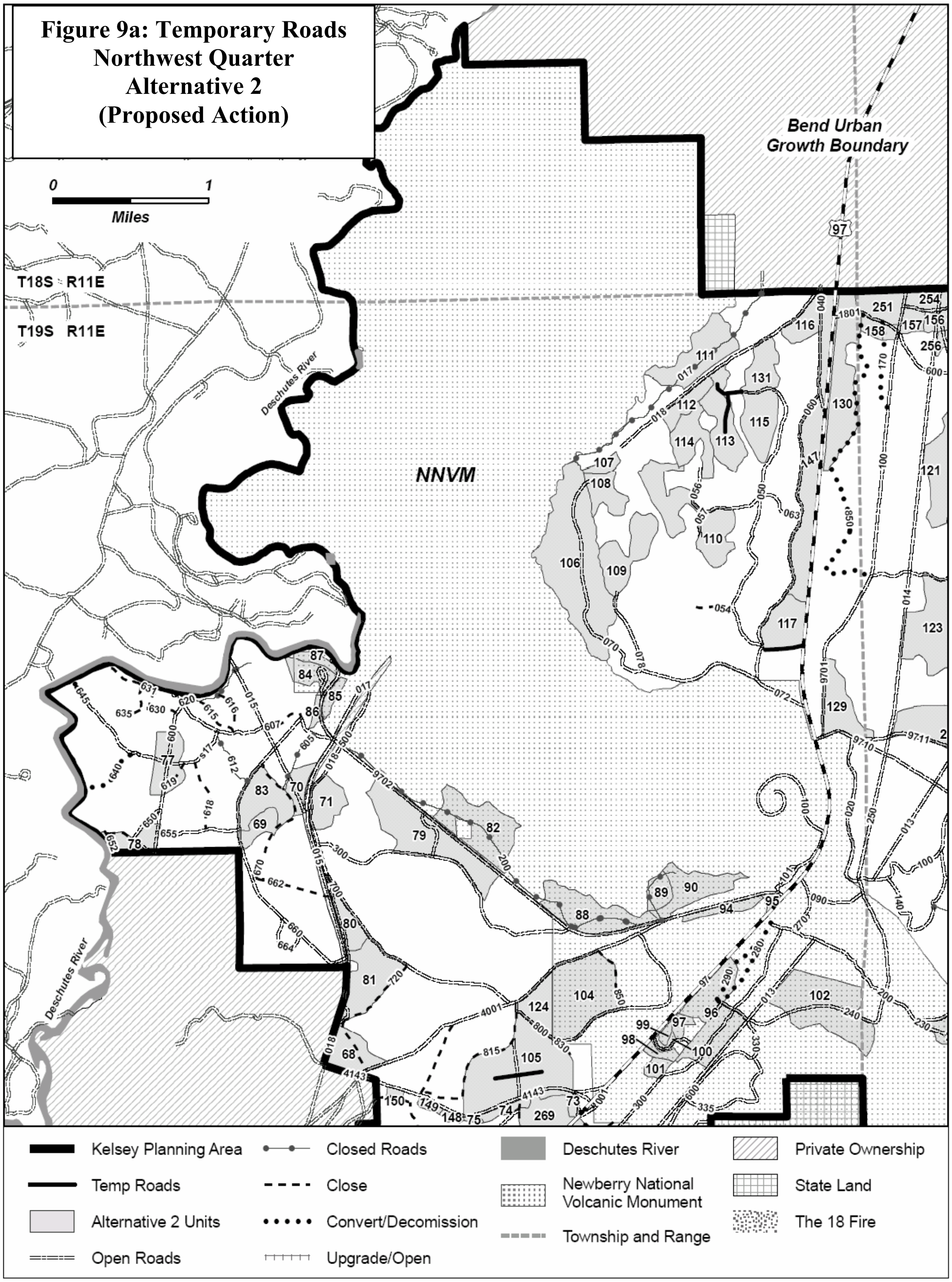


Figure 9a: Temporary Roads
Northwest Quarter
Alternative 2
(Proposed Action)
0
1
Miles
T18S R11E
T19S R11E
Deschutes River
NNVM
Bend Urban
Growth Boundary
97
Kelsey Planning Area
Temp Roads
Alternative 2 Units
Open Roads
Closed Roads
Close
Convert/Decomission
Upgrade/Open
Deschutes River
Newberry National
Volcanic Monument
Township and Range
Private Ownership
State Land
The 18 Fire

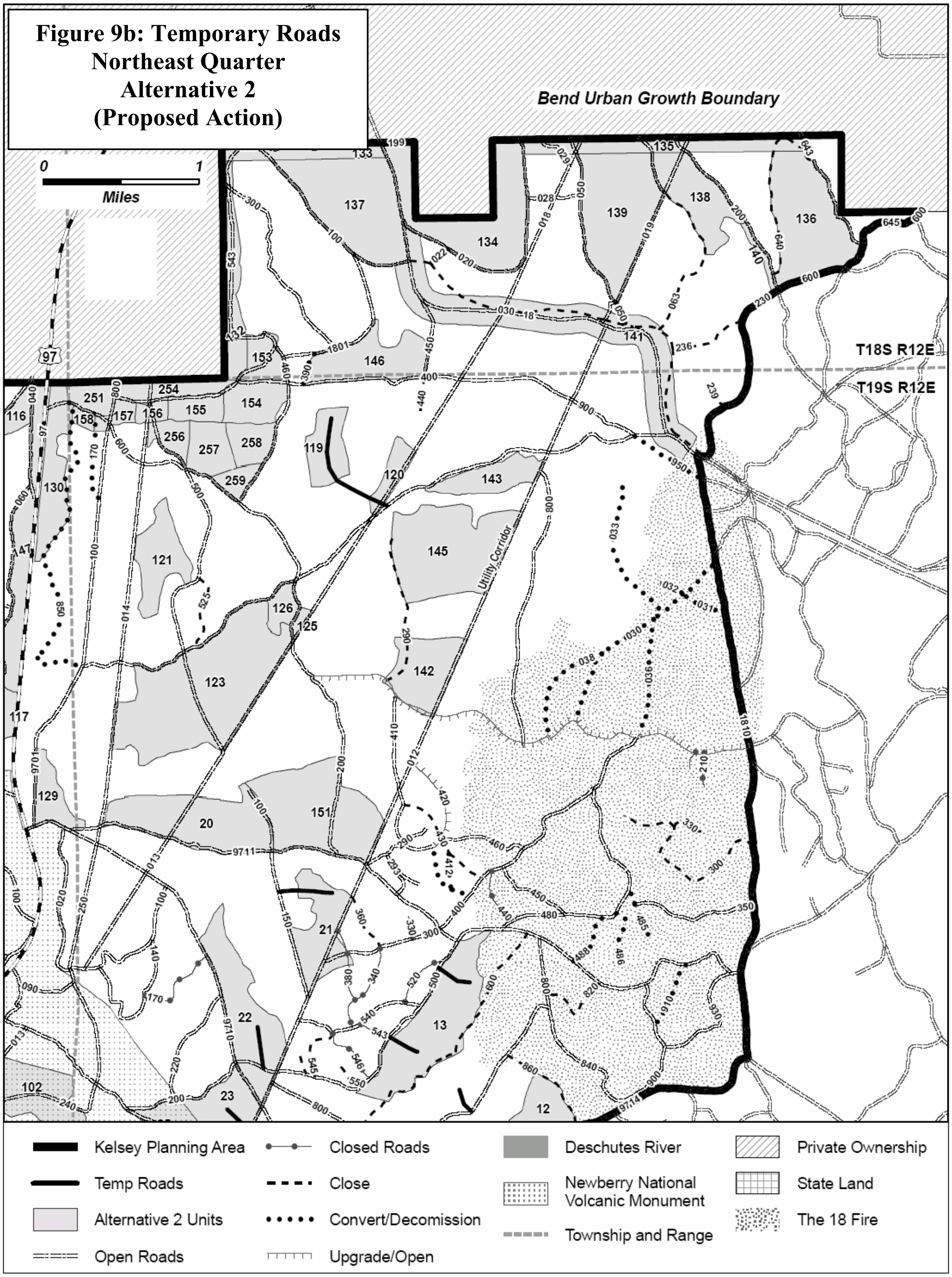


Figure 9b: Temporary Roads
Northeast Quarter
Alternative 2
(Proposed Action)
0
1
Miles
Bend Urban Growth Boundary
T18S R12E
T19S R12E
Utility Corridor
Kelsey Planning Area
Temp Roads
Alternative 2 Units
Open Roads
Closed Roads
Close
Convert/Decomission
Upgrade/Open
Deschutes River
Newberry National Volcanic Monument
Township and Range
Private Ownership
State Land
The 18 Fire

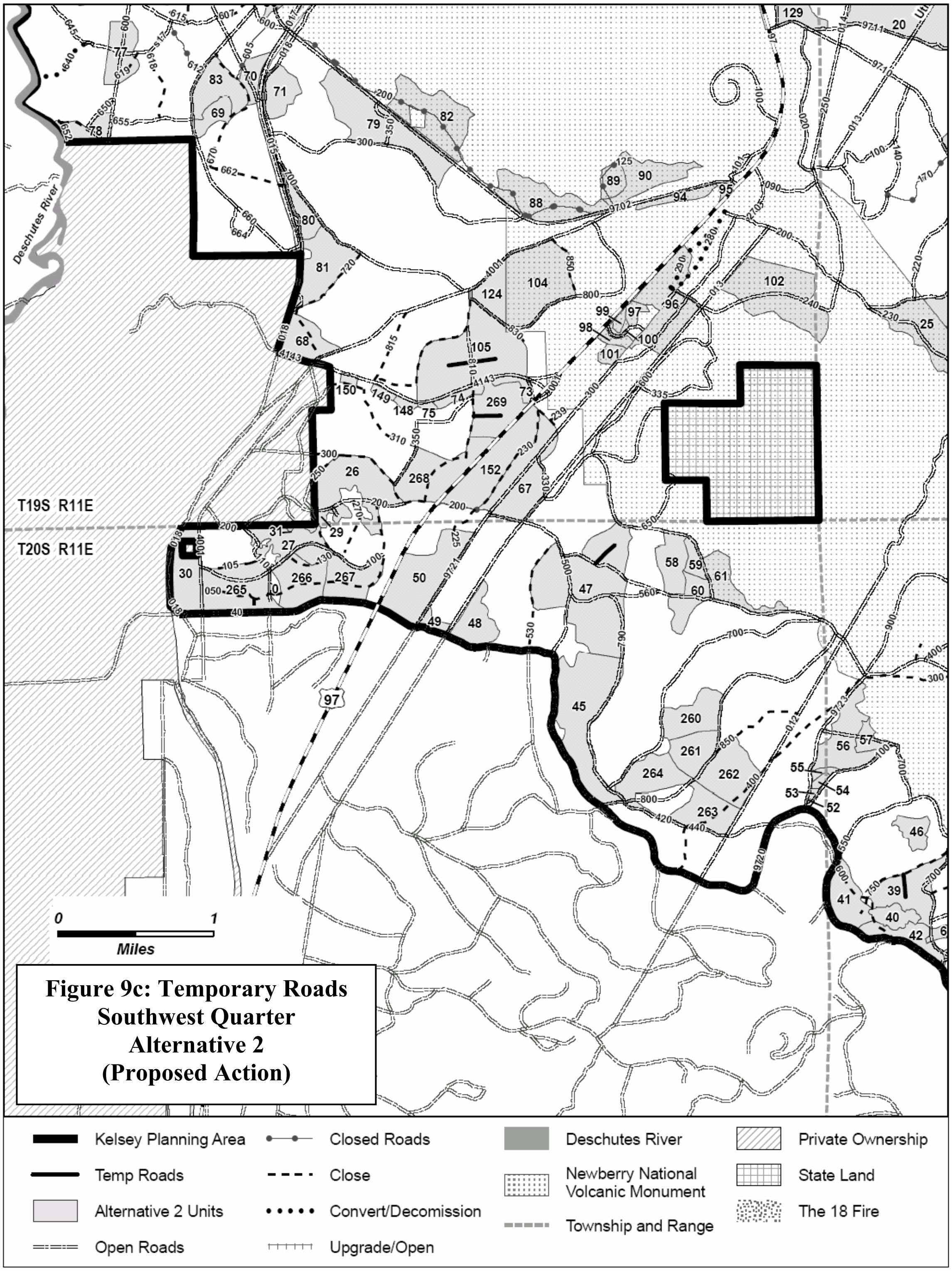


Figure 9c: Temporary Roads Southwest Quarter Alternative 2 (Proposed Action)

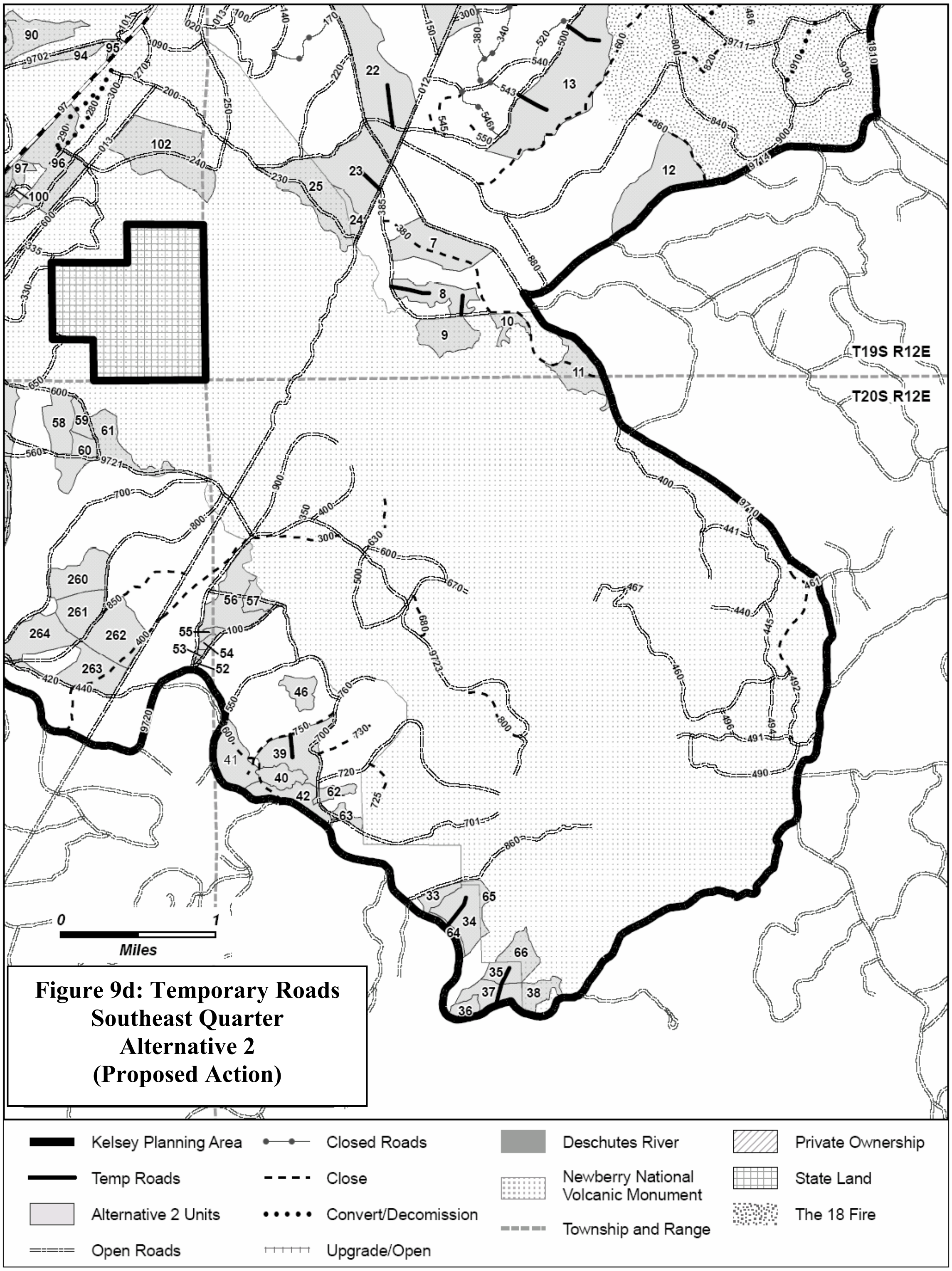


Figure 9d: Temporary Roads Southeast Quarter Alternative 2 (Proposed Action)

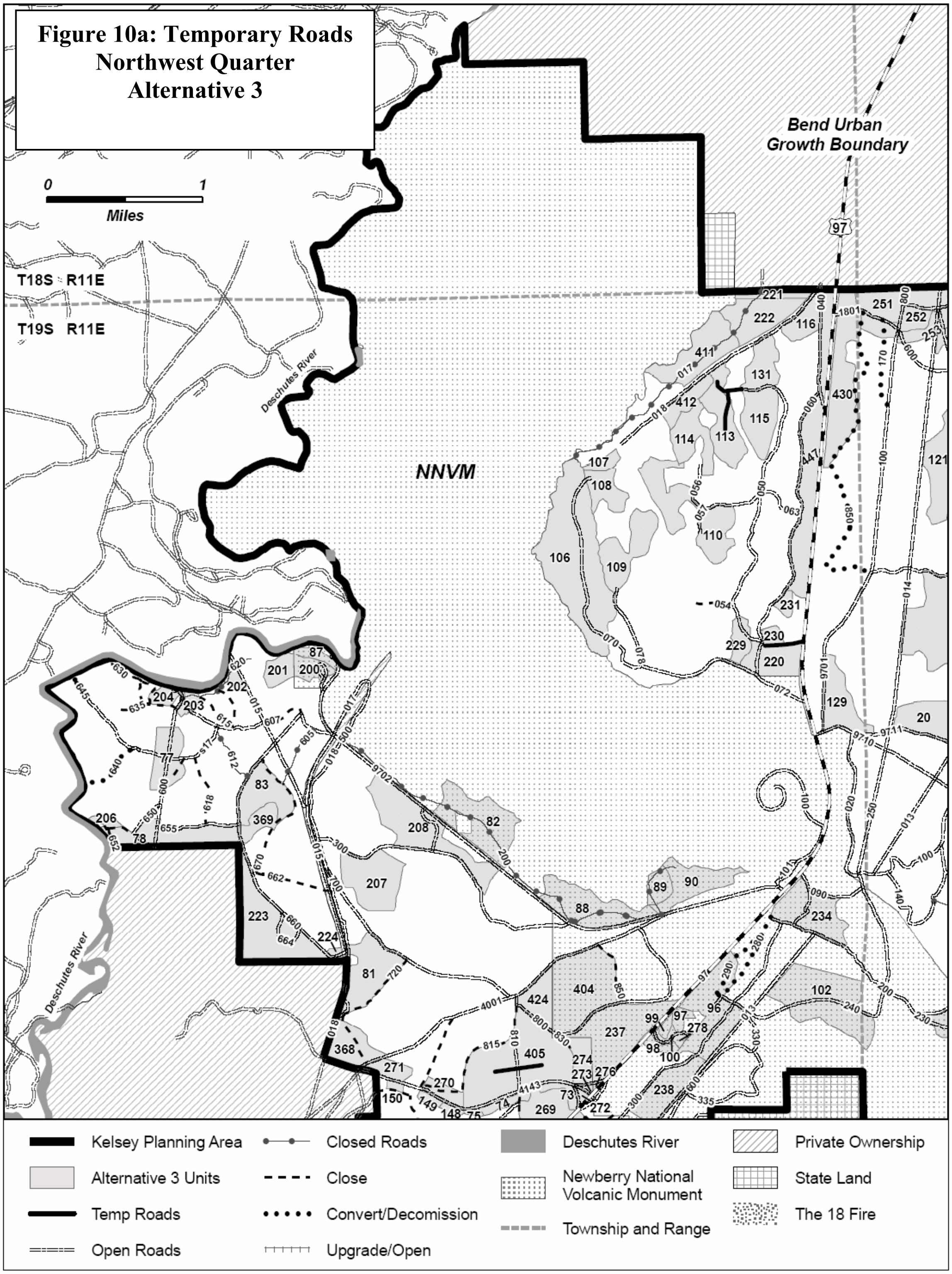
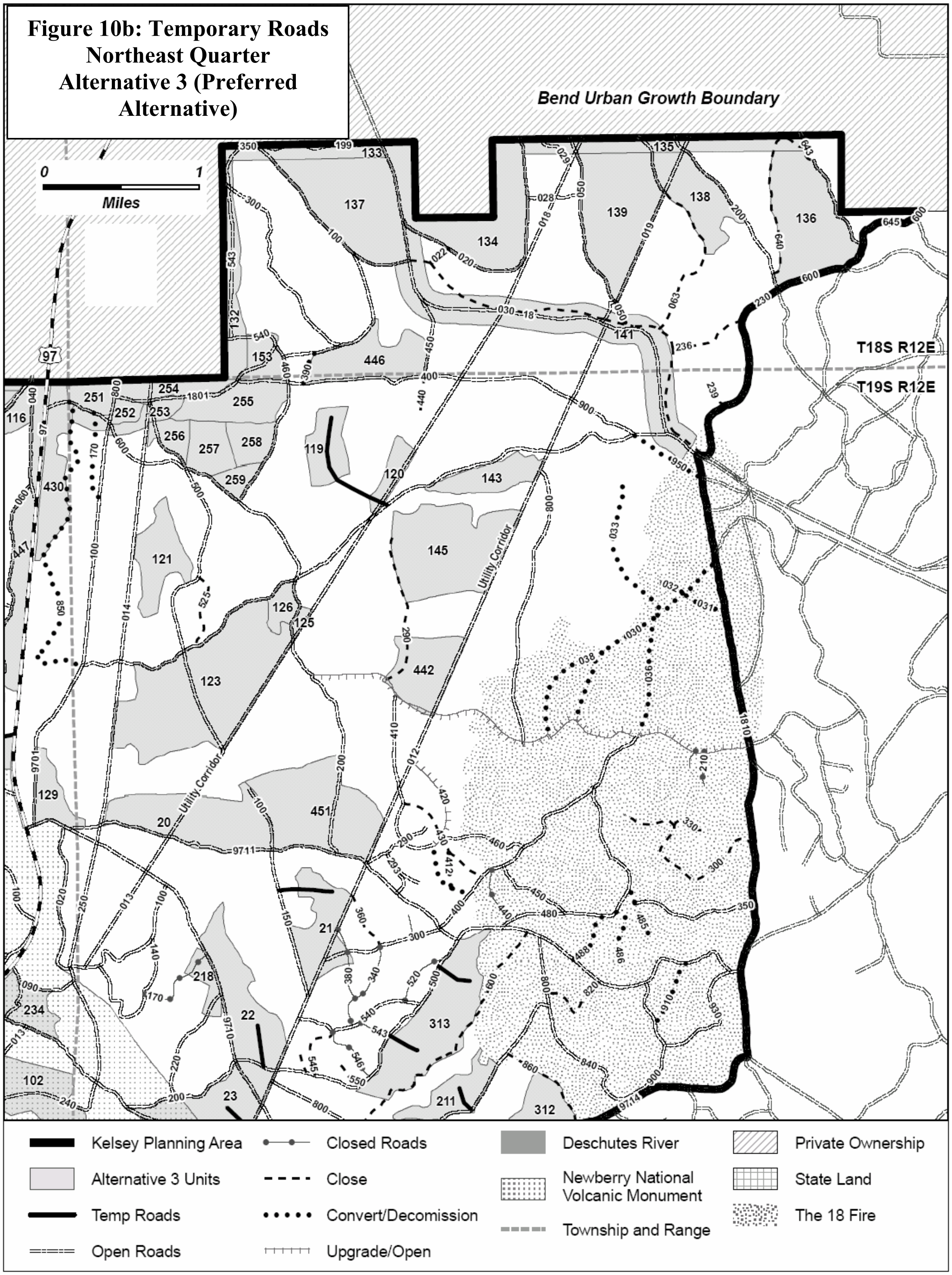


Figure 10a: Temporary Roads
Northwest Quarter
Alternative 3
0
1
Miles
T18S R11E
T19S R11E
Deschutes River
NNVM
Bend Urban
Growth Boundary
97
Kelsey Planning Area
Alternative 3 Units
Temp Roads
Open Roads
Closed Roads
Close
Convert/Decomission
Upgrade/Open
Deschutes River
Newberry National Volcanic Monument
Township and Range
Private Ownership
State Land
The 18 Fire

Figure 10b: Temporary Roads Northeast Quarter Alternative 3 (Preferred Alternative)



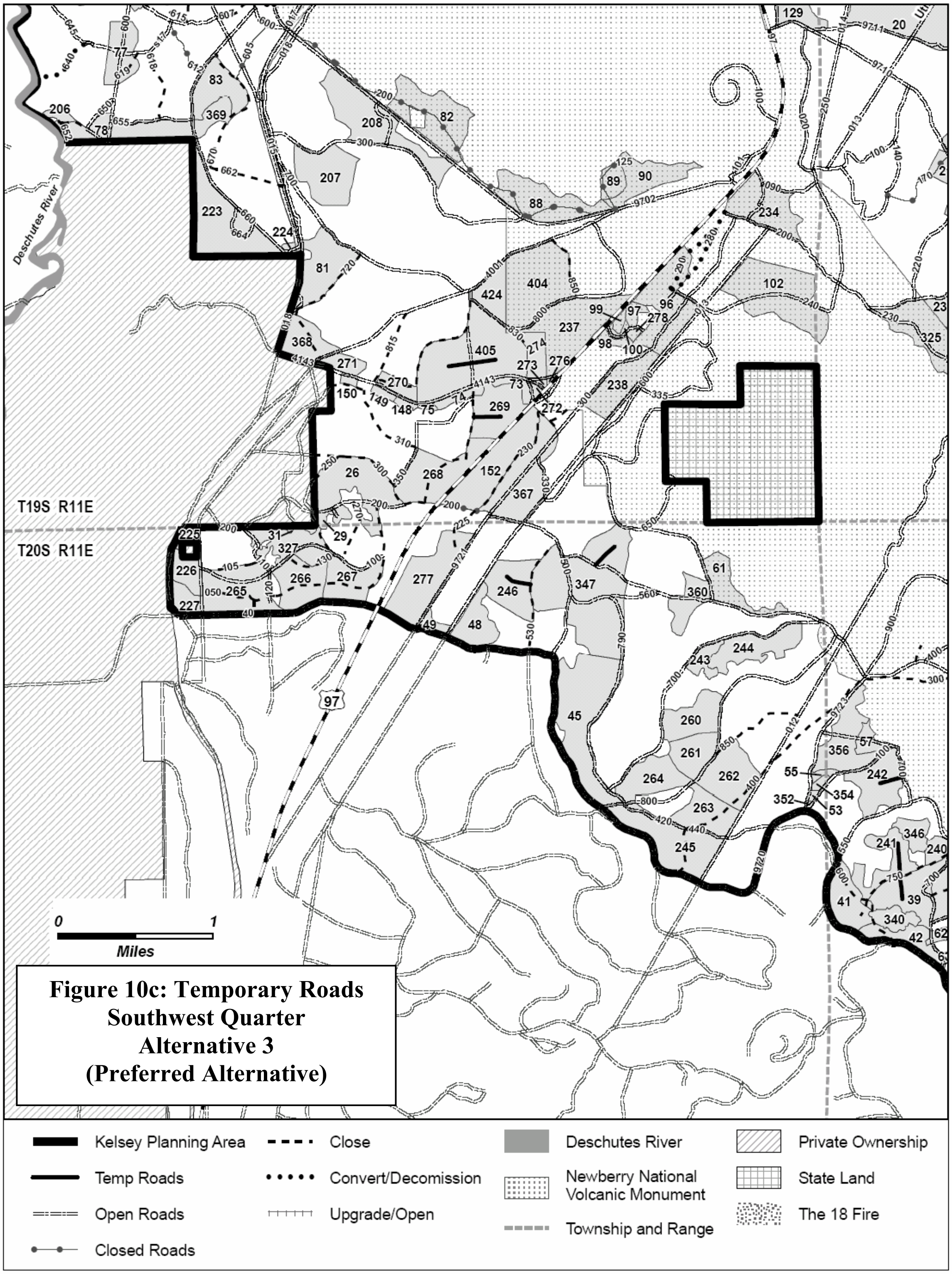


Figure 10c: Temporary Roads Southwest Quarter Alternative 3 (Preferred Alternative)

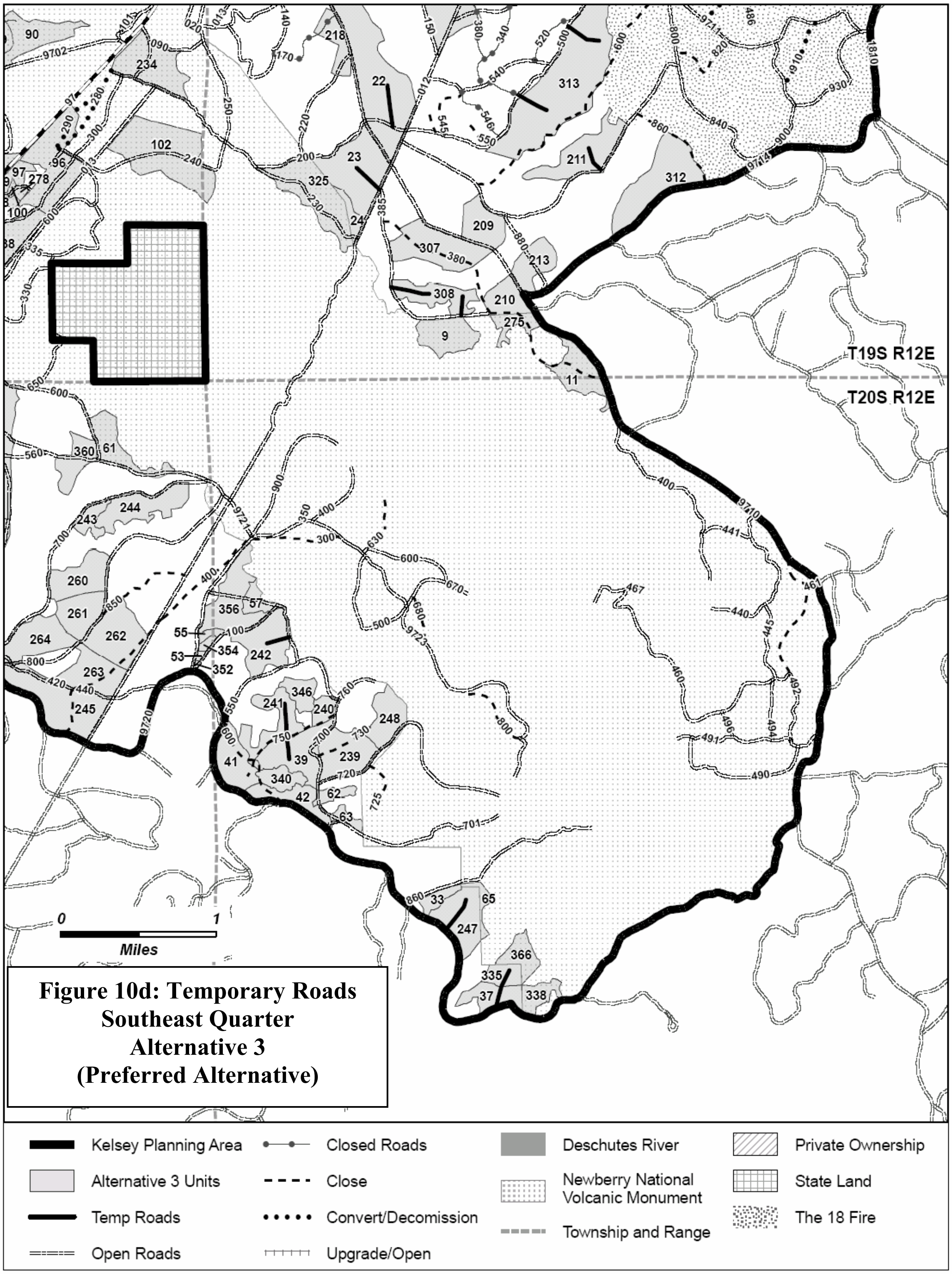


Figure 10d: Temporary Roads Southeast Quarter Alternative 3 (Preferred Alternative)

MITIGATION MEASURES COMMON TO ACTION ALTERNATIVES

Alternatives are designed to be consistent with the desired condition specified in the Forest Plan and the standards and guidelines contained therein. Mitigation measures are an integral part of each of the action alternatives. The following would be applied to reduce potential adverse impacts of Alternative 2 (Proposed Action) and Alternative 3. They are listed here separately to avoid repeating them in each alternative description.

The effectiveness of each measure is rated at high, moderate, or low to show how effective we expect they will be for preventing or reducing impacts on resources. These mitigation measures are considered in the effects discussions of Chapter 3.

Effectiveness ratings are based on the following criteria: a) Literature and Research, b) Administrative Studies (local or within similar ecosystem), c) Experience (judgment of qualified personnel by education and/or experience, d) Fact (obvious by reasoned, logical, response).

High: Practice is highly effective (greater than 90 percent), meets one or more of the rating criteria, and documentation is available.
Moderate: Documentation shows that practice is 75 to 90 percent effective; or Logic indicates that practice is highly effective, but there is no documentation. Implementation and effectiveness of this practice needs to be monitored and the practice will be modified if necessary to achieve the mitigation objective.
Low: Effectiveness is unknown or unverified, and there is little or no documentation; or applied logic is uncertain and practice is estimated to be less than 60 percent effective. This practice is speculative and needs both effectiveness and validation monitoring.

Herbicides

1. Areas treated with herbicides would be posted with public warning signs. The signs would be posted along roads, OHV trails, or other points where people would be likely to enter a unit. Signs would include the treatment date, the activity performed and who to contact for further information. Signs would remain up for at least 48 hours. *High*

Wildlife

1. N**est-1:** In the event that raptor nests are discovered during project preparation or implementation, active nest sites will be protected from disturbing activities within ¼ mile (1 mile for use of explosives) of the nest by restricting operations during the nestling period (Forest Plan WL-3). *Moderate*
   March 1 - August 31: red-tailed hawk & northern goshawk
   February 1 – July 31: golden eagle
   April 15 – August 31: Cooper’s hawk & sharp-shinned hawk
2. **Nest-2:** To prevent negative effects to active Cooper’s hawk and northern goshawk nests, develop burn prescriptions such that smoke from prescribed burn operations drifts away from active nests. *Moderate*
3. **Nest-3**: Northern Goshawk Seasonal Operating Restriction – Active nest sites should be protected from disturbing activities within ¼ mile (1 mile for explosives) of the nest by restricting operations during the nesting period of March 1 – August 31 (WL-11, Eastside Screens). The seasonal operating restriction applies to the following units: *Moderate*

Alternative 2: Units 13, 22
Alternative 3: Units 22, 244, 313

4. **Nest-4:** Cooper's Hawk Seasonal Operating Restriction – Active nest sites should be protected from disturbing activities within ¼ mile (1 mile for explosives) of the nest by restricting operations during the nesting period of April 15 – August 31 (WL-19). The seasonal operating restriction applies to the following units: *Moderate*
   Alternative 2: Units 45, 121
   Alternative 3: Units 45, 121
5. **Neotrop-1:** To avoid negative effects to birds, including: nest destruction, loss of broods, and direct mortality of adults, surveys will be conducted prior to mechanical shrub treatments or prescribed burning, during the period of April 1 – August 15, to determine if there are nesting species. Spring treatments should be done prior to the plants' break of dormancy if conditions allow. *Moderate*
6. **Cave 1:** Trees will not be harvested in a 150 to 200 foot radius around the entrance to Lava River Cave (Forest Plan CV-3). Prescribed burning operations will avoid smoke from entering the cave. This mitigation applies to Unit 100. *Moderate*
7. **CWM-3** During prescribed burn operations, avoid direct ignition of CWM that is greater than 12 inches in diameter and 6 feet in length and snags. *Moderate*
8. **Snag-1:** Retain all existing snags (including soft) as wildlife trees for roosting and foraging except where impractical because of human safety, other resource protection (such as Wildland Urban Interface), or project logistics (Such as prescribed fire treatments) *Wildlife Tree and Log Implementation Strategy, LRMP WL-38. High*
9. **BG-1:** To provide stand diversity and big game hiding and thermal cover, with the exception of commercial harvest units in the Ryan Ranch Key Elk Area (Mitigation, BG-2), will retain untreated clumps: *Moderate*
   Alternative 2: 21, 112, 117, 120
   Alternative 3: 21, 120, and 442,
   All commercial harvest treatments will retain approximately 10 percent of the unit treatment area in untreated clumps. Untreated clumps should be 0.5 to 6 acres, be the densest available, and distributed throughout the unit. As a general rule, untreated clumps will be located greater than 200 feet from open roads and be distributed approximately 600 to 1,200 feet apart (WL-59, M7-10, M7-15).
10. **BG-2:** Ryan Ranch Key Elk Area – To provide cover and visual screening throughout the area, 30 percent of the following commercially harvested units in the Key Elk Area that contain cover will be retained in untreated clumps greater than 2 acres (WL-47, 49, & 51): *Moderate*
    Alternative 2: 26, 27, 68-71, 78, 80, 88, 268
    Alternative 3: 26, 78, 88, 200-206, 224, 225, 227, 271, 268, 327, 368, 369
11. **BG-3:** To provide a seed source for shrub re-establishment, habitat for shrub-nesting songbirds, bat prey (moths), chipmunk and ground squirrels, and to retain mule deer forage and camouflage cover, between 30 to 50 percent of the unit acreage would not be treated in prescribed burning and/or mechanically treated fuels units (M7-14). The untreated acreage will be distributed in a mosaic of islands of untreated shrubs, varying size from 0.5 to 6 acres. Logs and rock outcrops should be included in untreated areas, such that these features retain treatment buffers of at least 25 to 30 feet (WL-74 & WL-75). *Moderate*
    Spacing between 6 acre islands would be approximately 300 feet and would generally not exceed 100 feet. Spacing between the smaller islands (less than 6 acres) could be less than 300 feet to capture key features.
    This mitigation applies to **all units except** :
    Alternative 2: 33, 34, 47, 65, 97, 113, 119-121, and 125;

Alternative3: 33, 65, 97, 113, 119-121, 125, 202-204, 213, 229-231, 240-244, 246, 247, 278, 335, 347, and 360.

12. **BG-4:** To reduce harassment to wintering mule deer and elk, a seasonal closure for all motorized vehicles, including over-the-snow motorized vehicles would be implemented within the Green Mountain Winter Range Habitat Unit (WRHU, Figure 12) and the Ryan Ranch KEA (Figure 13). This closure would reduce the seasonal road density to below the Forest Plan target level.

    Motorized access would be restricted annually during a four-month seasonal closure, from December 1 to March 31. Closure would occur during times that are critical for big game foraging and mule deer fawning periods to mitigate low thermal cover levels and reduce deer/vehicle interaction. Motorized vehicle access would be allowed on designated winter travel routes only (Table 13), or by special permit. If motorized access would be necessary on roads designated as seasonally closed, a permit would be required.

    The seasonal closures would go into effect when thinning and harvest activities begin in each of the closure areas. Termination of the seasonal closures would occur when adequate thermal cover levels have been achieved following treatment cessation, or if other unknown determinations of neutral of positive effects for the local populations of mule deer and elk are made.

Table 13: Proposed Motorized Road Access During Seasonal Closure Within Kelsey – Deer Habitat and Ryan Ranch Key Elk Area

Road Number	
Deer Habitat	**Key Elk Area**
1800000 – China Hat Road	4001000 – Powerline Road
1810000	4143000 – Cottonwood Road
1810012 – Gas Line	9702000 – Benham Falls Road
9710000 – Paulina Road	9702015 – Railroad Road
9711000	9702018 – Railroad Road
9714000	

13. **BG-5:** To mitigate proposed activities for big game, roads would be closed or decommissioned. A roads analysis was completed for Forest roads within the Kelsey planning area, including those that were analyzed in the 18 Fire Final Environmental Impact Statement (FEIS). Roads were analyzed for management necessity and impacts on resources. Roads proposed for closure and decommissioning (approximately 49.7 miles) are within the biological winter range of mule deer, including key elk habitat.

    Road closure and decommissioning would help mitigate the effects of the proposed thinning and harvest activities. These roads were determined as unnecessary for short-term management objectives as determined by the Kelsey Roads Analysis (Project Record, Roads Analysis, Appendix T). Roads that are associated with proposed treatment units would be closed or decommissioned following completion of proposed Forest activities. Figures 11a and Figure 11b display roads that are proposed for closure and decommissioning and those to remain open, including those analyzed in the 18 Fire FEIS.

    Road Closure: Road closure would prevent general motorized use. Closed roads would allow access for administrative, utility, or special permit use. Approximately 42.0 miles of roads would be closed (Table 14). Closed roads would be available for future forest management as needed. Methods for road closure would include, but not limited to, gating, subsoiling, earthen mounds, boulder placement, and scattering vegetation. The methods of closure would be dependent on terrain, likely success, and overall costs.

Table 14: Proposed Road Closures and Miles			
Road Number	**Road Miles**	**Road Number**	**Road Miles**
1800063	1.2	9720400	0.5
1801440	0.2	9720600	2.2
1810290	0.4	9720725	0.4
1815236	0.3	9720730	0.7
1815239	0.2	9720750	0.3
1815640	1.7	9721225	1.0
1815643	0.2	9721230	2.6
9700054	1.0	9721530	0.6
9701525	0.5	9721850	1.1
9702615	0.4	9723300	0.2
9702618	0.2	9723350	0.5
9702619	0.6	9723630	0.6
9702630	0.2	9723680	0.6
9702631	0.2	9723800	0.6
9702635	0.7	4001050	1.7
9702651	0.2	4001051	1.7
9702652	0.6	4001105	0.3
9702662	0.3	4001130	0.4
9702670	0.4	4001140	0.3
9710380	1.4	4001250	0.5
9711360	0.3	4001270	0.5
9711410	0.6	4001300	2.2
9711430	0.4	4001310	1.4
9711545	0.4	4001320	0.6
9711550	0.1	4001720	1.0
9711560	1.8	4001815	1.3
9711600	2.2	4001830	0.4
9711860	0.6	4001850	0.5
Total Road Closure Miles Within Kelsey Analysis Area – 42.0			

Road Decommissioning: Road decommissioning would eliminate use of a road or convert to other uses. Where complete elimination of use by motorized vehicles occurs, subsoiling would prevent motorized use to all class of motorized vehicles. Roads that are identified for decommissioning and converting to other uses would potentially allow non-motorized or Class I and III motorized use (motorcycles, quads), or both. Approximately 7.7 miles are proposed for decommissioning (Table 15), through subsoiling, which would no longer be accessible by motor vehicles.

Table 15: Proposed Road Decommissioning/Convert to Other Uses			
Road Number	**Road Miles**	**Road Number**	**Road Miles**
1800022	0.1	9701950	0.4
1800050	0.1	9710280	0.6
1801390	0.4	9710290	2.0
1801850	1.7	9711410	0.8
1810280	0.4	9711412	0.6
9701170	0.6		
Total Road Decommissioning Within Kelsey Analysis Area – 7.7 Miles			

Figure 11a: Proposed Road Access – North One-Half

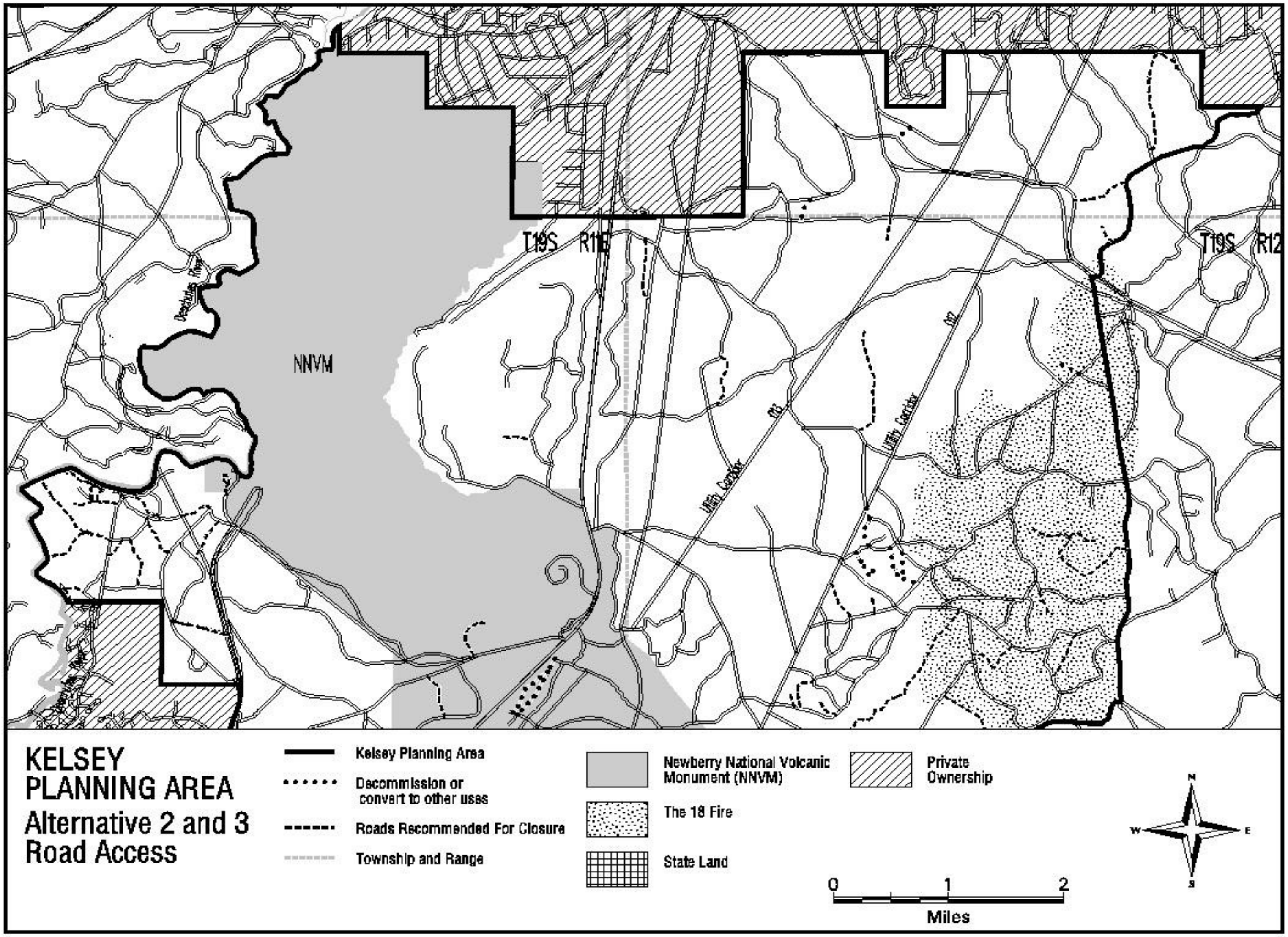


Figure 11b: Proposed Road Access – South One-Half

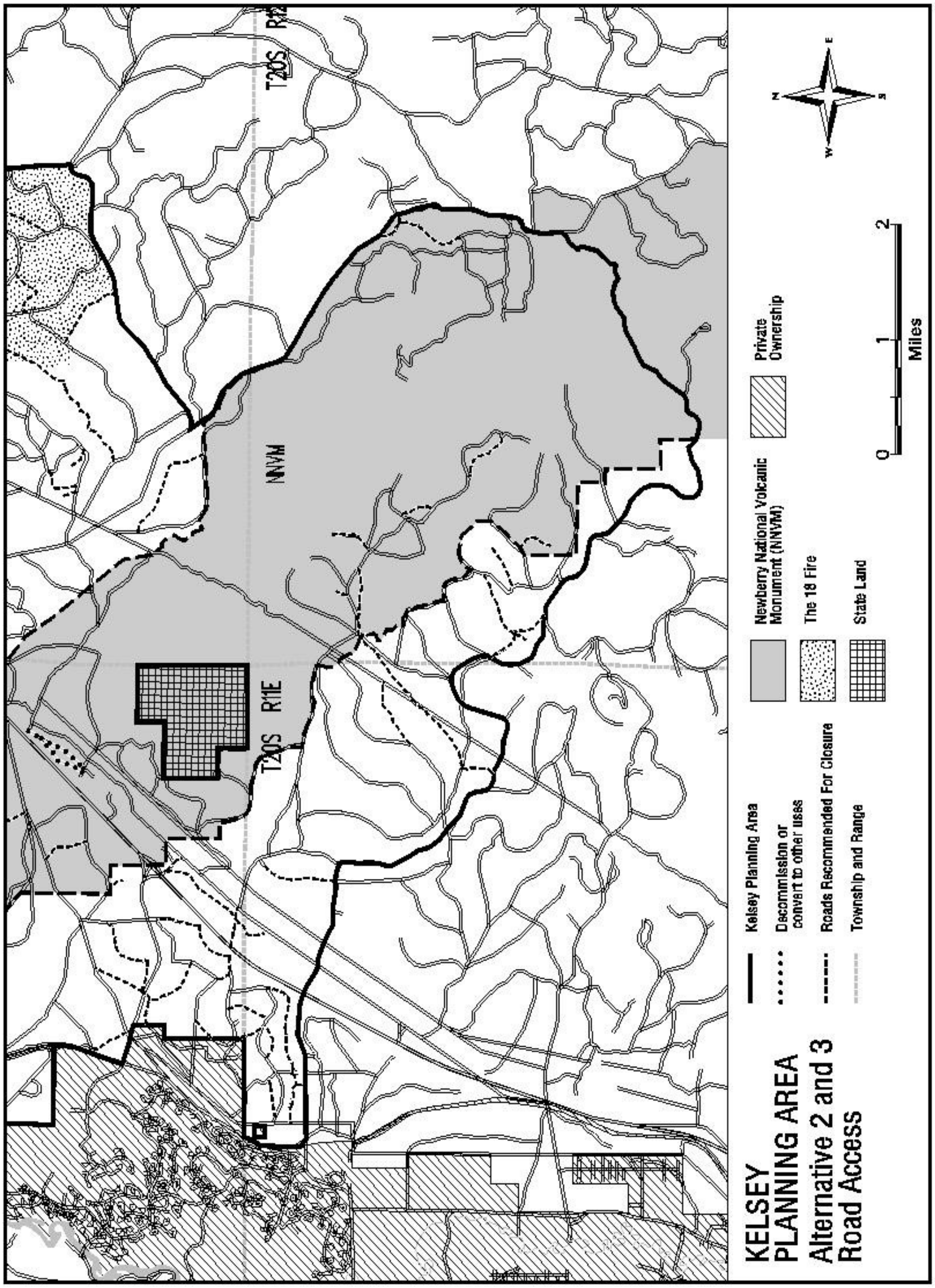
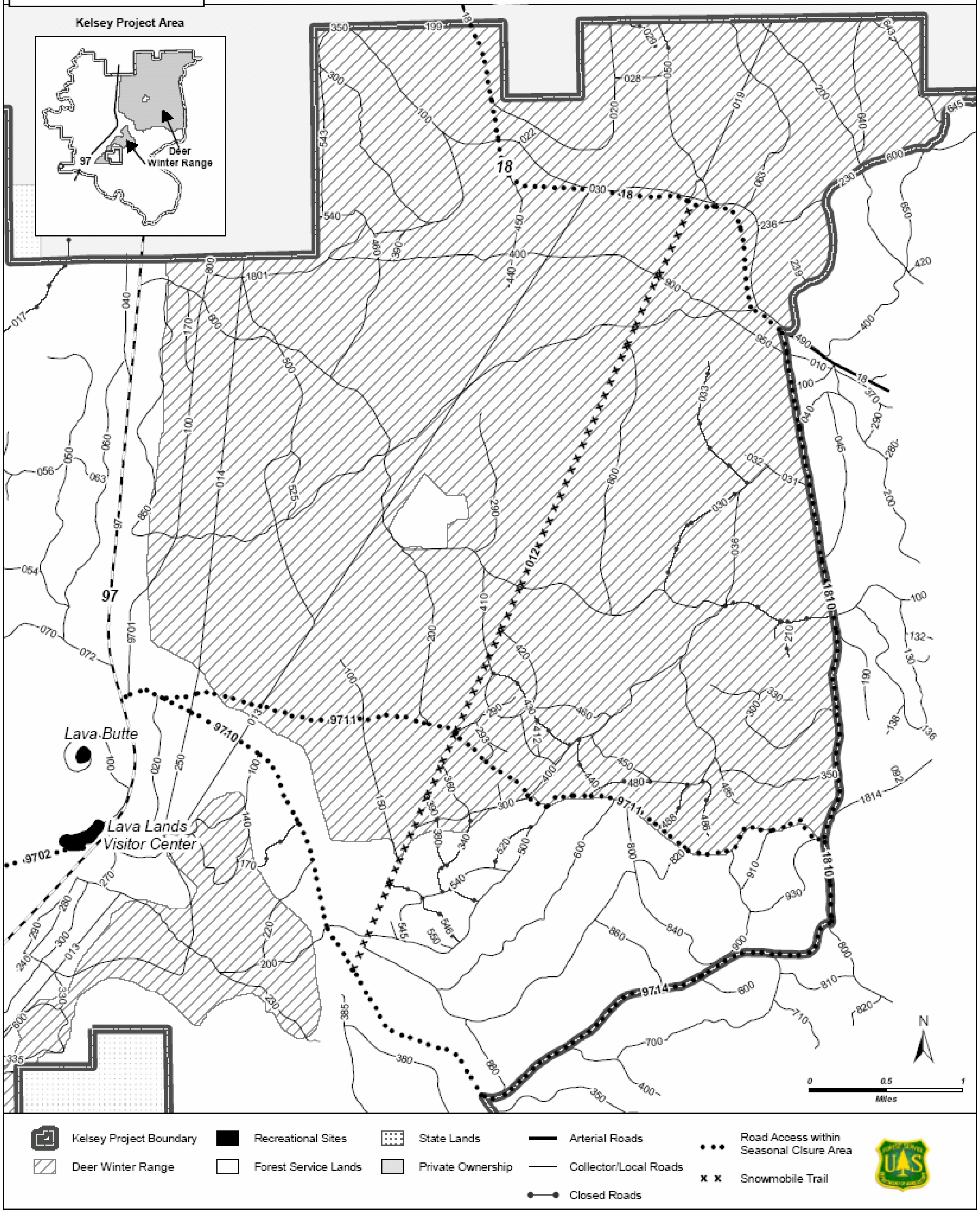


Figure 12: Kelsey Planning Area - Deer Winter Range Seasonal Closures



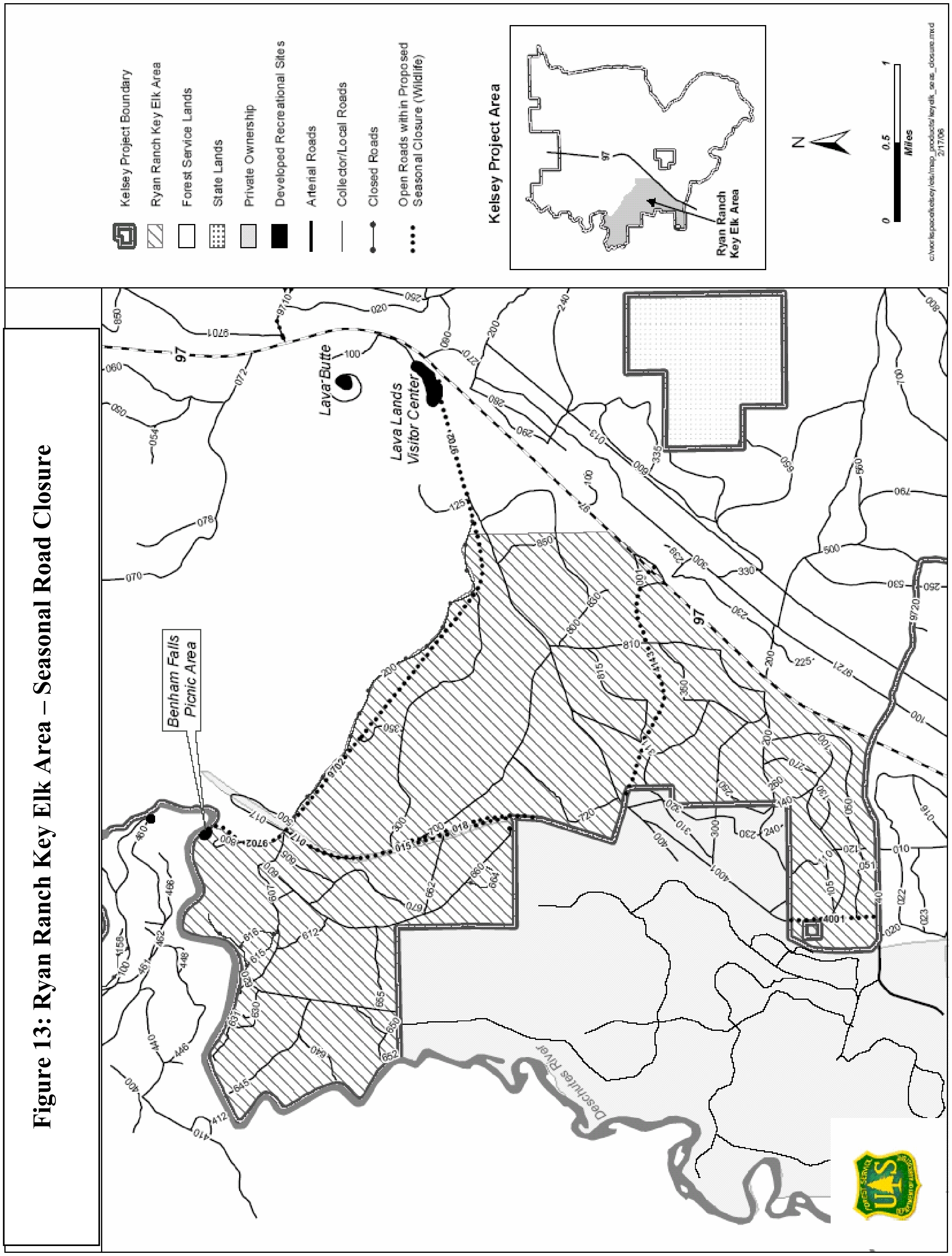


Figure 13: Ryan Ranch Key Elk Area – Seasonal Road Closure

Soils

1. Reclaim all temporary roads, log landings, and approximately 500 feet of all primary (main) skid trails that lead into log landings by applying appropriate soil restoration treatments in activity areas proposed under both Alternative 2 and 3. Options for improving the hydrologic function and productivity on these disturbed sites include the use of subsoiling equipment to loosen compacted soils, redistributing humus-enriched topsoil in areas of soil displacement damage, pulling available slash and woody materials over the treated surface, and planting shrubs and tree seedlings to establish effective ground cover protection (Forest Plan Standards and Guidelines for Soil, Water and Riparian Resources (SL-1 and SL-4); Watershed Management BMP W-1; Cafferata, 1983; Garland, 1983; Johnson, 1995; Experience, Logic). *High*
2. Based on harvest history, approximately 151 acres of past harvest overlap a portion of proposed Unit 01. Assure that water control structures are installed and maintained on skid trails that have gradients of 10 percent or more. Ensure that erosion control structures are stabilized and working effectively (Forest Plan SL-1; Timber Management BMP T-16, T-18). *High*
3. Avoid operations during periods of high soil moisture, as evidenced when rutting with standing water occurs. *High*
4. Soil displacement will be minimized to the extent possible, including sharp turning during the mowing operation.
5. On steep pitches (greater than 30 percent), less than 100 feet long one pass will be permitted to harvest trees. In other areas directional felling of trees to skid trails and /or line pulling should be utilized to harvest trees. *High*

Hydrology

Mitigations

1. For treatments within RHCAs, avoid mechanized equipment within 100 feet slope distance of perennial and intermittent fish-bearing streams. All mechanized treatment within RHCAs should be conducted over frozen ground or adequate snow pack when feasible. Hand treatment may be done within RHCAs to promote Riparian Vegetation and RMOs. *High*
2. No construction of fire lines in riparian areas to prevent ground disturbance and the concentration of surface flows. *High*
3. Avoid lighting fire and burning brush piles within the floodplain of the Deschutes River. Prescribed burning may occur within ephemeral swales. *High*
4. When fire lines and skid trails are constructed, assure that water control structures such as water bars, are installed and maintained to avoid concentrated runoff and accelerated soil erosion (Forest Plan SL-1); (Timber Management BMP T-16). *High*
5. Silt fences, straw wattles, and/or erosion cloth will be incorporated as needed, and will be used to protect bare slopes in RHCAs. *High*
6. All temporary roads will be located outside riparian and stream areas. *High*
7. All temporary roads will be rehabilitated by ripping and/or tilling, have water bars installed where necessary, and be closed immediately following harvest operations to restore hydrologic function. *High*
8. No landings or refueling sites within RHCAs (Timber BMP T-21). *High*
9. In all units, skid trails would be designated prior to the logging operations. Designating yarding and transportation systems would ensure a minimum of 80 percent of an activity area would be left in a condition of acceptable productivity potential for trees. This includes system and temporary roads, landings, and spur roads and skid trails and trails. Skid trails, landings and

temporary roads would be rehabilitated and stabilized after the sale. (Forest Plan SL-1 & SL-3); (Timber Management BMP T-11)

Best Management Practices (BMPs): Best Management Practices (BMPs), FEIS Appendix E, would be implemented to protect all water quality limited variables. Many of the above listed mitigations were derived from BMPs. A complete explanation of the BMPs is found in General Water Quality Best Management Practices (USDA, 1988) and is available at the District Office or Supervisors Office.

Botany – Invasive Plants

Project Design Criteria: Project Design Features for the Kelsey Project are taken from the *Guide to Invasive plant Prevention Practices* and from the *Deschutes National Forest Integrated Weed Management Plan*. When considering the use of a weed prevention practice, the efficacy of the weed prevention practice, its feasibility to implement in the specific situation, and its cost-effectiveness are evaluated. A determination of cost-effectiveness may consider the probability and cost of weed control if a weed prevention practice is not used and the relative contribution of the project or activity to the overall weed risk at the site. The Project Design Features listed below have been evaluated and have been determined to be effective, feasible, and cost-effective.

1. Treat weeds in project area, emphasizing treatment of weed infestations on existing landings, skid trails, and haul roads before activities commence.
2. Treat weeds in road decommissioning and reclamation projects before roads are made impassable. Reinspect and follow-up based on initial inspection and documentation.
3. To the extent feasible, during mowing or burning, avoid mowing or lighting obvious high-density cheatgrass locations, such as cattle water sets, hunter camps, or adjacent to roads.
4. To reduce the risk of spreading weed infestations, begin project operations in uninfested areas before operating in weed-infested areas (Units: 30, 50, 68, 73-75, 84-87, 96-101, 105, 117, 129, 130, 133, 134, 137, 141, 147-150, 152, 265, 267-269). *Moderate*
5. Determine the need for, and when appropriate, identify sites where equipment can be cleaned. Clean equipment before entering National Forest System lands. Remove mud, dirt, and plant parts from project equipment before moving into the project area. *High*
6. Ensure that equipment used in fuels reduction and prescribed burning activities for this project are free of weed seed and propagules before moving into or departing the project area. *High*
7. Clean all equipment before leaving the project site, if operating in areas infested with weeds. *Moderate*

General

1. Limit noise associated with harvest and mechanical fuel treatment proposed within one-quarter mile of Sunriver and during the primary tourist season (Memorial Day through Labor Day). The mitigation would apply to:
   Alternative 2: 30, 68, 69, 78, 80, 81, 83
   Alternative 3: 78, 81, 83, 206, 223, 224, 225, 226, 227, 368, 369
   1) Saturday: Operating hours 7:30 am to 7:00 pm.
   2) No operations on Sundays or holidays (Memorial Day, Independence Day, and Labor Day).
2. Maintain vegetative integrity immediately surrounding the Annette Dodds memorial site (Annie's Garden). Maintain an approximate 100-foot buffer while providing adequate protection from a high intensity wildfire.

FOREST PLAN AMENDMENTS

This DEIS proposes two Forest Plan amendments. The first amendment addresses thermal cover standards in Deer Habitat. The second amendment address the creation of 4 to 12 acre wildlife openings to improve big game utilization of and to provide for the development of horizontal and structural diversity in what is presently a single story, black-bark pine stand.

Proposed Forest Plan Amendment #1
Deer Habitat (MA7) – Thermal Cover in Mule Deer Winter Range

A short-term, non-significant amendment of the big game thermal cover goal and objective of 30 percent of the land area of Deer Habitat (MA-7), as described in the Forest Plan, within the Kelsey project area is proposed.

The amendment would allow the proposed activities to be incorporated into the design of Alternative 2 (Proposed Action) and Alternative 3 through the short-term reduction in thermal cover (20 years). The amendment would allow commercial harvest and non-commercial thinning to reduce thermal cover in mule deer winter range, which is presently below the recommended Standards and Guidelines in Deer Habitat. Though the current thermal cover Standards and Guidelines would continue to not be met in the short-term, the proposed activities are expected to protect and improve cover habitat diversity in the long-term. Thermal cover would be expected to increase to above the desired density of 30 percent in approximately 20 years, and be more resistant and resilient to natural disturbances, such as stand replacement events by wildfire or insect infestations.

Background

Current thermal cover levels within the allocated winter range (MA-7 – Deer Habitat) are below the Forest Plan goals and objectives of 30 percent of the land area being thermal cover. The recommendations for thermal cover are defined in the Forest Plan, M7-5, page 4-113 and M7-13, page 4-114: A crown cover greater than 40 percent with trees 30 feet high.

(These standards and guides are a direct result of standards and guides developed for stand conditions in the Blue Mountains, which were incorporated into the Deschutes National Forest Land and Resource Management Plan. Stands in the Blue Mountains are comprised mostly of mixed conifer (including Douglas fir, spruce, hemlock, and white fir) with various structural stages. Deer Habitat (MA-7) in the Kelsey planning area is primarily comprised of a single story ponderosa pine monoculture, a result of clearcutting in the 1930s and 1940s on private land by private companies. The U. S Forest Service subsequently purchased these lands.)

Tree densities are high enough to easily carry a high intensity, stand replacing crown fire, as evidenced by the 2003, 18 Fire that was located primarily in Deer Habitat (MA-7) within the planning area. As a result of the 18 Fire, the existing thermal cover level is below the Forest Plan goal and objective of 30 percent.

Reason for Amendment

The project proposes thinning and mechanical shrub treatments within portions of the MA-7 allocation to address wildlife, forest health, and wildland-urban interface objectives. Proposed treatments would further reduce the existing thermal cover levels. Reduced thermal cover levels would be temporary and it would be expected that thermal cover levels would increase and be sustainable within approximately 20 years.

In addition, the proposed treatments would address other Deer Habitat standards and guidelines; specifically breaking up large blocks of cover in order to increase the effective use of the cover (M7-10 and 16). As described in the Forest Plan, ***M7-3, page 4-113 and M7-5, page 4-113,*** timber harvest is appropriate when required to regenerate new cover stands, maintain resistance to stand-threatening insect damage, or encourage desirable forage in deficient areas (M7-3). Even and uneven-aged management would be applied and may include precommercial thinning and commercial harvest. Canopy cover should be managed at the highest percentage that would maintain healthy stand conditions with a low risk of catastrophic damage due to insects or disease (M7-5).

Rationale for Amendment

The current condition of vegetation is described in the purpose and need of Chapter 1 and in the Fire and Fuels and Forest Vegetation sections of the Environmental Consequences in Chapter 3. To summarize, high tree and flammable shrub densities have developed as a consequence of long-term fire suppression.

Wildfire has created the condition whereby the Forest Plan goals and objectives for thermal cover are not being met. Proposed activities under the Kelsey Environmental Impact Statement (DEIS) would further reduce current thermal cover levels, but would also address other wildlife, forest health, and wildland-urban interface objectives.

The Kelsey project area borders the southeast portion of Bend, Oregon with much of the Deer Habitat allocation contained within the wildland-urban interface (WUI). Efforts to reduce fuel loading and wildfire risk to private property are a priority. Much of the Deer Habitat allocation is also made up of dense stands of relatively young ponderosa pines (50 to 80 years old) that are currently at high risk for high intensity wildfire and insect infestation.

Maintaining crown cover at 40 percent would place thermal cover at high risk to high intensity, stand replacement wildfire and to beetle attack. Wildfire should also be included in what is termed "catastrophic" damage as evidenced by the 18 Fire within Deer Habitat in the planning area (approximately 3,520 acres) in 2003. The 18 Fire reduced thermal cover in Deer Habitat from approximately 31 percent to approximately 24 percent of the Deer Habitat land area. Even though the 18 Fire reduced overall thermal cover within Deer Habitat, thermal cover outside of the 18 Fire area remains at approximately 30 percent. The fire occurred in habitat that appears to be typical of conditions that could sustain an uncharacteristic, high intensity crown fire. Another similar wildfire in adjacent areas would further reduce thermal cover in the remaining Deer Habitat within the planning area. This thermal cover continues to remain at risk for loss from uncharacteristic events of wildfire and an insect infestation.

Proposed activities would not only achieve forest health and fire management objectives, but also address other wildlife objectives. Measures have been proposed to reduce the effects of reduced thermal cover. A seasonal road closure has been proposed within winter range to reduce harassment of mule deer and elk during the winter months. Following the 18 fire, some previously proposed units that had been classified as thermal cover were dropped in order to retain more and better cover distribution. In addition, recent research has suggested that forage quality and harassment are bigger influences to big game winter survival than thermal cover (Cook, J. G., L. L. Irwin, L. D. Bryant, R. A. Riggs, and J. W. Thomas. 2004. Thermal Cover Needs of Large Ungulates: A Review of

Hypothesis Tests. Transactions of the North American Wildlife and Natural Resource Conference 69: in press.). It is also noted that thermal cover conditions will return to the area as the stands respond to the proposed thinning treatments.

Due to the temporary reduction of thermal cover and the proposed mitigation measures proposed to reduce the effects, amending Forest Plan for this project area is justified.

Deschutes National Forest Land and Resource Management Plan (Forest Plan)

The goal (Forest Plan, page 4-113) of the Deer Habitat management area (MA-7) is to manage vegetation to provide optimum habitat conditions on deer winter and transition ranges while providing some domestic livestock forage, wood products, visual quality and recreation opportunities. The objectives include managing vegetation to provide optimum habitat considering the inherent productivity of the land. Long-term tree or shrub cover to moderate cold weather conditions is important. Ideally, cover and forage areas should be in close proximity for optimum use by big game, with cover making up 40 percent of the land area. Approximately three-quarters of cover areas should be thermal cover (30 percent) with the remainder being hiding cover (10 percent). Some stand conditions may satisfy both kinds of cover.

Finding of Non-Significance

The Forest IDT found that the proposed change to the Forest Plan would not significantly change the forest-wide impacts disclosed in the Deschutes National Forest Plan Environmental Impact Statement or the impacts disclosed in the Revised Environmental Assessment for the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales. This finding is based on the following factors:

Timing: The proposed change would take place within the third quarter of calendar year 2006, before the next scheduled revision of the Forest Plan.

Location and Size: Units proposed for stand density reduction are located throughout Deer Habitat (Management Area 7). Use of the regeneration cut method would be limited to small areas within the Kelsey project area, including Deer Habitat (Refer to discussion of Forest Plan Amendment #2, page 1-42). This type of harvest would occur on a total of approximately 140 to 250 acres (Alternatives 2 and 3, respectively), which is less than one to two percent of Deer Habitat (Approximately 10,880 acres). Other thinning within Deer Habitat would occur on approximately 550 and 565 acres (Alternatives 2 and 3, respectively), which is approximately five percent of Deer Habitat. Refer to Forest Vegetation – Trees, Table 37, page 3-42.

Goals, Objectives and Outputs: The proposed revised Deer Habitat standards and guidelines would not alter the long-term relationship between levels of goods and services projected by the Forest Plan. There would not be any significant change in timber outputs over what might be available if the project was designed without the proposed amendment.

Management Prescriptions: The proposed revised Deer Habitat standards and guidelines would apply to the specific situation within the Kelsey planning area. The change would not apply to future decisions throughout the planning area. The change would not alter the desired future condition for land and resources from that contemplated by the existing management direction in the Forest Plan. The proposed amendment would not change the Forest Plan allocations or management areas.

National Environmental Policy Act (NEPA) Compliance

Full analysis of the site-specific effects can be found in the Kelsey DEIS. In relation to the effects discussion within the Forest Plan EIS (Deschutes National Forest), there would be no measurable change of the effects already disclosed. The Forest Plan EIS acknowledges that maintaining thermal cover contributes to vegetative insect and disease risk as well as wildfire risk.

Proposed Forest Plan Amendment #2
Regeneration Cut

Proposed Forest Plan Amendment

It is recommended that Scenario A of the interim wildlife standard be amended to allow regeneration cutting methods, including clearcut and uneven-aged management using group selection, to occur provided:

- Harvest would occur within areas where vegetative structure does not meet LOS conditions;
- Harvest would contribute towards meeting Forest Plan objectives other than the development of LOS;
- Potential would remain to move towards meeting HRV for late or old structure within the particular biophysical environment within the watershed.

Background

The project area consists primarily of stands of even-aged, single story, black-bark ponderosa pine. Trees average approximately 12 inches dbh and have an average age of 70 to 80 years. Single- and multi-story late and old structure (LOS) is currently below the Historic Range of Variability (HRV). Scenario A of the Interim Wildlife Standard (Revised Interim Management Direction establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales, Regional Forester's Forest Plan Amendment #2, also known as the Eastside Screens) is applicable.

Proposed Regeneration Cut

Each of the action alternatives proposes limited use of regeneration cut (Table 11, page 2-21). Regeneration cut is associated with promoting deer hiding cover and vertical stand diversity (Prescription 8) and scientifically evaluating the effects of different harvest treatments in even-aged ponderosa pine stands (Prescription 93). Treatment would occur in portions of stands classified primarily as understory reinitiation. All trees (except those greater than or equal to 21 inches dbh) would be cut to create openings of varying sizes. With prescription 8, clearcuts 6 to 12 acres in size would be created over 30 to 40 percent of the area proposed for treatment. These clearcuts would be planted with ponderosa pine seedlings. With prescription 93, openings approximately 4 acres in size would be created over approximately 20 to 30 percent of the treatment area. Reforestation of openings would occur through natural regeneration of ponderosa pine.

Need for Change

Within stands that do not meet late and old structural conditions, exclusively focusing on moving stands towards LOS may preclude meeting other management objectives set forth in the Deschutes Forest Plan. These include regenerating new cover stands within the Deer Habitat allocation, creating visual diversity within the Scenic Views allocation, and using a form of uneven-aged management in the General Forest allocation.

Revised Interim Management Direction, Regional Forester's Forest Plan Amendment #2, Eastside Screens: Under Scenario A of the interim wildlife standard (Appendix B, Revised Interim Direction, page 10), outside of late or old structure stands the intent is to "maintain and/or enhance LOS components in stands subject to timber harvest as much as possible" by adhering to the following standards:

a) Maintain all remnant late and old seral and/or structural live trees greater than or equal to 21 inches dbh that currently exist within stands proposed for harvest activities.
b) Manipulate vegetative structure that does not meet late and old structural (LOS) conditions in a manner that moves it towards these conditions as appropriate to meet HRV.
c) Maintain open, park-like stand conditions where this condition occurred historically. Manipulate vegetation in a manner to encourage the development and maintenance of large diameter, open canopy structure. (While understory removal is allowed, some amount of seedlings, saplings, and poles need to be maintained for the development of future stands).

A November 14, 1995 memo from the Regional Forester documenting a field trip to the Umatilla National Forest, states:

> "…group selection methods are not allowed under Scenario A. Since LOS is below HRV levels in Scenario A, the intent of the screens is to maintain, in the short-term, all features of late and old structure, whether the stand is actually LOS or not. Any use of regeneration-type prescriptions, including group selection, are not allowed."

In a recent letter providing guidance for implementing Eastside Screens (June 11, 2003), the Regional Forester wrote "…the objective of increasing the number of large trees and LOS stands on the landscape remains. Economic considerations are important but are not considered adequate justification alone for conducting harvest activities in LOS stands."

Deschutes National Forest Land and Resource Management Plan (Forest Plan)

Within the Deer Habitat Management Allocation, the goal is to manage vegetation to provide optimum habitat conditions on deer winter and transition ranges while providing some domestic livestock forage, wood products, visual quality and recreation opportunities (Forest Plan, page 4-113). Timber harvest within this allocation is appropriate when required to regenerate new cover stands, maintain tree vigor for resistance to stand-threatening insect damage, or encourage desirable forage in deficient areas (Forest Plan, S&G M7-3, page 4-113).

Within the Scenic Views Management Allocation the goal is to provide Forest visitors with high quality scenery that represents the natural character of Central Oregon (Forest Plan, page 4-121). The desired condition for ponderosa pine is to achieve and maintain visual diversity through variations of stand densities and size classes. Ponderosa pine in Foreground Scenic Views MA areas will be managed to maintain or create a visual mosaic of numerous, large diameter, yellow-barked trees with stands of younger trees offering visual diversity and a sense of depth in landscapes viewed from travel routes recreation use area and other sensitive viewer locations (Forest Plan, S&G M9-4, page 4-122)

Within the General Forest Allocation the goal is to emphasize timber production while providing forage production, visual quality, wildlife habitat and recreational opportunities for public use and enjoyment (Forest Plan, page 4-117). The objective of timber management in this Management Area is to continue to convert unmanaged stands to managed stands. The aim is to have stands in a variety of age classes with all stands utilizing the site growth potential (Forest Plan, page 4-117). Uneven-aged management is the preferred silviculture system in the General Forest Management Area (Forest Plan, page 4-118). Uneven-aged management within the ponderosa pine community type can be applied using either individual tree selection or group selection (Forest Plan, S&G TM-15, page 4-40).

Finding of Non-Significance

The Forest IDT found that the proposed change to the Revised Interim Wildlife Standard will not significantly change the forest-wide impacts disclosed in the Deschutes National Forest Plan Environmental Impact Statement or the impacts disclosed in the Revised Environmental Assessment for the Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales. This finding of non-significance is based on the following factors:

Timing: The proposed change would take place within the third quarter of calendar year 2006, before the next scheduled revision of the Forest Plan.

Location and Size: Use of the regeneration cut method would be limited to small areas within the Kelsey project area. This type of harvest would occur on a total of approximately 80 to 120 acres (Alternatives 2 and 3, respectively), which is less than one percent (0.17 to 0.26 percent) of the Kelsey project area.

Goals, Objectives and Outputs: The proposed change would not alter the long-term relationship between levels of goods and services projected by the Forest Plan (Forest Plan, Table 4-1, pages 4 to 9). Additionally, the proposed change would not alter the long-term potential to move towards HRV for late or old structural conditions over what would be possible if the project was designed without the proposed amendment.

Management Prescriptions: The proposed change to the Revised Interim Wildlife Standard would apply to the specific situations within the Kelsey project area. The change would not apply to future decisions throughout the planning area. The change would not alter the desired future condition for land and resources or change the Forest Plan allocations or management areas.

COMPARISON OF THE ALTERNATIVES

Monument Activities

Alternative 3 would reintroduce fire on approximately 20 percent more acres (1,182 acres) than Alternative 2 (990 acres). Alternative 3 would use mechanical shrub treatment on approximately 20 percent fewer acres (692 acres) than Alternative 3 (843 acres). Alternative 2 (532 acres) and Alternative 3 (540 acres) are similar in their proposals to reduce stand density to provide more fire-based, park-like, old growth ponderosa pine in the future. The proposed activities displayed in Table 16 are consistent with Monument direction regarding acres of treatment allowed per year or decade.

Table 16: Newberry National Volcanic Monument (NNVM) Proposed Treatments				
Treatment	Alternative 2		Alternative 3	
	Treatment Acres within NNVM	% of Total NNVM Treatment	Treatment Acres within NNVM	% of Total NNVM Treatment
Underburn Only	62	6%	67	42%
Mechanical Shrub Treatment (MST)	15	1%	0	0
MST/Underburn	262	27%	574	12%
Underburn/MST	119	12%	0	0
Commercial Thin with:				
No other Treatment	20	2%	50	4%
MST	17	2%	2	<1%
MST/Underburn	430	44%	116	10%
Underburn	65	6%	373	32%
Total Acres of Treatment	**990**	**100%**	**1,182**	**100%**

Wild and Scenic River Activities

Both alternatives propose to use a combination of commercial and non-commercial thinning and mechanical shrub treatment to meet the identified purpose and need. Alternative 3 proposes treatments on approximately three times more acreage (85 acres) than Alternative 2 (29 acres). Alternative 3 adds treatments adjacent to the canoe takeout at the end of Forest road 9702600 and adjacent to private land. Alternative 3 also proposes to use prescribed fire in combination with thinning (20 acres) to meet the purpose and need.

Deer Habitat, General Forest, and Scenic View Management Area Activities

The total number of acres proposed for treatment **to reduce hazardous fuels and harvest timber would increase from approximately 7,693 acres in Alternative 2 to** approximately 8,622 acres in Alternative 3, an increase of 12 percent.

Alternative 3 (7,653 acres) would treat seven percent more acres than Alternative 2 (7,135 acres) to provide for discontinuous fuels. Of these acres, the number of acres proposed for treatment in past fuels reduction areas would increase from 3,353 acres in Alternative 2 to 3,986 acres in Alternative 3, an increase of 19 percent.

To provide timber production, there would be an increase from 4,163 acres in Alternative 2 to 4,833 acres in Alternative 3, an increase of 16 percent. Commercial volume would increase from 13.6 MMBF (26.1 CCF) in Alternative 2 to 15.8 MMBF (30.3 CCF) in Alternative 3, an increase of 16 percent. Table 17 provides a summary of the proposed actions of each action alternative respond to the Purpose and Need for the project.

Table 17: Proposed Treatment Acres
In Deer Habitat, General Forest, and Scenic View Management Areas

Purpose and Need	Alternative 2 (Proposed Action) Acres	Alternative 3 Acres
Treatments to Provide for Discontinuous Fuels by Treating Shrub/Grass/Dead Fuels	**3,530**	**3,789**
Treatments within past fuel reduction treatment areas	(1,463)	(1,749)
Treatments to Provide for Discontinuous Fuels and Timber Production		
With no treatment of shrubs/grass/dead fuels;	**558**	**969**
With treatment of shrubs/grass/dead fuels;	**3,605**	**3,864**
Treatments within existing plantations;	(683)	(702)
Treatments within past fuel reduction treatment acres.	(1,890)	(2,237)
Total Acreage of Treatments to Provide for Discontinuous Fuels and for Timber Production	**7,683**[1]	**8,622**[1]
Evaluate Silviculture Treatments and Supply Timber	745[2]	745[2]
Total Estimated Volume from Timber Harvest	13.6 MMBF (±20%) 26.1 CCF (±20%)	15.8 MMBF (±20%) 30.3 CCF (±20%)
Sunlight to Cottonwood Road	40	40

[1] Numbers in parenthesis are accounted for in total acres.
[2] 170 acres are the total acres of control units (Units 257, 260, and 266) in the proposed silviculture study. These acres would not be treated for the length of the study.

Within the Community Wildfire Protection Plan boundaries, Alternative 3 would treat approximately 437 more acres (8 percent) than Alternative 2, treating more acres in both CWPPs. The increase in acreage is primarily adjacent to the Wildland Urban Interfaces with Bend and Sunriver. These acres are reflected in the total acres displayed in Table 15 and the discussion of acres in the Wild and Scenic River description. Table 18 displays the acres within each CWPP and the proposed treatment acres.

Table 18: CWPP Proposed Treatment Acres and Percent by Alternative

Community Wildfire Protection Plans (CWPP)	Alternative 3 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Bend CWPP Total Acres (15,510) Bend CWPP Forested Acres (9,853)	0	3,419 (35%)	3,529 (36%)
Sunriver CWPP Total Acres (5,350)	0	1,739 (33%)	2,066 (39%)
CWPP Total Forested Acres (15,203)	**0**	**5,158 (34%)**	**5,595 (37%)**

Table 19 summarizes intermediate cutting methods, wide spacing (Prescription 2) and moderate spacing (Prescription 1). Refer to Appendix D for prescription descriptions. Wide spacing would decrease from 2,743 acres in Alternative 2 to 1,478 acres in Alternative 3, a decrease of 46 percent. Moderate spacing would increase nearly five times from 413 acres in Alternative 2 to 2,094 acres in Alternative 3.

Table 19: Thinning to Wide and Moderate Spacing

Treatments	Alternative 2 (Proposed Action)	Alternative 3
Thin from below to wide spacing (2)	2,743 acres	1,478 acres
Thin from below to moderate spacing (1)	413 acres	2,094 acres

Table 20 provides an overall comparison of Alternative 1 (No Action), Alternative 2 (Proposed Action), and Alternative 3 in relation to the proposed activities. All commercial harvest would be ground based. Measurements are approximate.

Table 20: Comparison Of Alternatives

Proposed Activity	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Vegetation			
Mechanical Shrub Treatment (MST): Acres	0	7,194	7,648
MST – NNVM: Acres	*0*	*870*	*780*
Prescribed Fire: Acres	0	5,186	6,913
Prescribed Fire – NNVM: Acres	*0*	*965*	*1,130*
Key Issue #1: Wildland Urban Interface Acres (20,668, includes lava) Forest Acres (15,203) Forest Acres Proposed for Treatment	0	5,158	5,595
Key Issue #1: Defensible Space: Miles to be Treated	0	20	20
Total Fuels Treatment Acres (MST and Prescribed Fire)*	***0***	***8,750****	***9,460****
Key Issue #2 Wide Thinning to 30-35 Foot Spacing: Acres	0	2,743	1,478
Moderate Thinning: 20-30 Foot Spacing: Acres	0	413	2,094
Non-commercial Thinning: Acres	0	2,920	3,060
Commercial Harvest: Acres	0	4,645	5,345
Total Thinning/Harvest Acres*	***0***	***5,500****	***5,450****
Estimated Commercial Volume	0	13.6 MMBF (±20%) 26.1 CCF (±20%)	15.8 MMBF (±20%) 30.3 CCF (±20%)
Key Issue #3 Reforestation: Acres/Cost	0	275/$322,000	210/$212,000
Reforestation Herbicide Treatment: Acres	*0*	*44*	*36*
Reduce Imminent Susceptibility to Bark Beetle Attack: Acres	0	3,420	4,065
Reduce Severe Dwarf Mistletoe: Acres	0	3,980	4,380
LOS Development: Acres	0	3,580	4,320
Key Issue #4 Protecting Forest Investments Thinning previously pruned stands: Acres	0	0	352
Pruning: Acres	0	925	800
Total Treatment Acres*	***0***	***9,330****	***10,505****
*Total Treatment Acres in NNVM**	*0*	*1,250*	*1,060*
Roads – Connected Activity			
Road Reconstruction: Miles	0	22.0	22.0

Table 20: Comparison Of Alternatives			
Proposed Activity	**Alternative 1 (No Action)**	**Alternative 2 (Proposed Action)**	**Alternative 3**
Temporary Road Construction	0	6.5	7.0
Roads – Mitigation Activity			
Road Closure: Miles	0	42.0	42.0
Road Decommission: Miles	0	7.7	7.7
Seasonal Road Closure – Deer Habitat and Ryan Ranch Key Elk Area (KEA) December 1 through March 31	No	Yes	Yes
Total Road Closure/Decommission: Miles	**0**	**49.7**	**49.7**

*** Total treatment acres**: Many units have multiple treatment activities. The sum of proposed treatment activity acres is greater than total unit treatment acres.

ALTERNATIVE CONSIDERED BUT NOT FULLY ANALYZED

During initial scoping for the Kelsey project, an issue was identified concerning the use of mechanical treatment within Newberry National Volcanic Monument. An alternative was considered that would decrease the amount of mechanical treatment, including mowing and mechanical thinning of trees and would have emphasized the reintroduction of fire within the Monument. Use of mechanical treatments would have been minimal and limited to use around Lava Lands Visitor Center, Benham Falls Day Use area, and Lava Cast Forest. While this alternative would meet the need for restoring fire, it would not meet the need for restoring old-growth ponderosa pine. Proposed mowing and thinning activities in the Monument is necessary to reduce fire hazard (shrubs and ladder fuels) and protect large old growth pine, and move toward reestablishing other stands of old growth ponderosa pine. This alternative was eliminated from detailed study.

MONITORING

Project monitoring focuses primarily to assure the selected alternative and mitigation measures are implemented on the ground as designed and achieve the desired results.

Soil Quality

The Regional supplement to the Forest Service Manual (FSM 2520, R-6 Supplement No. 2500-98-1) provides policy for planning and implementing management practices which maintain or improve soil quality. An emphasis is placed on protection over restoration. The following excerpt is taken from FSM 2520.3:

"When initiating new activities":

> Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area. (This includes the permanent transportation system).
>
> In activity areas where less than 20 percent detrimental soil impacts exist from prior activities, the cumulative amount of detrimentally disturbed soil must not exceed the 20 percent limit following project implementation and restoration.
>
> In activity areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move conditions toward a net improvement in soil quality".

This Regional policy is consistent with the Forest Plan interpretation of Forest-wide standards and guidelines SL-3 and Sl-4, which is filed in the Deschutes National Forest Supervisor's Office (Final Interpretations, Document 96-01, Soil Productivity, 1996).

> ***Objective:*** To determine if post-implementation soil compaction is within parameters (Percentage of detrimental disturbance) consistent with regional standards and guidelines for soil quality, within units with commercial thinning and regeneration cut.
>
> ***Frequency:*** Following completion of commercial harvest activities, sample units using transects to determine detrimental disturbance within areas of activity.

Botany – Noxious Weeds

The purpose of monitoring is to assess the possible introduction and spread of invasive plant species, including noxious weeds, from proposed activities.

Objective: To determine until reasonably certain that no noxious weeds are becoming established.

Frequency: Inspect and document limited term ground-disturbing operations in noxious weed infested areas for at least three (3) growing seasons following completion of the project. For ongoing projects, continue to monitor until reasonable certainty is obtained that no weeds have occurred. Provide for follow-up treatments based on inspection results.

Hydrology

The Deschutes River has had many monitoring sites over the years. Various monitoring has included stream flow, water temperature, turbidity and sedimentation, dissolved oxygen, pH, conductivity, and various physical stream parameters such as width/depth ratio and substrate composition. Past monitoring information is on file at the Bend-Fort Rock Ranger District and the Deschutes National Forest Supervisor's Office.

Objective: Continue monitoring the Deschutes River to compare and contrast baseline data with new data that is collected during and after implementation of the selected alternative.

Frequency**:** The Deschutes River should continue to be observed and monitored on an annual basis to see if water quality parameters change as this project is implemented. With the presence of Wickiup Dam, conditions are not natural in the Deschutes River, and sediment loads are regulated by flows coming out of the reservoir. However, many years of monitoring (with the dam in place) temperatures, turbidity, dissolved oxygen, pH, conductivity and other parameters has given a baseline condition. Out-year monitoring could identify any unexpected changes in water quality. Monitoring should continue during implementation and for at least five years upon completion of the project.

Forest Vegetation – Trees

The created openings would be provided to develop structural diversity for big game to utilize thermal cover, hiding cover, and foraging areas more successfully. To ensure the establishment of seedlings for successful reforestation of areas where openings have been created:

Objective: To monitor reforestation progress, animal damage, and competing vegetation growth.

Frequency/Duration: Monitor reforestation progress one year (1), two years (3 year) and four years (5 year) following planting.

Objective: To monitor natural regeneration progress, animal damage, and growth of competing vegetation.

Frequency/Duration: Survey natural regeneration units two (2) years (3-year exam) and 4 years (5-year exam) following site preparation.

Herbicides

Forest Service Handbook 2109.11 (Pesticide Project Handbook) will be used to direct project planning. This establishes procedures for planning, organizing, conducting and reporting pesticide use projects. Included is the requirement for a post-treatment evaluation report.

Both worker and public exposure monitoring is required for all herbicide application projects. Pertinent details are documented, including herbicides used, land areas treated, dates and times of applications, people involved, and mitigation measures followed.

Objective: Effectiveness of Treatment; To aid in future project planning, document the following where treatments have been done to control competing and unwanted vegetation: 1) efficacy of treatment or no treatment, 2) unintended effects, and 3) lessons that could be applied to other projects.

Frequency/Duration: Within 1 to 2 years of vegetation treatment. As needed following that until plantation is certified as reforested.

Cultural

Where sites need to be avoided by any treatment, an archaeologist will mark the area to be avoided prior to any needed implementation layout or design. Avoidance areas will be marked in any contractor files or maps as area to be avoided and not as archaeological sites.

Objective: To confirm that avoidance measures were implemented and effective (Forest Plan Monitoring element).

Frequency/Duration: All areas to be avoided or otherwise should be monitored by an archaeologist once during implementation and after implementation has been concluded.

Chapter 3

Affected Environment and Environmental Consequences

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

The Affected Environment refers to the existing biological, physical, and social conditions of an area that are subject to change, directly, indirectly, or cumulatively as a result of a proposed human action. Information on the affected environment is found in each resource section under "Existing Condition." The effects may be direct, indirect, or cumulative.

The Affected Environment (existing condition) and Environmental Consequences (Effects) section provides the scientific and analytical basis for alternative comparison. This chapter summarizes the various environments of the project area and the anticipated effects of implementing each alternative on that environment. Probable effects are discussed in terms of environmental changes from the existing condition and include qualitative as well as assessments of direct, indirect, and cumulative effects.

Direct effects: Those effects that occur at the same time and in the same general location as the activity causing the effects.
Indirect effects: Those effects that occur at a different time or different location than the activity to which the effects are related.
Cumulative effects: – Those effects that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

Specialist reports have been summarized, and hereby incorporated, in the following discussions within this section. For more detailed and supporting documentation, and to incorporate by reference, refer to the specialist reports in the following appendices of the Project Record located at the Bend-Fort Rock District Office.

Appendix C: Fire and Fuels
Appendix D: Forest Vegetation
Appendix E: Herbicide Analysis
Appendix F: Wildlife Biological Evaluation and Wildlife Report
Appendix G: Soils
Appendix H: Fisheries
Appendix I: Hydrology
Appendix J: Roads Analysis and Roads and Transportation Report
Appendix K: Botany Biological Evaluation and Botany Invasive Plant Report
Appendix L: Scenic Resources
Appendix M: Cultural Resources
Appendix N: Range Report
Appendix O: Economic and Social Analysis

For supplemental and supporting documentation, refer to the Appendices listed in the Table of Contents of this Draft Environmental Impact Statement. The appendices include the Wildlife Biological Evaluation, Botany Biological Evaluation, and Herbicide Analysis.

FIRE AND FUELS

Key Issue #1: Wildland Urban Interface Fuels Reduction

Issue Statement: Public and internal concerns identified additional areas where fuels treatments are needed. Without treatment, these areas within the Wildland Urban Interface (WUI) would continue to have hazardous fuels, a risk for high intensity, stand replacement wildfire, and provide a greater risk of wildfire moving from Forest Service land to private lands.

Unit of Measure: Acres proposed for fuels treatment that would reduce fuels hazard adjacent to the Wildland Urban Interface and along defensible space corridors.

INTRODUCTION

If lower and mid-elevations ecosystems are to experience a disturbance regime similar to that which they are adapted, the fuels must first be reduced to keep fire effects within an historical range. One goal of this project is to manage fuel loads and fuel arrangements to be within a manageable range for both fire control and ecosystem processes.

Concerns vary depending on the resources at risk and the location of the resource within the analysis area. One concern is fire behavior and its effects in the WUI areas. For example, ground forces can use direct attack tactics with flame lengths that are less than 4 feet in height. When flame lengths are greater than 4 feet, indirect tactics such as burning out from a road or dozer line construction several hundred feet away from the fire edge could be required. Reducing fuel loads and modifying fuels arrangements can reduce fire behavior and fire spread.

Experience has shown thinning and prescribed fire target different components of the fuel bed of a given forest stand and landscape (Peterson et al., 2003). Thinning is potentially effective at reducing the probability of crown-fire spread and is precise in that specific trees are targeted and removed from the fuel bed. Prescribed burning and mowing affects potential fire behavior by reducing fuel continuity on the forest floor, thereby slowing fire spread rate, reducing fire intensity, and reducing the likelihood of fire spreading into the ladder fuel and crown. Experience has also shown that suppression options are increased and more highly effective where fuels treatments have occurred. During the 18 Fire crews were able to anchor the east line of the fire where previous fuel treatments had taken place because fire behavior was such that crews were able to use hand-line as a suppression option.

DESIRED CONDITION

The landscape within the project area should display a mosaic of strategically placed areas which are managed to reduce fire behavior potential, aide in the suppression of wildland fire (such as defensible space), provide protection to forest resources, especially within the WUI. The desired stand structure would be a crown bulk density and forest canopy continuity could not sustain an independent crown fire. Shrub cover would be maintained in a mosaic pattern with shrub height that would keep flame lengths under approximately four feet to reduce the rate of fire spread and crown fire initiation. Trees within stands would have a live crown that is high enough that shrubs and tree saplings could not serve as “ladder fuels” in crown fire initiation. Within these areas across the landscape, fuel models 8 and 9 would characterize conditions conducive to low fire behavior and a return to a condition class 1 where there is a natural, or historical range of variability (HRV) of vegetation characteristics. Firefighters could be more effective in suppression operations, especially along defensible space areas.

It has taken several decades of fire exclusion to create the conditions that currently exist in the planning area. One hazardous fuels reduction treatment would not return this forest to a condition to which it would function under the historical low-severity fire regime (Brown 2000). The goal, then, is not to completely return these forests to a historical range of variability with one treatment, but to prescribe treatments that would start to move them toward that range, allowing a more natural fire regime to function.

Figure 14 was taken in the early spring after a fall prescribed burn on the southern end of the Bend-Fort Rock Ranger District. The photo illustrates a desired condition in the ponderosa pine type for fuels management in the Kelsey Planning area as described above.

Figure 21: A Desired Condition For The Project Area

The principles of a fire resilient forest has been described (Peterson, 2005). These include reduced surface fuels, increased height to live crown, decrease in crown density, maintaining or enhancing large structure (tree size), and retention of fire resistant species. Desired conditions for each of these components are displayed in Table 21). These are average stand level attributes.

Table 14: Desired Conditions for Kelsey Plant Association Group (PAG)					
Plant Association Group (PAG)	**Surface Fuel Loading (Tons/Acre)**	**Height to base of Live Crown (feet)**	**Crown Bulk Density (kg/m2)**	**Tree Structure (dbh)**	**Fire Resistant Tree Species**
Ponderosa Pine	Less than 5 inches dbh 7 to 10 tons per acre	Greater than 10 feet	Less than.10	Greater than or equal to 8	Ponderosa pine
Mixed Conifer - Dry	Less than 5 inches dbh 7 to 10 tons per acre	Greater than 10 feet	Less than.10	Greater than or equal to 8	Ponderosa pine, Douglas-fir

Fire Regime I: To move forests towards a more natural fuel condition, fire will be managed, through the use of prescribed fires. Actions proposed in the alternatives are aimed at reducing fuel loading so that as conifer stands develop the option of using prescribed fire will be available to either maintain or enhance desired conditions. A reduced fuel load would increase the variance of weather and fuel conditions under which prescribed fire could be applied.

Hall (2003) suggests that the historical condition contained very little woody fuel averaging about 3 to 6 tons/acre. The optimum range of Coarse Woody Debris (CWD) for warm dry forest types is described as 5 to 20 tons per acre (Brown, 2003). The desired fuel loading for ponderosa pine, displayed in the table above also applies to the Wildland Urban Interface,

Fire Regime IIIa: To introduce prescribed fire as a disturbance, it is necessary to first remove some of the fuels to allow for these fires to be safe and ecologically beneficial. From a firefighting perspective, less fuel is better. It is not ecologically appropriate to reduce fuel levels below that which provides for other ecosystem functions. Such reductions are not proposed in this project.

Under a frequent fire regime it would be possible to maintain fine fuels at lower levels and various patch sizes than under a less frequent fire regime, but fine fuels will always exist. Aside from eliminating the fine fuels that contribute to fire spread, only the total amount and arrangement can be modified to benefit fire control efforts.

EXISTING CONDITION

Historically, fuel levels were kept low with frequent fire return intervals of 8 to 15 years, allowing fire to burn at lower intensities (Agee 1993). Changes in forest density, forest composition, and public use have occurred across the Kelsey planning area since the early 1900s when wildfire suppression and tree harvest activities began. It is generally accepted that fire suppression over the last 100 years and past large tree harvesting operations have contributed to excess tree densities and fuel loads in ecosystems that developed with short return intervals. Stands dominated by large sized, fire resistant ponderosa pine with little ground vegetation have been converted to smaller sized ponderosa pine and heavy bitterbrush stands primarily as a result of the cessation of aboriginal burning, timber harvest, and fire suppression. These stands are presently less fire resistant as a result of increased tree and shrub densities and ground fuel accumulations. Presently, fires frequently burn at higher intensities, killing substantial amounts of vegetation, including large trees.

Ponderosa pine forests have undergone substantial structural changes since earlier this century due to fire exclusion and logging. Heavy fuel loads and ladder fuels make these stands more susceptible to crown fires. This may result in an increased risk of fire intensity and severity that could exceed the lethal limits of thick barked species (USDA 2000a; USDA 2000b). "Certain forest types (low elevation ponderosa pine, for example) may be susceptible to burning in ways that have not been seen in centuries" (Beschta et al. 1995). The type of fire behavior that can be exhibited by this changed stand condition can make conditions less safe for firefighting operations.

The dominant plant association group within the planning area is ponderosa pine *(Pinus ponderosa)*. Other conifers include lodgepole pine *(Pinus contorta)* and white fir *(Abies concolor)*. The understory plant association consists of Greenleaf manzanita *(Arctostaphylos pataula)*, Snowbrush *(Ceanothus Velutinus)* and Antelope bitterbrush *(Purshia tridentata)*. Fuel loading varies across the planning area from 5 tons per acre to 30 plus ton per acre depending upon the location. Figure 15 is representative of vegetation within much of the project area.

Figure 15: Representative Stand in the Kelsey Project Area

Photo courtesy of USDA, Forest Service, Central Oregon Area Ecology Program

In the past 10 years there have been large, high intensity fires in the general locale and with similar stand characteristics of ponderosa pine and bitterbrush, with stands of second growth ponderosa pine and plantations lost. Outside of the planning area, in 1996 the Skeleton fire (17,789 acres) burned on both federally managed and private lands and 19 homes were destroyed and the Evans West fire burned 4,230 acres to the southeast of the planning area. Within the planning area, approximately 4,076 acres have burned during other large recent wildfires events including the 1995 Green Mountain (223 acres) and Bessie Butte (430 acres) fires, and the 2003 18 Fire within the planning area (3,518 acres within and 282 acres within the Fuzzy planning area). Between 1987 to present there have been 92 known fire occurrences (40 lightning, 15 arson and 37 other fires). Smaller fires include Dillon Falls (15 acres), Sugar (33 acres), and Benham (30 acres). The planning area is heavily used for hiking, biking, horse and off highway vehicle (OHV) riding. With increasing recreational use in close proximity to the city of Bend, human caused fires are predicted to increase.

Roads currently allow access to most areas for fire suppression activities. Fuel conditions adjacent to many roads do not provide an adequate defensible space (fuel break/safety corridor) or safe escape route for suppression forces or the public in the event of a high intensity wildfire.

The planning area has Long-Term Site Productivity (LTSP) study plots located within the southern portion of the planning area, an area of natural fuels that is high risk for wildfire. These are on-going studies that are planned to continue for the next 50 or more years. One of the primary research goals of these study sites is to provide information that will contribute to a better understanding of the role of fire in contemporary ponderosa pine ecosystems.

Vegetation and fuels vary somewhat across the analysis are. The area is represented by:

Ponderosa pine stands with shrub fields understory (approximately 70 percent).
Ponderosa pine and lodgepole pine mixed stands (approximately 2 percent).
Lodgepole pine stands (approximately 1 percent).
Mixed conifer stands (approximately 4 percent).
Non-forested (approximately 23 percent.).

Expected Fire Behavior by Fuel Model and Fire Weather Parameters

Historical weather data was collected from the Lava Butte weather station via Kansas City and contains records from 1994 through 2004. The station is located within the project area and best represents the area's weather conditions. A typical fire season on the Bend-Fort Rock Ranger District is defined as May 15 through September 30. The Project Record, Appendix C, Fire and Fuels Report, page 15 provides a detailed explanation.

Fuel Modeling

Behave (Andrews, 1986) was used to model the expected fire behavior for the 55th, 90th and 97th percentile weather. Anderson describes 13 standard Fire Behavior Prediction models that are organized into four groups: grass, shrubs, timber and slash (Anderson, 1982). The difference in fire behavior among these groups is related to the fuel loading and its distribution among the fuel size classes. Table 22 displays surface fuel models that are most likely to be represented within the analysis area during the Central Oregon fire season, from May 15th through September 30th.

To better understand percentile weather and fuel moistures in Table 15:

At the 55th percentile, 45 percent of the days would be warmer and drier than the fire weather, which is represented at the 55th percentile.
At the 90th percentile, 10 percent of the days would be warmer and drier than the fire weather, which is represented at the 90th percentile.
At the 97th percentile, 3 percent of the days would be warmer and drier than the fire weather, which is represented at the 97th percentile.

Table 22: Expected Flame Length And Scorch Height In Feet By Fuel Model

Flame Length (Feet) and Scorch Height (Feet) by Fuel Model & Fire Weather Percentile		Grass		Shrub		Timber		
		FM2	FM3	FM5	FM6	FM8	FM9	FM10
55th Percentile Fire Weather	Flame Length	4	9	4	4	1	2	4
	Scorch Height	22	67	19	20	1	5	17
90th Percentile Fire Weather	Flame Length	14	23	13	10	2	6	11
	Scorch Height	130	308	115	67	1	17	70
97th Percentile Fire Weather	Flame Length	19	29	16	13	2	8	13
	Scorch Height	228	478	159	95	1	27	97

Under 55th percentile weather, flame lengths less than 4 feet, can generally be attacked by suppression crews using hand tools under all Fuel Models (FM) except, FM-3, see fuel model descriptions below for more details. In certain cases, flame lengths greater than 4 feet generally requires mechanized equipment (such as engines and bulldozers) to aide in suppression efforts of wildland fire. On the other hand, these are ideal weather parameters to implement management ignited prescribed fire because of "spring-like" conditions which are typically when we burn.

Under 90th percentile weather, flame lengths can range from two (2) foot to 23 feet. Wildland fires greater than four feet generally require either mechanized equipment or retardant drops, or both, to be effective. Typically, fires are too intense for direct attack with suppression crews because of summer conditions. Although, prescribed fire can be implemented under these conditions in certain fuel models (FM-8 and FM-9), we typically don't burn under these conditions because things are hotter, drier and it increase the potential for control problems and tree mortality. Also, down woody objectives are tougher too meet. Scorch height would range from 1 foot to 308 feet. Usually, scorch heights greater than 25 feet can be undesirable when using prescribed.

Under 97th percentile weather, flame lengths can range from 2 feet to 29 feet. Scorch heights can range from as low as one (1) foot to 478 feet again depending on the fuel model. Wildland fire presents serious fire control problems such as torching, crowing and spotting. Generally, mechanized equipment in combination with aerial resources is the only method of attack. Because of summer conditions prescribed fire is not appropriate.

Thirteen (13) fire behavior fuel models (Rothermel 1972, Albini 1976) represent the planning area and interpret fire behavior potential. A large area of the analysis area is occupied with non-vegetation (lava flows). The following are the predominant fuel models:

Fuel Model 2 (7,120 acres): Fire behavior potential is moderate. Fire spread is primarily through fine herbaceous fuels. Herbaceous material dead stem wood from shrubs and timber overstory contributes to fire intensity.

Fuel Model 5 (1,935 acres): Fire behavior potential is low. Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and grasses in the under story. Fires are generally not intense due to lighter fuel loading and younger shrubs with little dead material**.**

Fuel Model 6 (14,860 acres): Fire behavior potential is extreme. Fire carry through shrub layer. Moderate winds are usually required to carry fire. Shrubs are older but not tall averaging two and one-half feet.

Fuel Model 8 (4,255 acres): Fire Behavior Potential is low. Slow burning ground fires with low flame lengths are represented. This model represented by the closed canopy stands of short needle conifers. Fire tends to travel through the needles, leaves and occasional twigs because little undergrowth is present.

Fuel Model 9 (5,180 acres): Fire behavior potential is moderate. Fires run through the surface litter faster than fuel model 8 and have longer flame heights. This model represents closed stands of ponderosa pine.

Fuel Model 10 (2,065 acres): Fire behavior potential is high. Fires burn in surface and ground fuels with greater fire intensity than models 8 and 9. Large down woody material is in greater quantity. Crowning, spotting and torching is more frequent leading to potential fire control difficulties.

Fires can be expected to burn actively in the analysis area assuming average daytime summer conditions for flat terrain: 85 degrees Fahrenheit, relative humidity 12 to 15 percent, fuel moistures (3 to 4 percent 1 hour, 5 to 6 percent 10 hour, and 6 to 7 percent 100 hour fuels), and mid-flame winds around 4 to 6 miles per hour (MPH). The rate of spread and intensity of fires will increase with the addition of slope or greater wind. Table 23 summarizes current fire behavior potential and acreage.

Table 23: Current Fuel Model Acreage And Associated Fire Behavior Potential [1]	
Fire Behavior Potential	**Alternative 1 (No Action)**
Extreme/High	16,925
Moderate	12,335
Low	6,187
Non-vegetated (Lava)	10,728
Total	**46,175***

*Based on planning area acreage, not project area acreage which equals Planning area minus 18 Fire area.

An estimated 37 percent of the project area is classified as high or extreme for fire behavior based on current vegetation and fuel loadings. These areas are located primarily in large acreage blocks in the low to mid elevations. Lava Lands Visitors Center and Lava River Cave are high use/value recreational sites located inside the Newberry National Volcanic Monument (NNVM). Fuel accumulations adjacent to Lava Lands Visitors Center, Lava River Cave, and the Wildland/Urban Interface exceed natural levels and pose a high risk to public and firefighter safety.

Background

The National Fire Plan provides national direction for hazardous fuels reduction, restoration, rehabilitation, monitoring, applied research and technology transfer. The Kelsey DEIS responds to the hazardous fuel reduction and restoration elements of the National Fire Plan (Project Record, Appendix C, Fire and Fuels Report, page 1).

In April 2002, a national assessment was completed quantifying land conditions in the United States. The analysis describes the degree of fire regime departure from historic fire cycles due to fire exclusion and other influences (Schmidt et al. 2002). The analysis identified changes to key ecosystem components such as species composition, structural stage, tree or shrub stand age, and canopy closure. It characterizes the landscape by five “Fire Regime Groups” and three “Fire Condition Classes” (USDA, USDI, 2002).

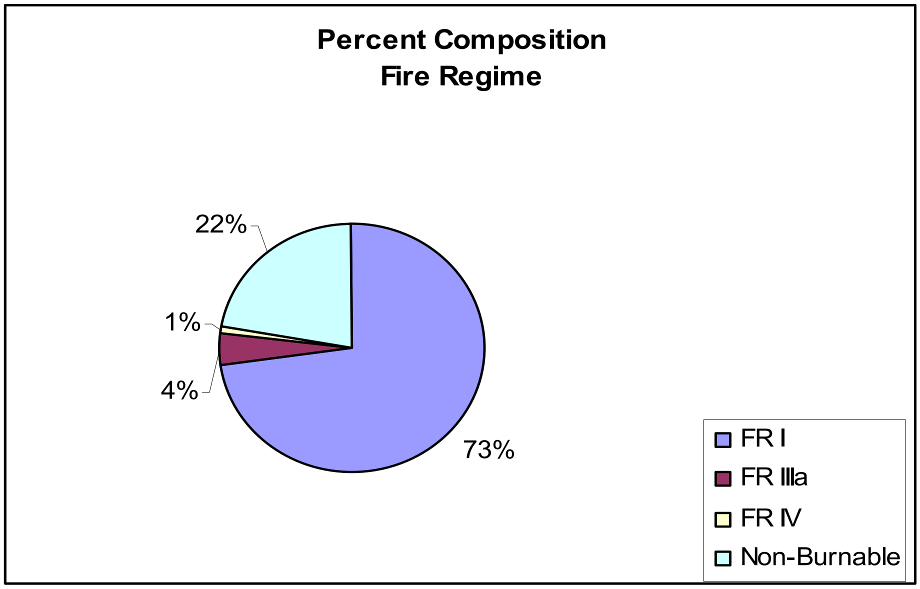
A fire regime is a generalized description of fire’s role within an ecosystem – characterized by fire frequency, predictability, seasonality, intensity, duration and scale (USDA, USDI, 2002). Fire condition class is a landscape-level attribute which characterizes the degree of departure from historic reference conditions of vegetation composition and structure, and fire frequency and severity that currently exist inside the fire regime.

The national fire regime scheme has been modified for use within the Central Oregon Area (Central Oregon Fire Management Plan USFS, 2003). Fire regimes were identified by plant association group (PAGs) for the Kelsey planning area, Table 24. Three (3) Fire Condition Classes, Table 25, categorize and describe current vegetation composition and structure condition within the Fire Regime Groups.

[1] Acreage calculated in GIS using landsat data and plant associations. Fire behavior potential based on surface fire potential flame length, rate of spread and fire line intensity using the BEHAVE fire spread model (Andrews 1986). For a detailed explanation of the fire behavior fuel models, refer to the Project Record, Appendix D, Fire, Fuels, and Air Quality Report pages 2-6 located in Appendix D of the Official Record located at the Bend/Fort Rock District Office.

Table 24: Fire Regimes			
Fire Regime Group	**Fire Frequency**	**Fire Severity**	**Plant Association Group**
I	0-35 years	Low	Ponderosa Pine
IIIa	< 50 years	Low/Mixed	Mixed Conifer Dry
IV	35-100 years	Stand Replacement	Lodgepole Dry

Figure 16: Fire Regime Composition For The Kelsey Planning Area



Condition Class Descriptions

Condition classes (Table 25) are a function of the degree of departure from historic fire regimes resulting in alterations of key ecosystems components such as species composition, structural stage, stand age, and canopy closure. One or more of the following activities may have caused this departure: fire exclusion, timber exclusion, timber harvesting, introduction and establishment of exotic plant species, insects or disease (introduced or native), or other past management activities.

Table 25: Fire Regime Condition Classes Within The Kelsey Project Area	
Condition Class	**Attributes**
Condition Class 1	▪ Fire regimes are within or near an historical range. ▪ The risk of losing key ecosystem components is low. ▪ Fire frequencies have departed from historical frequencies (either increased or decreased) by no more than one return interval. ▪ Vegetation attributes (species composition and structure) are intact and functioning within an historical range.

Table 25: Fire Regime Condition Classes Within The Kelsey Project Area	
Condition Class	**Attributes**
Condition Class 2	▪ Fire regimes have been moderately altered from their historical range. ▪ The risk of losing key ecosystem components has increased to moderate. ▪ Fire frequencies have departed (either increased or decreased) from historical frequencies by more than one return interval. This change results in moderate changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. ▪ Vegetation attributes have been moderately altered from their historical ranges.
Condition Class 3	▪ Fire regimes have been significantly altered from their historical range. ▪ The risk of losing key ecosystem components is high. ▪ Fire frequencies have departed (either increased or decreased) by multiple return intervals. This change results in dramatic changes to one or more of the following: fire size, frequency, intensity, severity, or landscape patterns. ▪ Vegetation attributes have been significantly altered from their historical ranges.

Vegetation Condition

Fire Regime I: Fire Regime I consists of the dry and wet ponderosa pine PAGs. This fire regime makes up about 71 percent of the Kelsey planning area. The existing condition is characterized by a deficiency of area dominated by large size ponderosa pine. Historical Ranges of Variability (HRV) (Forest Vegetation, page 3-21) for this structural stage is 30 to 90 percent. The majority (73 percent) of the Fire Regime I area is dominated by second growth stands of ponderosa pine. Departure from historical reference condition is estimated to be about 55%.

Fire Regime IIIa: Fire Regime IIIa is included with Fire Regime I because of similarity in fire frequency and a small percentage (4 percent) of the project area.

Fire Regime 1V: Fire Regime IV consists of lodgepole pine PAG and makes up one (1) percent of the Kelsey planning area. Existing conditions for Fire Regime IV is within the HRV for seral /structural stages. Departure from historical referenced conditions is estimated to be less than 33 percent.

Fire Frequency and Severity: Frequently used terms that relate to fire and the effects of fire on natural ecosystems, relevant terms are defined below:

Fire Frequency, refers to the number of fires in a specified time an area.

Fire Severity, refers to the degree which a site has been altered or the successional process disrupted by fire. Fire severity is a product of fire time and intensity (DeBano et al., 1998).

Fire Condition

Fire Regime I: The Deschutes National Forest maintains a historical large fire record dating back to about 1904. An analysis of this record indicates that few acres (1,116 acres) have burned within the Kelsey planning area. The historical reference fire frequency ranges from about 7 to 35 years. This short interval fire cycle would indicate that most of the Fire Regime I area would have experienced three or more fire events during the last 100 years.

Fire Regime IIIa: This historical reference fire frequency ranges from 35 to 100 years. It is likely that most of the area in this Fire Regime missed at least one fire cycle.

Fire Regime IV: The historical reference of fire frequency ranges from 100 to 200 years or more. It is likely that most of the area within in this Fire Regime has not missed a fire cycle.

The historical record contains little data on the severity of past large fires. Historically, fire occurring with Fire Regime I was low intensity and had little effect on dominant vegetation layer. Large, stand-replacing fire could occur within Fire Regime I under extreme weather conditions, but are very rare events associated with exceptional droughts.

Fire Regime IIIa was historically of mixed intensity and had variable effects to the dominant vegetation. Large, stand-replacing fire could occur but were usually rare events. Fire disturbance resulted in a mix of stand ages and size classes. Historical fire severity within Fire Regime IIIa would tend toward low intensity, supporting and maintaining a higher percentage of early seral ponderosa pine. Table 26 summarizes the elements of vegetation condition, fire frequency and severity in the determination of condition class for the Kelsey planning area.

Table 26: Existing Fire Regime Elements – Kelsey Project Area

Fire Regime Existing Condition	Vegetation Condition*	Fire Frequency	Fire Severity	Condition Class
I and IIIa	55%	90%	80%	3
IV	20%	20%	20%	1

* Represents the departure from reference conditions.

Fire Regime I, which makes up the majority of the Kelsey planning area, is characterized as Condition Class 3 because of a substantial departure from reference conditions for vegetation, fire frequency and intensity. Because the project area only has a small percentage (4 percent) of Fire Regime IIIa, the acres were included under Fire Regime I because of similarity in fire frequency. Fire Regime IV is shown as Condition Class 1 and essentially functioning within the ranges of historical reference conditions.

Landscape Fire Behavior

This section displays the potential for landscape fire behavior parameters that would result from Alternative 1 (No Action) or implementation of either action alternative. Potential flame length is shown by fuel model as an indicator of fire intensity. Potential effects are based on estimated fuel and vegetation conditions for the area. Effects to fire behavior parameters are based on weather and fuels conditions at the high level (90^{th} percentile discussion, DEIS page 3-7).

The maps and analysis for flame length and fuel model shown below were developed using the program FlamMap (Flamability Map) developed by Mark Finney. Information on FlamMap is available at www.fire.org. A fire simulation using the Farsite model (Finney, 1997) was performed for the planning area. Using the Farsite model, the progression of a fire is simulated given weather and fuels data and geographic information. The use of Farsite has limitations in that it simulates fire progression over a specified time period and ignition point. Associated figures are located in the Project File, Appendix C.

Air Quality

Smoke contains pollutants including tiny particles called particulate matter (PM). Particulate matter can cause significant health problems, especially for people suffering from respiratory illness. Based on recent research, the Environmental Protection Agency (EPA) revised the air quality standards to provide better health and visibility protection. Under the new standards, techniques must be considered that minimize smoke emissions and the impact of smoke on public health and the environment.

Smoke Management would be regulated by The Oregon Department of Forestry according to the Oregon Smoke Management Plan, Oregon revised statues 477.013. The air quality objective is to improve the management and minimize emissions from prescribed burning to be consistent with the Interim Air Quality Policy on Wildland and Prescribed Fires, Federal Clean Air Act, and the State of Oregon Clean Air Act Implementation Plan developed by the Department of Environmental Quality under ORS 468A.035 (1989 c.920 s.2).

Federal Land Management agencies (USDA Forest Service (USFS)) are required by law to follow the direction for the protection of air quality for conducting prescribed burning operations. Smoke management weather forecasts and instructions, as provided by the Oregon Smoke Management Plan and the Operational Guidance for the Oregon Smoke Management Program (Directive 1-4-1-601) are to be followed.

On the Deschutes National Forest, prescribed burning is accomplished during the, spring and early summer when dilution, dispersal, and mixing conditions are generally good to excellent. Prescribed burning also occurs during the winter when conditions are more restrictive. The Deschutes National Forest requires a public notification to be conducted. This is accomplished using local media, Forest Service websites and occasional door to door announcements when appropriate in affected neighborhoods prior to burning operations. Also, signs are posted, which include maps, for local residents which we post at entrances to subdivisions and mail centers.

Consumption of Fuel and Smoke Emission

Studies from the Columbia River Basin Analysis show that emissions from wildfires are 50 to 70 percent greater than that of prescribed burns. The potential particulate matter of 10 microns (PM10) from wildfires is twice the amount as from a prescribed fire of the same size. Smoke management studies shows approximately 80 to 90 percent of fuels are consumed in the flaming phase and 10 to 20 percent consumed in the smoldering phase.

Emissions from fire (smoke) results in the release of particulates into the atmosphere, possibly affecting human health. According to the Clean Air Act of 1977 and 1990, Federal Land Managers will attempt to "protect and enhance the quality of Nation's air resources so as to promote the public health and welfare……"

The critical pollutants thought to affect human health include particulate matter emitted in smoke that is less than 10 microns in diameter (PM10). Particulates less than 10 microns are able to traverse the nose and mouth and enter the upper airways. Due to their small size and weight, PM10 can remain airborne for weeks. Over ninety percent of smoke particles are less than 10 microns. Wood smoke has been documented to be mutagenic, though no direct studies have proven it carcinogenic to humans. Mutagenic compounds cause changes to structure of a cell in ways that can be transmitted during cellular division. This is of primary concern because mutation can be precursors for cancer (Boutcher 1999). Exposure to PM10 aggravates chronic respiratory disease such as asthma, bronchitis and emphysema.

Burning debris will release carbon dioxide and water (making up about 90% of total mass emitted from the combustion process), criteria pollutants (those pollutants regulated by the EPA under the clean air act), including carbon monoxide and sulphur/nitrogen oxide, and hazardous air pollutants (also known as "air toxins"). Air toxins include several hundred known substances including the class of compounds known as aldehydes (formaldehyde's, acetaldehyde and acrolin) and polynuclear aromatic hydrocarbons (PAHs), several of which are known to be carcinogenic.

Research to date has yet to determine if levels of pollutants and durations of exposure from prescribed fire operations significantly affect human health. According to sources at the Environmental Protection Agency (EPA), particulate matter that exceeds human health standards have been measured up to three miles downwind of prescribed burns. Also, according to studies conducted by the California Department of Health Services, John Hopkins University and the National Institute for Occupational Safety and Health, small but significant changes in pulmonary function occur when wildland firefighters are tested before and after a single fire season. Wildland firefighters exposure to CO over a full shift are generally well below occupational health limits, but brief (1-minute) peak exposure exceeding short-term limits, of 200 parts per million, that are not to be exceeded for any amount of time, do occur.

A study of emissions in the Central Oregon area found slash burning to contribute less than 1 percent (.34 percent) of Particulate Matter (PM). The same study found that slash burning also produced less than 1 percent (.64 percent) of the carbon monoxide in Central Oregon (CAB, 1997).

Prevention of Significant Deterioration to Air Quality

The prevention of Significant Deterioration (PSD) provisions of the Clean Air Act requires measures, to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural recreation, scenic, or historic values." Stringent requirements are therefore established for areas designated as "Class 1" areas (42 U.S.C. 7475(d)(2)(B). Designation as a Class 1 area allows only very small increments of new pollution above already existing air pollution levels. The Three Sisters Wilderness Class 1 air-shed is approximately 14 miles northwest of the northern end of the project area. Bend, Oregon is the closest Designated Area (DA).

Meteorological Patterns

Weather patterns are primarily from the west and northwest. Airborne particulates matter is generally dispersed to the east and southeast during the fall and winter months. During the summer months the overall the wind pattern is generally west and northwest.

Temperature changes throughout the day affect how particulate matter and other pollutants are dispersed. Daytime heating causes pollutants to rise along with heated air. Surface cooling at night can create downslope winds that carry pollutants from higher elevations to lower lying areas. Pollutants may pool in the lower regions or exit north following the Deschutes River.

Visual

Smoke emissions vary with combustion efficiency and quantity of fuel consumed. Machine and hand piles tend to produce more smoke (per ton of fuel consumed) than other burns because much of the consumption occurs during inefficient smoldering phase of combustion. The overall factor in the amount of emissions produced lies solely in the amount of fuel consumed.

WILDLAND URBAN INTERFACE (WUI)/COMMUNITY WILDFIRE PROTECTION PLAN (CWPP)

The wildland urban interface (WUI) is commonly described as the zone where structures and other human development meet and intermingle with undeveloped wildland or vegetative fuels. This WUI zone within the project area (Figures 7a and 7b, pages 2-10 and 2-11 and 8a and 8b, pages 2-17 and 18) poses risk to life, property, and infrastructure in associated communities and is one of the most dangerous and complicated situations firefighters face (CWPP 2004). Both the National Fire Plan and the Ten-Year Comprehensive Strategy for Reducing Wildland Fire Risks to Communities and the Environment place a priority on working collaboratively within communities in the WUI to reduce their risk from large-scale wildfire.

The Deschutes National Forest lands surrounding Sunriver Resort, Woodside Ranch, Deschutes River Woods, Sunset View, High Desert Museum, Mountain High subdivision and Lost Tracks Golf Course in the project area are categorized as WUI. This area includes approximately ten to twelve miles of national forest land extending into the forest from the forest boundary adjacent to privately owned lands. Several smaller private tracts of land with homes are in close proximity to the project area. Homes in the area vary as to their defensible condition from wildland fire. Some homes have green grass around them and roofs made from fire resistant materials. Others have shrubs and trees up to the structures and shake roofs, leaving them susceptible to wildland fire.

In 2001, the Federal Register listed the communities at risk from wildland fire within the United States. A total of 93 communities appeared on the list in Deschutes County. After the Federal Register was published, a coalition of fire managers in Central Oregon re-evaluated this list and improved the assessment which resulted in the current list of 136 Central Oregon communities, including Bend and Sunriver, Oregon. Each community was buffered by one and one-half miles to identify the Wildland Urban Interface (WUI) boundary. The Healthy Forest Restoration Act (HFRA) emphasizes the need for federal agencies to work collaboratively with communities in developing hazardous fuel reduction projects, and it places priority on treatment areas identified by communities themselves in a Community Wildfire Protection Plan (CWPP).

Approximately 10 to 12 miles of private lands interface with National Forest land (WUI) within the planning area. Included in the interface are Sunriver and several subdivisions. Smaller private tracts of land are in close proximity to the analysis area and new home starts continue. The WUI adjacent to Woodside Ranch has received a total of 261 acres of fuel treatments, including mowing of shrubs and thinning. The existing fuels condition in these areas is capable of moderate to extreme fire behavior under summer conditions. Treatments of natural fuels within and around developed areas may not be sufficient to ensure protection of privately owned structures. During extreme burning conditions, embers may be carried long distances and ignite private lands.

Fuel loadings within both CWPP areas range from 5 tons per acre up to 30 tons per acre depending upon location. Fuel treatments proposed under both alternatives would include either mechanical shrub treatment (mowing) or underburning or both, precommercial thinning (PCT), commercial harvest, and hand piling of activity slash.

ENVIRONMENTAL CONSEQUENCES

Table 27 displays the type of proposed burning and an estimate of smoke emissions using an estimate of tons per acre of fuel consumed during the burning operations.

Table 27: Estimated Smoke Emissions for Fuel Treatments			
Fuels Treatment	**PM<10 Pounds per Acre**	**PM<2.5 Pounds per Acre**	**Average Consumption Tons per Acre**
Underburn/Jackpot	114	100	7
Pile and Burn	186	162	15
MST/Underburn	65	57	4
Comparison: Wildfire Severe Conditions	900	810	30

The effects of alternatives on smoke emissions are primarily related to the amount and type of fuels treatment proposed. Table 28 displays the estimated smoke emission for each alternative.

Table 28: Smoke Emissions by Alternative			
Alternative	**Acres Treated**	**Total Tons PM<10**	**Total Tons PM<2.5**
Alternative 1 (No Action)	0	0	0
Alternative 2 (Proposed Action)			
Underburn/Jackpot Burn	1,506	86	75
MST/Underburn	3,987	130	114
Pile and Burn (HP, MP, WTY)*	6,752	630	547
Total	**12,245**	**846**	**736**
Alternative 3			
Underburn/Jackpot	1,761	100	88
MST (Mow)/Underburn	5,554	181	158
Pile and Burn (HP, MP, WTY)*	7,996	744	648
Total	**15,311**	**1025**	**894**

*** Proposed Fuel Treatments: MST** = Mow; **HP** = Hand-piles; **MP** = Machine Pile; **WTY** = Whole Tree Yard.

Alternative 1 (No Action)

Direct and Indirect Effects: No administrative fuels reduction activities would occur. Fuels reduction would only occur during wildfires and this trend would likely continue. Wildfire suppression activities would continue for both human and lightning caused fires. Forest succession trends would continue, as more acres would transition towards increased fuel loadings (needle cast, bark slough, ground vegetation, limb cast, over stocked tree stands, and dead trees). The risk of negative impacts to forest health, deer winter range and other wildlife habitat, soils, water quality, recreational values, and safety would continue to increase.

Suppression actions would continue to be extremely hazardous for firefighters. Some suppression options could be eliminated due to lack of escape routes and safety zones. An estimated 37 percent of the project area is classified as high or extreme for fire behavior based on current vegetation and fuel loadings. Fire intensity would prevent direct attack with ground forces, even with light winds. The effectiveness of aerial delivered retardants would be limited due to high fire intensity and long range spotting. Dozer line construction would be required verses handline construction due to fire intensity, spotting and limited safe access. Public safety could be compromised due to limited evacuation routes and a high probability of wildfires spotting into and near adjacent private subdivisions.

In the WUI where wildland fires have not burned or where prescribed fire has not taken place, fuels accumulations would continue to increase through time under this alternative. Wildfires would likely be large, very intense events similar to the Horse Butte 1992 (1,629 ac.), Evans West 1996 (4,230 ac.) and the Skeleton (17,789 ac.) wildfires, which had similar stand type and conditions. Shrubs would grow back in the burned areas and dead trees would fall to the ground creating a hazardous fuel condition within the next 15 to 20 years. The existing fuels condition is capable of moderate to extreme fire behavior under summer conditions. There would not be an opportunity to expand fuel treatments to make the Forest boundary more defensible.

Existing high fuels accumulations coupled with increasing fuels in and around high use/value recreation sites which include but not limited to: Lava Lands Visitors Center, High Desert Museum, Benham Falls and Lava River Cave would continue to increase.

Stands of second growth ponderosa pine and plantations would remain at high risk to loss from wildfire. Stands of mixed ponderosa and lodgepole pine similar fuel conditions would continue. Dense lodgepole pine would continue to provide ladder fuels, posing a risk to the survival of larger ponderosa pine during wildfire. Isolated stands of large structure ponderosa pine are at risk to loss from wildfire. Replacement stands would unlikely re-establish and survive future wildfire events. Continued change from a fire dependent ecosystem frequent low intensity fire to an infrequent and intense fire regime would occur. In areas that historically were infrequent high intensity fire regimes, fire starts that escape initial suppression action would cycle a high portion of the landscape to an early seral stage.

The goal of ponderosa pine restoration through the use of prescribed fire in the Newberry National Volcanic Monument would be compromised under this alternative. The Long Term Site Productivity study would remain at risk from wildfire under this alternative, ongoing, related studies would be lost should wildfire burn through the study area. This loss would be costly in both dollars invested and knowledge that could be gained with further study.

Potential for substantial degradation of air quality from wildfire in the future as surface fuels occur would not be reduced. Higher quantities (PM10) would be released during wildfire. This can be attributed to forest conditions that are usually windier, hotter, and drier under summer conditions. During usual summer conditions, wildfire consumes a greater amount of down woody material, litter, duff, and foliage components.

During a high intensity wildfire, smoke emissions particulate matter of 10 microns and less in size (PM10) could range from 500 pounds per acre to 2,000 pounds or more per acre. Where either down woody fuels have accumulated or stands are dense, or both, PM 10 production may exceed these estimates. Smoke from wildfires would likely impact some of the following locations: Bend (designated air-shed), Deschutes River Woods, Mountain High Homes, Woodside Ranch, Sunriver Resort, Sunset View, surrounding communities, and travel along Highway 97.

Mule deer winter habitat has experienced reductions in thermal cover and forage due to recent wildfires and this would continue.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Under both action alternatives mechanical shrub treatments, thinning, and prescribed fire would be used to begin restoring the role of fire in the ponderosa pine ecosystem. Within treatment units, the intensity of wildland fire under extreme conditions would be reduced and provide suppression forces an opportunity to control a wildland fire near the WUI boundary. As shrubs and tree densities increase over time, these treatment benefits would gradually decrease without further treatment.

Although, treatment of natural fuels may not insure total protection of neighborhoods and privately owned structures, experience has shown thinning and prescribed fire targets different components of the fuelbed of a given forest stand and landscape (Peterson et al., 2003). Thinning is potentially effective at reducing the probability of crown-fire spread and is precise in that specific trees are targeted and removed from the fuelbed. Prescribed burning and mowing affects potential fire behavior by reducing fuel continuity on the forest floor, thereby slowing fire spread rate, reducing fire intensity, and reducing the likelihood of fire spreading into the ladder fuel and crowns of trees. Bitterbrush which is the dominant surface fuel throughout the project area is capable of 15 foot flame heights under moist conditions in late spring and displays even more extreme fire behavior under summer conditions.

Experience has also shown that suppression options are increased and more highly effective where fuels treatments have occurred. The Spring River Butte Fire in 1999 (112 acres) started in a 75-acre stand of unthinned trees and was moving in the direction of Sunriver Resort. However, when the fire reached a 30-acre area that had been thinned, the fire dropped from the crowns of trees to the ground and firefighters were able to control the fire. Firefighters ultimately credited control of the fire to a previously thinned area (Sunriver CWPP).

Proposed treatments would enhance fire suppression effectiveness and safety, and reintroduce fire into fire associated ecosystems. Both action alternatives would reduce the risk of wildland fire spreading to the WUI boundaries of Woodside Ranch, Sunset View, Mountain High, Sunriver Resort, High Desert Museum, and other private residential developments.

While it is recognized that reducing crown density opens the understory and may allow surface winds to increase and dry surface fuels, post harvest treatments (such as mowing, prescribed fire, whole-tree-yarding) would be implemented where applicable to treat residual fuels. Thinned stands would reduce the risk and spread of a potential crown fire by increasing the distance between residual trees and decreasing crown bulk density. Wildfire intensity would be reduced and provide suppression forces an opportunity to successfully contain a wildfire.

MST of shrubs to a height of approximately six-inches, not less, would result in a reduction of flame height from 15 to four feet. This reduction in flame heights would change fire behavior, reduce fire intensity, and allow suppression forces the opportunity to better control fire in this area. Mowing would be expected to retain condition class 1 for five to 10 years as compared to the seven to 15 years expected with prescribed fire (location dependent). A combination of thinning and prescribed burning has been recommended as a tool to restore ponderosa pine forest and reduce fire risk (Fiedler 1996). Depending on shrub and other vegetative growth within the project area, wildfire risk reduction treatments could become less effective in 7 to 10 years in some areas and ineffective in 15 to 20 years in others.

In the areas where restoration of historic fire regimes is planned, prescribed fire would be returned every 8 to 15 years or as needed. Areas with initial high fuel loads would require slow reduction of existing accumulations. Units proposed in the NNVM, identified as burn only, would possibly require multiple entries to achieve the desired condition. The first few entries into these areas would be with low intensity prescribed burns to gradually reduce fuel loadings, requiring an early spring burn. As fuel loads are reduced, through prescribed burns, the intensity of the burns could increase until historic conditions have been reached. Under a frequent fire regime it would be possible to maintain fine fuels at lower levels and various patch sizes than under a less frequent fire regime, but fine fuels will always exist. Aside from eliminating the fine fuels that contribute to fire spread, only the total amount and arrangement can be modified to benefit fire control efforts. From a firefighter's perspective, it is better to construct fire line through 2 inches of this small material to reach mineral soil (therefore stopping fire spread) than through 10 inches because fire line construction would progress faster and potentially contain fire at a smaller size.

Proposed treatments would reduce fuel continuity across the planning area. Through the use of wood fiber utilization, mechanical shrub treatments, underburning, machine piling, hand piling, and utilization or burning of slash piles, the continuity of large areas of heavy fuels accumulations would be reduced and fragmented. To meet wildlife objectives in deer winter habitat, continuous untreated high hazard fuels (shrubs and/dense tree stands) would remain that could support a high intensity wildfire of 100 acres and greater during average summer conditions. A wildfire could decrease deer winter habitat and cause soil sterility, long range spotting due to flying embers, and increased tree mortality.

The effects of prescribed fire with no mechanical treatment would result in longer flame lengths, higher tree scorch, increased tree mortality, increased short-term smoke emissions, potential control problems, reduced time frames for safe burning, red needles in scenic corridors, and higher operating costs. Areas with initial high fuel loads would require a longer time period to reduce the existing fuels accumulation to the desired condition. Fire maintenance activities would occur when necessary to maintain a reduced wildfire risk. Prescribed fire would be used where shrubs like greenleaf manzanita (*Arctostahylos patula*) and snowbrush (*Ceanothus velutinus*) exist. A second burn would kill plants that sprout from seeds prior to producing seed of their own. This multiple entry strategy could be used to reduce shrubs from understories.

Roads 18, 1810, 40, 9702, 9710, 9711, 9720, 4143 and, Highway 97are identified as defensible space roads (fuel break/safety corridors) in the project area. Approximately twenty-miles of defensible space would be created through vegetation management treatments. The use of major roads for defensible space would be used near areas where public safety is of high concern. Roads that provide defensible space would also provide safe escape routes in the event of a wildland fire for firefighters and the public. Suppression actions would be considerably less hazardous for firefighting personnel, the effectiveness of aerial delivered retardants would be enhanced, and the need to construct mechanical fireline with the associated detrimental effects on soils would be reduced. Suppression options, including the ability to safely construct handline, would be improved with safe access and defensible space.

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Slash produced from harvest activities that could not be further utilized, would be piled and burned. MST would occur prior to prescribed burning, where feasible, to further reduce emission and smoke impacts. Prescribed burning would be conducted under favorable smoke dispersal conditions, avoiding impacts to the Class 1 air-shed and urban areas. These burns would occur under weather conditions that would allow the best success with the least impact to sensitive areas. The principle impacts of burning forest residues, whether by prescribed fire or wildfire, are temporary reductions in visibility and effects on human health.

Air quality would be affected primarily by smoke produced during prescribed fire and pile burning proposed in Alternatives 2 and 3. Smoke from prescribed burning could cause short-term impacts to surrounding communities and developments. The effect of prescribed fire in the WUI would be short-term for smoke particulates and reduced visibility. Burning would only occur on days when smoke dispersion is most favorable. Emissions from fire (smoke) results in the release of particulates into the atmosphere, possibly affecting the health of forest workers, visitors and urban residents in areas adjacent to Forest lands.

If a threshold is reached that is undesirable, such as impacting a sensitive area, firing operations would cease and immediate mop-up procedures would be initiated. Inversion conditions, which could increase the potential for pooling smoke into smoke sensitive locations, would be avoided or mitigated as much as possible to not impact those areas of concern.

Dust would be created from proposed operations under all action alternatives, such as log haul on roads and operations of machinery within treatments areas. Dust abatement and signing would be conducted on haul routes to minimize effects to public safety. Dust created during operations would be short-term.

Oregon State University proposed study site units 261 through 264 surround the Long-Term Site Productivity (LTSP) study located on Forest road 9720850. The proposed thinning, mowing and/or underburning adjacent to LTSP would reduce ground and aerial fuels. These treatments maintained through time would improve the chances for continued monitoring of LTSP plots and data collection through life of the study. Units 256, 258, 259, 265, 267, and 268 would provide similar results south of the High Desert Museum and the south entrance into Sunriver. Units 257, 260, and 266 are control plots for the life of the study and would not be treated.

Approximately 49.7 miles of road closure and decommissioning would occur in the project area. Under some situations, the potential to increase response time of ground based suppression resources to fire starts, especially lightning, would occur. Most human caused fires are in close proximity to roads. The potential increase in response time could under certain weather and fuel moisture conditions, lead to larger fires.

Cumulative Effects: Past and proposed fuel treatments to reduce natural fuels, including stand density, would limit potential wildfire size to less than 400 acres per occurrence under average conditions. Treatments maintained through time would improve the likelihood for continued monitoring of Long-Term Site Productivity study plots through the life of the study. Monitoring would indicate when re-entry with fuels treatments would be necessary. Anticipated road density reductions under the Kelsey Access EA would have the potential to increase fire suppression response time and fire size and may reduce human caused fires.

The combination of past and proposed tree density and fuels reduction activities would reduce many acres to low or moderate fire behavior, particularly along the WUI. The risk of large acreage losses from wildfire would be reduced.

Proposed activities adjacent to Long-Term Site Productivity study plots would reduce ground and aerial fuels that contribute to crown fire initiation and spread. Treatments maintained through time would improve the chances for continued monitoring of LTSP plots and data collection through the life of the study.

The placement of centerline median barriers in 2004 on Highway 97 that bisects the planning area, north to south, and other planned Oregon Department of Transportation (ODOT) lane separation projects, could increase the response time of suppression crews. Crews traveling on the opposite side of the barriers would need to go to the end of the barriers and return to an effective access route.

The 18 Fire (2003) burned on approximately 3,520 acres within the planning area. Dead trees were salvaged on approximately 1,960 acres, using Leave-Tops-Attached (LTA). No additional fuels work was needed. The risk of wildfire on these acres has been reduced to low and moderate, through the reduction in both vertical and horizontal fuels by wildfire and salvage.

Approximately 1,105 acres burned with high intensity in the analysis area. The majority of the severely burned area consisted of ponderosa pine with a bitterbrush understory. No surface fuels remain other than occasional patches of duff and litter. Standing material consists of mainly live scorched trees.

Approximately 1,375 acres burned with moderate intensity. Fuel loading will build at a faster rate than the high intensity burn area because there are smaller trees, limbs and brush that were not consumed in the fire. The scorched but unburned material (needle cast) will continue to fall, accumulating and developing enough surface fuel to sustain a ground fire. Fire behavioral potential that had been rated as extreme is now rated low. There is a possibility for the fire hazard rating to increase in the long-term (10 years), due to an increase in the brush component and snags becoming down logs creating ground fuel.

Approximately 1,040 acres burned at low intensity and benefited from the 18 Fire. The burn was a mosaic, similar to an underburn. Other stands burned at low intensity, with little consumption of vertical or horizontal fuels in the same area, leaving the associated fire behavior potential unchanged. Fire damage that occurred may add to the ground fuels and increasing the fire hazard.

The 18 Fire burned approximately 290 acres that were classified as high and extreme for fire behavior potential in the Fuzzy planning area, which is immediately adjacent to the northeast boundary of the planning area. Approximately 4,155 acres that were classified as high and extreme for fire behavior potential have been treated through mowing, burning, and ladder fuels reduction. The fire and fuels treatments have reduced the acreage that remains classified as high and extreme for fire behavior potential in the Fuzzy analysis area to approximately 20,420 acres. The burned acres moved from high and extreme to low and moderate fire behavior potential. In the Fuzzy planning area, the 18 Fire, completed fuels reduction acres, and planned treatments will decrease the acres rated as high and extreme fire behavior potential to approximately 9,500 acres.

A total of 260 acres have been treated adjacent to Woodside Ranch under the Natural Fuels Mowing and Underburning CE (1997). Natural fuels, focusing on reducing continuity of decadent and non-palatable brush species, have been reduced. Under alternative 2 and 3 maintenance and proposed fuel treatments would be extended around residential and private developments. This project would continue to reduce unwanted vegetation, maintain and accelerate tree growth, and reduce the wildfire risk to communities.

Sunriver, an urban interface community of 3,375 acres, presently maintains a six-year cycle of fuels reduction within the urban boundary. The second cycle of fuels reduction has nearly been completed. The Sunriver Homeowners Association and the Sunriver Fire Department, in consultation with state and federal agencies and other interested parties, have collaboratively developed the Sunriver Community Wildfire Protection Plan (CWPP) that was signed in May 2005. Federal lands surrounding Sunriver are at extreme risk from uncharacteristic, high intensity wildfire. Strong winds from the east could threaten the community with the possibility of a crown fire or by burning embers from an adjacent wildfire starting fires within the community.

The Kelsey DEIS proposes to treat 1,250 acres of Wildland Urban Interface (WUI) adjacent to Sunriver and Deschutes River Woods, in addition to 164 acres that was mowed in 1997 to provide protection to the north entrance of Sunriver. The Sunriver Wildfire Protection Plan and the activities proposed in this DEIS would substantially reduce the risk of the spread of wildfire, either into or from Sunriver. The reduction of fuels on private land by residents has lowered the risk of the spread of wildfire in many areas. The Forest Service continues to provide fire safe talks and guidance to private landowners

The Lava Cast Fuels Reduction CE in the Lava Cast planning area adjacent to the Kelsey project was signed in March 2005. The project will treat approximately 2,195 acres, 845 acres identified as WUI. The purpose of the project is to reduce the fuels hazard and the risk of wildland fire within and outside the WUI. Fuels reduction will reduce the amount of surface fuels, interrupt fuel continuity, and reduce the rate of spread of a wildland fire should one start. This would be accomplished through a combination of pre-commercial thinning, mowing, and prescribed fire. The Lava Cast Environmental Assessment is currently in planning and proposes an additional approximate 7,000 acres of fuels treatment across the landscape and is anticipated to have a decision in 2005. This will reduce the risk of spread of wildfire from the Lava Cast or Kelsey planning areas.

The East Tumbull project area is located just west of the Kelsey project area this decision proposes to treat approximately 1,638 acres. This decision would create approximately 13 to 14 mile of defensible space along roads and private lands within the project area. Cumulatively, suppression, evacuation and access for both firefighters and the public would be less hazardous.

The proposed traffic interchanges at Highway 97 and Sunriver junction (Forest road 40) and Highway 97 and Cottonwood Road junction (Forest road 4143)) would reduce the fuels hazard at those locations. The removal of dense pockets of trees and continuous quantities of shrub understory reduces the risk and breaks-up the fuel continuity in those areas.

Prescribed burning would be accomplished during periods of optimal smoke dispersion; cumulative smoke impacts from concurrent Forest Service, other federal agencies and private prescribed burning operations could occur. Private debris burning, agriculture burning and wood stove burning all contribute smoke to the environment. The cumulative effects on air quality from the prescribed burning of landings piles and prescribed burning are negligible. Burning of residues piles would only occur if existing and forecasted conditions are favorable.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: Approximately 7,194 acres would be mowed and approximately 5,186 acres would be treated by prescribed fire to reduce fuel loads and modify vegetation and dead fuel conditions. Within past fuels reduction units, maintenance treatments would occur on approximately 1,890 acres to maintain fuels in Condition Class 1. Proposed thinning and fuels reduction treatments would help fragment continuous ground and aerial fuels to change many acres to low or moderate fire behavior from extreme or high. This would improve safety for firefighters and the public, reduce the risk of wildfire entering private lands, aid in the suppression of fires that start on private lands, and move toward federal ownership.

Fuels reduction treatments in the WUI would occur on an estimated 5,158 acres. The proposed treatments would help fragment continuous ground and aerial fuels across the landscape. Adjacent to the developments of Woodside Ranch, Sunset View and Mountain High, all vegetation (brush) within 200 feet of the forest boundary (133 and 135), would be mowed to a height of approximately six-inches, not less, resulting in a reduction of flame height from 15 to four feet. This reduction in flame height would change fire behavior, reduce fire intensity, and allow suppression forces the opportunity to better control fire adjacent to the urban growth boundary. Units 136 through 141 would also be mowed using a “feathered” approach leaving more vegetation in a mosaic pattern as distance increases from developed areas. This mosaic pattern would retain more of the existing forage for mule deer while still meeting fuels management objectives in some locations.

Units adjacent to High Desert Museum, 130, 132, 146, 153 through 158, 251 and 254, are proposed to provide fire protection for the museum. Units 153 through 155, 157 and 158 are proposed for maintenance using prescribed fire on 199 acres. These units were previously treated by mowing and prescribed fire which initially placed these areas in condition class 1. Treatments would change the distribution and reduce the quantity of understory shrubs and needle cast from overstory trees, retaining these areas in condition class 1 for and estimated 7 to 15 years.

Units 146, 156 and 254 would be thinned, increasing the distance between residual trees and decreasing crown bulk density. This would reduce the risk and spread of a potential crown fire and increase the opportunity for wildfire control. Units 146 and 254 would be mowed; 146 and 156 would be underburned. Mowing and burning would reduce the quantity and distribution of shrub and needle cast, reducing ladder fuels and the risk of crown fire. Unit 254 would be mowed in a mosaic pattern to reduce visual and smoke impacts adjacent to the museum. This would leave approximately 20 to 30 percent of the unit untreated providing a greater risk for a crown fire compared to prescribed fire.

Units 111and 112 adjacent to Deschutes River Woods would be thinned and underburned. Thinning would reduce the risk and spread of a potential crown fire by increasing the distance between residual trees and reducing crown bulk density. Unit 116 would be treated by mowing. Alternative 2 does not include the treatment units 221 and 222 that are adjacent to Deschutes River Woods. Defensible space would not be provided in these areas to give suppression forces a better chance of stopping an intense wildfire from entering private lands.

The western portion of the project area between Highway 97 and the Deschutes River and between Forest road 9702 and County Road 40 (main road to Sunriver), is identified as Key Elk habitat. This area is located within the Sunriver WUI boundary. Units 69 through 71, 80 and 81 are strategically placed to reduce the risk of wildland fire adjacent to Sunriver. Areas of untreated fuels were not addressed in order to meet wildlife objectives away from the WUI boundary. By leaving untreated fuels there’s a greater risk for a crown fire, loss of Elk habitat, control problems within the WUI, especially during unstable wind events.

Fuel accumulations around Lava Lands Visitors Center and Lava River Cave exceed natural levels and; therefore, poses a high risk to public and firefighter safety. To meet the goals of the NNVM plan, 366 acres of existing dense stands adjacent to the visitor’s center and Lava River Cave, units 88, 89, 94, 96 through 100, and 102, would be treated by thinning, mowing and underburning. The proposed treatments would reduce the risk of mountain pine beetle outbreak, maintain and accelerate development of ponderosa pine old growth, decrease crown bulk density and increasing the chance of control of a wildland fire.

Units 9 and 10 would be treated using only prescribed fire in NNVM. Units 25, 82, 90 and 104 would be treated by mowing and prescribed fire. Under current stand conditions, mowing prior to underburning would reduce the quantity and distribution of understory shrub vegetation and needle cast. This would reduce ladder fuels, scorch heights, smoke emissions, and create conditions that would more safely allow for the reintroduction of fire. Initially mowing, where applicable, would move those stands towards the goal of fuels conditions that allow stands to be maintained and perpetuated solely with prescribed fire as identified in the *NNVM Management Plan Standard and Guidelines M-15*.

Alternative 3

Direct and Indirect Effects: Proposed activities would be similar to Alternative 2 (Proposed Action). Total number of acres proposed for fuels treatment would increase from approximately 9,330 acres to approximately 10,505 acres (approximately 11 percent) from Alternative 2.

Approximately 7,648 acres would be mowed and approximately 6,913 acres would be treated by prescribed fire to reduce fuel loads and modify vegetation and dead fuel conditions. Vertical and horizontal fuels that can facilitate the development of a relatively benign ground fire into a more high intensity and potential stand replacement crown fire would be reduced. Prescribed fire would be used across approximately 1,820 more acres than Alternative 2. Alternative 3 would treat approximately 185 fewer acres using MST than Alternative 2. Within past fuels reduction units, maintenance treatments would occur on 2,154 acres to maintain fuels in Condition Class 1. Implementation of Alternative 3 would increase the total acres of fuels treatment in the WUI from approximately 5,158 acres (Alternative 2) to approximately 5,595 acres.

Alternative 3 allows for the greatest possible fuels reduction within the WUI. The proposed treatments would help fragment more continuous ground and aerial fuels across the landscape than Alternative 2. Similar to alternative 2, all vegetation (brush) within 200 feet of the forest boundary in units 133 and 135 would be mowed. These units could be underburned if mowing does not meet the fuel objectives. This reduction in flame heights changes fire behavior, reduces fire intensity and provide suppression forces the opportunity to better control fire in this area.

Units 136 through 141 would be a combination of mowing and underburning. The absence of fire over the last 90 years combined with the development of shrubs and dense thickets of regeneration in the understory have placed ponderosa pine stands at high risk of stand replacing wildfire. Although, some of the timber stands in the WUI have been thinned in the past, the shrub layers within these stands remain capable of producing extreme fire behavior.

Treatments units adjacent to High Desert Museum, 153, 251 through 255, and 430 are proposed to provide fire protection for the museum. Units 132, 153 and units 251 through 255 are proposed for maintenance using prescribed fire on 327 acres. The treatments would reduce the distribution and quantity of understory shrubs and needle cast from overstory. These units were previously treated by mowing and prescribed fire which initially placed these areas in condition class 1. The new treatments using prescribed fire would retain these areas in condition class 1 for an estimated 7 to 15 years. Units 254 and 446 would be treated using thinning MST, and underburning. Unit 253 would be treated using thinning and underburning. In addition to reducing the quantity and distribution of understory shrub vegetation and needle cast, this would also further reduce ladder fuels and the risk of a potential for crown fire. Unlike Alternative 2, Unit 254 also treats understory fuels using underburning. Using prescribed fire would likely cause short-term visual and smoke impacts to the Museum. All prescribed fire operations would meet the direction of the Oregon Smoke Management Plan.

Treatment units 411 and 412, near the southern urban growth boundary (Deschutes River Woods, units 111 and 112 in Alternative 2), would be treated by thinning and underburning. Alternative 3 includes new units 221 and 222, located between the southern urban growth boundary and unit 411. These units would provide additional treatments adjacent to and near private land. Unit 221 would be treated using non-commercial thinning and MST within 200 feet of the forest boundary. All brush would be mowed to a height of not less than six-inches. Units 116 and 222 would be mowed only.

Units 69 through 71, 80 and 81 are strategically placed to reduce the risk of wildland fire adjacent to Sunriver. Areas of untreated fuels were not addressed in order to meet wildlife objectives away from the WUI boundary. By leaving untreated fuels there's a greater risk for a crown fire, loss of Elk habitat, control problems within the WUI, especially during unstable wind events. This KEA is located within the Sunriver WUI boundary. Units 83, 207 and 223 are strategically placed to reduce the risk of wildland fire adjacent to Sunriver. Areas of untreated fuels were not addressed in order to meet wildlife objectives away from the WUI boundary. By leaving untreated fuels there's a greater risk for a crown fire, loss of Elk habitat, control problems within the WUI, especially during unstable wind events. Unit 223 was previously treated by mowing and would be proposed for a maintenance treatment.

Fuel accumulations around Lava Lands Visitors Center and Lava River Cave exceed natural levels and; therefore, poses a high risk to public and firefighter safety. To meet the goals of the NNVM plan, 359 acres of existing dense stands adjacent to the visitor's center and Lava River Cave, units 87, 88, 89, 96 through 100, 102, and 278 would be treated by thinning, mowing and underburning. The proposed treatments would reduce the risk of mountain pine beetle outbreak, maintain and accelerate development of ponderosa pine old growth, decrease crown bulk density and increasing the chance of control of a wildland fire.

Units 9 and 275 (62 total acres) would be treated using only prescribed fire in NNVM. Units 82, 90, 234, 237, 238, 325, and 404 (381 total acres) would be treated by mowing and prescribed fire**.** Under current stand conditions, mowing prior to underburning would reduce the quantity and distribution of understory shrub vegetation and needle cast. This would reduce ladder fuels, scorch heights, smoke emissions, and create conditions that would more safely allow for the reintroduction of fire. Initially mowing, where applicable, would move those stands towards the goal of fuels conditions that allow stands to be maintained and perpetuated solely with prescribed fire as identified in the *NNVM Management Plan Standard and Guidelines M-15*. In the areas where restoration of historic fire regimes is planned, prescribed fire would be returned every 8 to 15 years or as needed.

FOREST VEGETATION – TREES

Key Issue #2: Stand Density

Issue Statement: Within the General Forest Management Area, thinning to a wide spacing (DEIS, Appendix D, Prescription 2) is proposed. A General Forest management objective is to have all stands utilizing site growth potential. Thinning to a tighter spacing may more fully utilize site growth potential, while meeting the purpose and need to provide timber and reduce the likelihood of large fire spread. More acres of reduced stand density would be more resistant to insect infestation.

Unit of Measure: Acres proposed for thinning to a wide spacing of 30 to 35 feet.

Key Issue #3: Reforestation Costs

Issue Statement: On approximately 330 acres, harvest methods necessitating reforestation treatments are proposed to either: 1) promote deer hiding cover; 2) reduce level of dwarf mistletoe infection; or 3) increase ponderosa pine stocking. Proposed reforestation treatments would cost approximately $500 per acre ($830 per acre with administrative costs). Different harvest methods may meet the stated need without while incurring reforestation costs. Varying reforestation treatments may reduce reforestation costs.

Unit of Measure: Total acres proposed for reforestation.

Unit of Measure: Estimated reforestation costs per acre and total costs.

Key Issue #4: Protection of Forest Investments

Issue Statement: Previously pruned areas are in need of thinning so that growth and commodity value are not lost. To meet the goals and objectives within the General Forest Management Area identified within the analysis area there is a need to have a more intense management. Thinning these areas is needed to optimize growth and commodity value for timber production (Forest Management Goals, Forest Plan 4-2).

Unit of Measure: Total acres proposed thinning previously pruned stands.

SPECIES DIVERSITY

Existing Condition

The dominant plant association group within the planning area is ponderosa pine (dry and wet). Plant association groups (PAGs) (Table 29) combine plant associations (Volland, 1985) by their climax species, site potential, and temperature and moisture similarities. Ponderosa pine (*Pinus ponderosae*) is the dominant conifer species within the Kelsey planning area. Other conifers include lodgepole pine (*Pinus contorta*) and white fir (*Abies concolor*). The three species occur together within the mixed conifer PAG. Ponderosa and lodgepole pine can occur together in other PAGs, but most frequently within the ponderosa/lodgepole pine grouping.

Table 29: Plant Association Groups And Non-Vegetation Types – Kelsey Planning Area			
Vegetation/Non-Forest Classification	**Acres**	**Percent of Planning Area**	**Percent of Forest Area**
LRMP Association Groups (PAGs)			
Ponderosa pine (Dry and wet)	32,185	70%	91%
Ponderosa/lodgepole pine[2]	1,039	2%	3%
Lodgepole pine (Dry)	423	1%	1%
Mixed Conifer (Dry)	1,905	4%	5%
Subtotal of Forested Area	**35,552**	**77%**	**100%**
Non-Forest Groups			
Cinder/Lava/Rocks	10,288	22%	---
Riparian	294	1%	---
Water	33	<1%	---
Subtotal of Non-Forest	**10,615**	**23%**	**---**
Planning Area Total[3]	**46,167**	**100%**	**---**

Alternative 1 (No Action)

Direct and Indirect Effects: No changes to existing species composition would occur. White fir and lodgepole pine would continue to be more common than would have occurred with historic disturbance regimes. Continued exclusion of fire would favor an increase of these species.

Cumulative Effects: Tree removal associated with future road access projects would create forest gaps, but would not affect the diversity of tree species present within the planning area. Future road access projects include the widening of Highway 97, construction of new Sunriver and Cottonwood interchanges, and construction of new access routes to Lava River Cave, Lava Lands Visitor Center, and Benham Falls Picnic Area from Cottonwood Interchange.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Cutting treatments would favor retaining ponderosa pine over lodgepole pine and white fir. White fir and lodgepole pine stocking would be reduced, although these species would remain in some units following thinning. In units proposed for underburning following thinning, no more than 15 percent of the residual basal area would remain in lodgepole pine. Residual stocking of white fir could be as high as 60 percent in some units. Mortality of lodgepole pine and white fir would be expected following proposed underburns. Cutting and underburning, separately or in combination, would generally increase ponderosa pine dominance and decrease the amount of lodgepole pine and white fir. Favoring ponderosa pine would be similar to what would have occurred under historic disturbance regimes. Favorable conditions for the germination of ponderosa pine, lodgepole pine and white fir seeds would be provided by reduced canopy cover and exposed mineral soil. Treatment units would likely regenerate where lodgepole pine and white fir are present to serve as a seed source. Lodgepole pine would be most successful in regenerating openings. White fir would be most successful regenerating areas with heavier canopy cover. Potential for these seedlings to establish and mature would depend on frequency of future underburns.

Cumulative Effects: Similar to the No Action Alternative, there would be no cumulative effects on tree species diversity within the planning area.

[2] A subset of the lodgepole pine PAG. Identified where 1953 timber type data indicate the presence of ponderosa pine.
[3] Includes other ownership within the outer boundary of the Kelsey Planning Area.

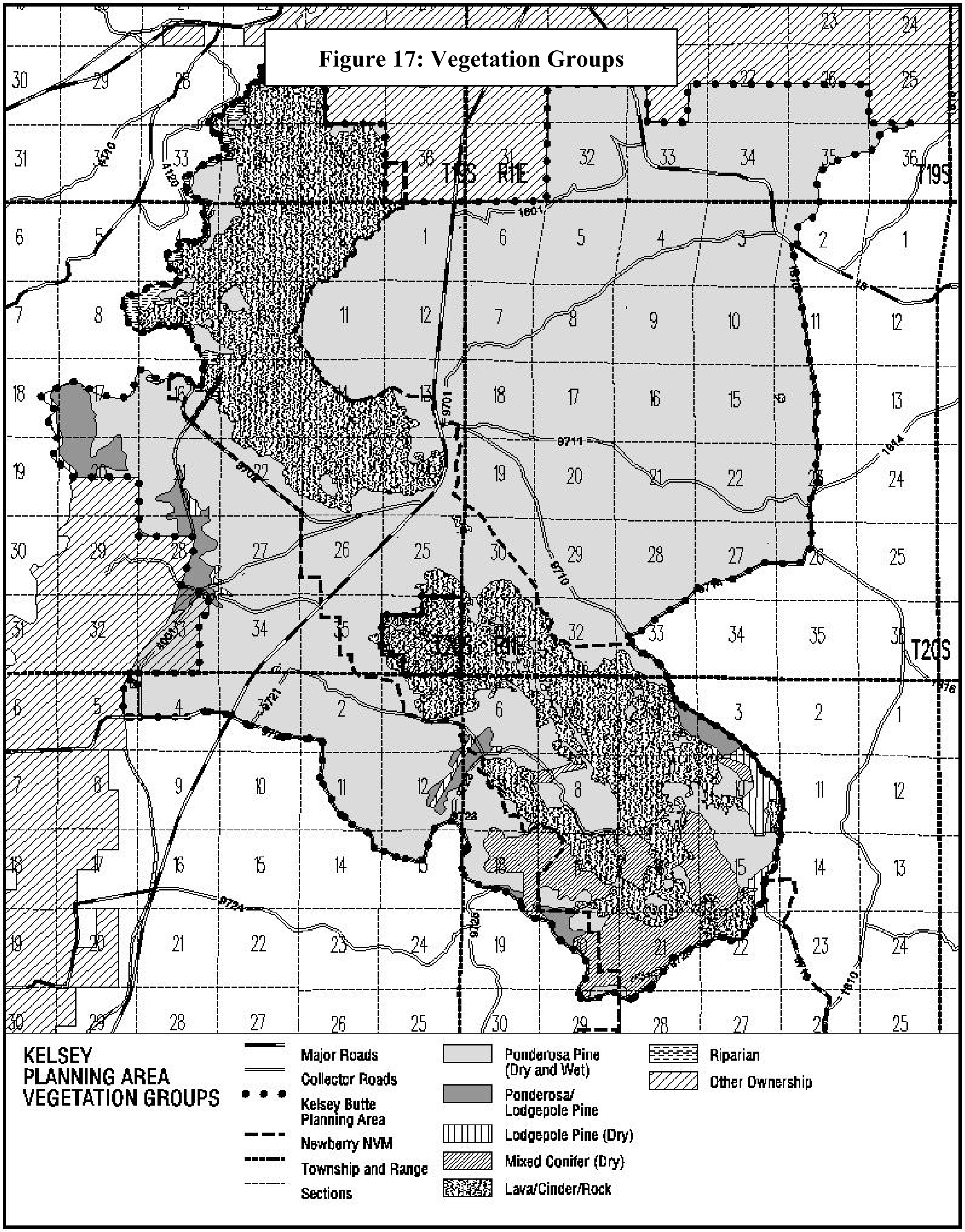

Figure 17: Vegetation Groups

Plot date: 28-JAN-2003
/go/project/band_ftrock/kelsey1_2/amldir/pag611.aml

TREE DENSITY AND STRUCTURAL STAGE

Existing condition

Forest vegetation was classified using structural stages (Table 30) described in Appendix B of the 1995 revised continuation of interim management direction establishing riparian, ecosystem and wildlife standards for timber sales. The proportion of these structural stages historically present (historic range of variability - **HRV**) was estimated for the time period between 1850 and 1910. HRV is a reference for understanding forest succession and disturbance regimes. For a detailed description of classification methods, historic disturbance regimes, and determination of HRV, incorporate by reference Attachment 2 of the Kelsey Silviculture Report, Project Record, Appendix D, Forest Vegetation.

Table 30: Structural Stage Before And After Proposed Treatment Compared To Historic Range Of Variability (HRV)

Structural Stage*	Historic Range of Variability (HRV)	Alternative 1 (No Action)		Alternative 2 (Proposed Action)		Alternative 3	
		Percent Forested Area (Present)	Relation to HRV	Percent Forested Area (Present)	Relation to HRV	Percent Forested Area (Present)	Relation to HRV
Stand Initiation	0 – 15%	15%	Within	15%	Within	15%	Within
Stem Exclusion, Closed Canopy	0 – 20%	17%	Within	14%	Within	14%	Within
Understory Reinitiation	10 – 30%	55%	Above (+25%)	59%	Above (+29%)	59%	Above (+29%)
Multi-story without Large Trees	0 – 30%	12%	Within	11%	Within	11%	Within
Multi-story with Large Trees	10 – 35%	1%	Below (-9%)	1%	Below (-9%)	1%	Below (-9%)
Single-story with Large Trees	20 – 55%	<1%	Below (-20%)	<1%	Below (-20%)	<1%	Below (-20%)

***Stand Initiation:** Growing space reoccupied following a stand replacing disturbance. One cohort of seedlings or saplings. **Stem exclusion, closed canopy**: Occurrence of new tree stems is excluded. Closed canopy (crown closure ≥35%). One cohort. Pole, small, or medium diameter trees (<21" dbh). **Understory re-initiation:** A second cohort of trees is established under an older overstory. Overstory of pole, small, medium diameter trees. Large trees (≥21" dbh) are uncommon. Understory of seedlings, saplings, or poles. **Multi-story without Large Trees**: Several cohorts of trees are established. Diverse distribution of tree sizes. Large trees (≥21" dbh) are uncommon. **Multi-story with Large Trees (LOS)**: Several to many cohorts of trees. Large trees (≥21" dbh) are common. **Multi-story without Large Trees (LOS)**: One or more cohorts of trees. One dominant canopy stratum. Large trees (≥21" dbh) are common.

The majority (55 percent) of the forested portion of the planning area is within the understory reinitiation structural stage (Table 30), which is above HRV. Stands in this structural stage have a young cohort of trees establishing under an older cohort of trees (a cohort is a class of trees arising after a common natural or artificial disturbance). Within the Kelsey planning area, ponderosa pine stands with this classification were primarily established following historic logging in the early 1920s and 1930s. These stands generally appear to be single story. Trees average 75 years in total age. They have an average diameter of 12 inches (4.5 feet above ground) and an average height of 60 feet. Some remnant older ponderosa pine trees can be present and average 160 years in total age, 24 inches dbh, and 85 feet tall. Tree density is low enough to allow for the establishment and growth of forbs, grasses, shrubs, and conifer seedlings in the understory.

Single- and multi-story late and old structure (**LOS**) is currently below HRV (Table 30). Late and old structure ponderosa pine stands typically have 18 to 40 trees per acre (USDA Forest Service, 1993). Within the planning area, ponderosa pine stands were classified as late or old structure if there were greater than or equal to 13 trees per acre and 21 inches in diameter.

Alternative 1 (No Action)

Direct and Indirect Effects: No treatments to change existing vegetation conditions or trends would occur. Natural disturbances could change the existing proportion of structural stages. High intensity wildfires have the greatest potential to create rapid, large-scale change. In the event of a high intensity wildfire, more of the stand initiation structural stage would be created. The amount of stand initiation structural stage would likely be increased above HRV.

Approximately 12,460 acres of ponderosa pine stands have potential to develop into a late or old structural stage (Table 31). Approximately 12,460 acres of ponderosa pine have potential to develop into a late or old structural stage (Table 3). This acreage is within, but at the lower end, of the Historic Range of Variability. These stands are currently at low risk to bark beetle attack and are in one of the following structural stages: stem exclusion closed canopy, understory reinitiation, or multi-story without large trees. In the absence of natural disturbances (fire, bark beetles), it will take a projected 50 to 60 years for these stands to meet the diameter requirement for late or old structure. Within approximately 20 years, stand densities will have increased sufficiently to put the stands a risk to bark beetle. Depending on the timing and extent of beetle induced mortality, it could take an average of 60 years to develop late or old structure.

Table 31: Ponderosa Pine Potential Development (Acres) Into LOS Compared to HRV LOS			
Alternative 1 (No Action)	**Alternative 2 (Proposed Action)**	**Alternative 3**	**Late or Old Structural Stage (Historic Range of Variability)**
12,460 acres	15,600 acres	16,160 acres	10,800 – 32,400 acres

Cumulative Effects: The recent 18 fire and past harvest, non-commercial thinning, and reforestation treatments were considered in the classification of structural stage and stand densities. Tree removal associated with future road access projects would increase the non-forest area within the Kelsey Planning Area, but would not affect the proportion of structural stages present. Future road access projects include the widening of Highway 97, construction of new Sunriver and Cottonwood interchanges, and construction of new access routes to Lava River Cave, Lava Lands Visitor Center, and Benham Falls Picnic Area from Cottonwood interchange. These actions would affect less than one (1) percent of the forested portion (35,879 acres) of the Kelsey planning area.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Trees would be cut on approximately 5,256 acres with Alternative 2 (Proposed action and on approximately 5,918 acres with Alternative 3 (Table 32). Stand density would be reduced to varying levels, with the lowest retention of trees associated with regeneration cutting methods and the highest retention of trees associated with the thinning in proposed plantations.

Table 32: Treatments Grouped By Cutting Intensity				
Treatments[1]	Alternative 2		Alternative 3	
	Acres	Percent of Total	Acres	Percent of Total
Regeneration Cutting – Even Aged Method				
Clearcut (8): Deer habitat	112 (gross) 39 (net)	0.7	225 (gross) 79 (net)	1.3
Clearcut with Seed Trees Reserved (10): Lodgepole	14	0.3	14	0.2
Regeneration Cutting – Uneven Aged Method				
Group Selection (93) – OSU study	165	3.1	165	2.8
Single Tree Selection				
Mistletoe Reduction (6)	329	6.3	102	1.7
Ponderosa pine restoration (7)	60	1.1	0	0
Research (92)	174	3.3	174	2.9
Intermediate Cutting Methods				
Thin from below to wide spacing (2)	2,743	52.2	1,478	25.0
Thin from below to wide spacing (91) Research	236	4.5	236	4.0
Thin from below to moderate spacing (1)	413	7.9	2,094	35.4
Thin from below to variable spacing for:				
Mistletoe Reduction (4)	157	3.0	261	4.4
Goshawk Habitat (11)	172	3.3	172	2.9
Scenic Views (12)	20	0.4	24	0.4
Added value to Pruned Trees Value (13)	0	0	352	6.0
Sanitation Harvest (14)	49	0.9	49	0.8
Plantation Thinning (0)	683	13.0	718	12.1
Total (Gross)	**5,329**	**---**	**6,063**	**---**
Total (Net)	**5,256**	**100**	**5,918**	**99.9**

[1]Refer to DEIS, Appendix D for treatment descriptions. Numbers in ( ) reference prescriptions in appendix.

Given the scarcity of trees greater than 21 inches dbh, few trees, if any, would remain within openings created by the clearcutting proposed in deer habitat to develop new cover stands (Prescription 8) and the uneven-aged group selection method proposed to study cutting methods in even-aged, second growth ponderosa pine stands (Prescription 93).

Regeneration cutting methods to regenerate lodgepole pine (Prescription 10), eliminate dwarf mistletoe (Prescription 6), and restore ponderosa pine dominance (Prescription 7) would result in variable, and in some areas substantial, reductions in tree density. With the proposed seed tree method, as few as 27 trees per acre would remain to provide for natural regeneration of a new age class of lodgepole pine. With single tree selection methods designed to remove dwarf mistletoe or restore ponderosa pine dominance, residual tree density would vary depending on existing stand conditions. Where mistletoe is heavy or lodgepole pine dominates, small group openings would be created. This would occur over an estimated 40 percent of the treatment area. Where no mistletoe infection is present or where ponderosa pine dominates, residual stand densities would be higher, with approximately 60 square feet of basal area being retained.

Within openings created by the regeneration cutting methods, stand density would increase within 5 years of cutting as a new age class of trees is created either by planting (Prescriptions 6, 7, and 8) or natural regeneration (Prescriptions 10, 92, and 93).

Intermediate cutting methods (Table 32) would retain variable stand densities. Table 33 displays projected stand density that would remain with the thinning to a wide spacing (Prescriptions 2 and 91) and a more moderate spacing (Prescription 1). These stand conditions represent the majority of the intermediate cutting methods proposed.

Table 33: Projected Stand Conditions Following Intermediate Harvest Methods[4]				
	Wide Spacing (Prescriptions 2 and 91)		Moderate Spacing (Prescription 1)	
	Average	Range of Averages	Average	Range of Averages
Measures of Stand Density				
Trees per Acre[5]	40	30 - 50	60	40 - 90
Spacing between Trees (Feet)	35	30 - 40	25	20 - 35
Basal Area (Square Feet/Acre)	45	30 - 70	60	40 - 70
Stand Density Index[6]	70	50 - 105	100	70 - 120
Canopy Cover[7] (Percent)	15%	10 – 20%	20%	15 – 30%
Crown Bulk Density (kg m^{-3})[8]	.038	.016 - .068	.033	.017 - .108
Other Stand Attributes				
Quadratic Mean Diameter	15”	10 – 20”	13”	9 – 18”
Live Crown Ratio (Percent)	50%	40 – 60%	50%	40 – 60%

Alternative 2 proposes to thin to wide spacing (Prescription 2) on approximately 85 percent more acres than Alternative 3 (Table 32, page 3-31). It proposes wider thinning in the following allocations: General Forest, Deer Habitat, and Scenic Views. Alternative 3 would do less wide thinning within the scenic views along Highway 97 north of Lava Butte. Both alternatives are similar in the amount of wide thinning that would be done within the Monument. Alternative 3 proposes to thin to moderate spacing (Prescription 1) on approximately five times the acres proposed in Alternative 2 (Table 31, page 3-31). Refer to Project Record, Appendix D, Forest Vegetation Report for the complete comparison of wide (Prescription 2) and moderate thinning (Prescription 1) by management allocation.

With thinning to wide spacing (Prescription 2 and 91), reduced stand density would increase individual tree diameter growth, shortening the time needed for trees to achieve diameters common in the late or old structural stage (greater than or equal to 21 inches dbh). Within approximately 40 years, sufficient number of large trees would likely be present to meet ponderosa pine old growth definitions (USDA Forest Service 1993). Approximately 10 percent less cubic foot volume would be produced over the next 40 years when compared to stands grown at optimal spacing for site growth utilization and minimal bark beetle risk. Within approximately 50 years, if no additional thinning is done, stand densities will have increased sufficiently to put stands at risk to bark beetle.

With thinning to moderate spacing (Prescription 1), individual tree growth would be less than with the wide thinning, but would be increased over existing rates. Within approximately 50 years, sufficient number of trees would likely be present to meet ponderosa pine old growth definitions. Stands thinned to the moderate spacing would produce approximately the same amount of cubic foot volume (99%) when compared to stands grown at optimal spacing for site growth utilization and minimal bark beetle risk. Within approximately 30 years, if no additional thinning is done, stand densities will have increased sufficiently to put the stands at risk to bark beetle.

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[4] Refer to DEIS, Appendix D, for treatment description.
[5] **Point of Reference: 18-40 trees per acre** greater than or equal to 21” dbh present in ponderosa pine old growth (USDA Forest Service, 1993).
[6] **Point of Reference:** Stands at risk to bark beetle attack when **Stand density index** is greater than or equal to 160.
[7] **Canopy cover:** Estimated using average trees per acre, quadratic mean diameter, and a report accessing canopy cover in even-aged stands of ponderosa pine (Deschutes National Forest, 1991).
[8] **Crown bulk density**: Estimated using average trees per acre, diameter, height (70 feet) and live crown ratio to assess crown fire (Carlton, 1999).

Reduced stand density would increase individual tree diameter growth and decrease the time needed to achieve diameters common in late or old structure (greater than or equal to 21 inches DBH). Approximately 10 percent less volume would be produced during the next 40 years than stands growing at optimal spacing. Bark beetle risk would remain low for approximately 50 years. Sufficient trees would remain to preclude the need for reforesting the site following harvest. Alternatives 2 (Proposed Action) and 3 are similar in the amount of wide thinning that would be done within the Monument.

Alternative 2 proposes more acres (approximately 53 percent) of wide thinning than Alternative 3 (approximately 24 percent) (Table 32, page 3-31 and Table 33). Alternative 3 would best meet the goal of utilizing site growth potential within General Forest by thinning both more total acres and thinning a lower percent to wide spacing. Within NNVM and the Wild and Scenic River Corridor, over 90 percent of proposed thinning would be wide spacing (Refer to Project Record, Appendix D, Forest Vegetation Report for a comparison of the amount of wide thinning proposed by management allocation). Projections indicate stands of trees thinned to the higher densities would produce approximately the same amount (99 percent) of cubic foot volume as stands growing at optimal spacing that utilize site growth potential and minimize bark beetle risk. Thinned stands that retain higher densities would remain at low risk to bark beetle for approximately 20 years, approximately 30 years sooner than wide spaced thinning.

Thinning to moderate to variable spacing (Table 33) approximately 20 to 35 feet (40 to 90 trees per acre), would result in light to moderate reductions in tree density. Individual tree growth would be less than with the wide thinning and would be increased over existing rates. Sufficient numbers of large trees would meet ponderosa pine LOS within approximately 50 years, approximately 10 years longer than thinning to a wide spacing. Stands thinned at this spacing would become at risk to bark beetle attack approximately 20 years before size requirements are met for LOS.

Table 31, page 3-30, displays changes in structural stage conditions associated with proposed cutting. Regeneration cutting methods would increase the amount of stand initiation structural stage. These cutting methods are proposed primarily in stands classified as understory reinitiation. Alternative 2 would create approximately 80 and Alternative 3 approximately 120 additional acres of the stand initiation structural stage and the acreage would remain within the HRV (Table 30, page 3-29).

Both alternatives propose treatments in units containing late or old structure (Table 34). Treatments include timber harvest and natural fuels treatment. Within the Monument (NNVM), both Alternatives 2 and 3 propose commercial harvest in two (2) stands classified as multi-story with large trees. Stand densities and fuel loadings are currently high. Unit 87 (both alternatives) is within/adjacent to Benham Falls Day Use/Picnic Area. Thinning would primarily remove lodgepole pine from around large diameter ponderosa pine and smaller ponderosa pine to reduce the risk of losing large diameter trees to bark beetles and wildfire. Unit 66 (Alternative 2) / Unit 366 (Alternative 3) is located in the vicinity of Lava Cast Forest. Thinning would decrease stand density and increase dominance of ponderosa pine. These treatments, as well as the natural fuels treatments, would not change the existing late or old structural stage.

Table 34: Units Proposed For Treatment That Contain Late Or Old Stand Structure (LOS)

Unit	Unit Acres	Allocation[1]	Alternative	LOS Acres	Thinning	Natural Fuels
66	26	NNVM	2	8	Wide	MST/Underburn
366	26	NNVM	3	8	Wide	None
87	11	NNVM	2, 3	11	Selective	Underburn
136	213	DHB	2, 3	20	None	MST

[1] Newberry National Volcanic Monument (NNVM), Deer Habitat (DHB), and Wild and Scenic (WS1).

Reductions in stand density associated with Alternatives 2 and 3 would increase the acreage of ponderosa pine with potential to develop into late or old structure (Table 31, page 30). With Alternative 2 there would be approximately a 25 percent increase over the existing condition. With Alternative 3, there would be an approximate 30 percent increase. Similar to the no action alternative, with no additional thinning in these stands, it would take a projected 50 to 60 years to meet the diameter requirement for late or old structure. With one (1) future thinning (to maintain diameter growth rates and a low risk to bark beetle attack), LOS could be attained in approximately 35 to 45 years. The proportion of the landscape developing into LOS would be within the midrange of HRV.

***Cumulative Effects*:** As with the No Action Alternative, future road construction activities would increase the amount of non-forest area within the Kelsey Planning Area, but would not affect the proportion of structural stages present. These actions would affect less than 1 percent of the forested portion of the Kelsey Planning Area.

To reduce the risk of uncontrollable wildfire spreading from the new Weigh and Safety Station, trees within approximately 100 feet of the parking and inspection areas were thinned to 12 to 15 foot spacing at the time of weigh station construction. Thinning was intended to provide a clear space between crowns. Immediately adjacent to the location of the new Weigh and Safety Station, additional thinning is proposed with Alternative 2 (Unit 130) and 3 (Unit 430). Additional thinning would further increase the spacing between tree crowns. Residual trees would be more widely spaced with Alternative 2 (Prescription 2 – approximately 30 to 40 foot spacing) than with Alternative 3 (Prescription 1 – approximately 20 to 35 foot spacing).

INSECTS

Bark Beetles

Existing Condition

Bark beetles most commonly causing tree mortality within the planning area are: mountain pine beetle (*Dendroctonus ponderosae* Hopkins), pine engraver beetle (*Ips pini*), western pine beetle (*Dendroctonus brevicomis*), red turpentine beetle (*Dendroctonus valens*), and the fir engraver beetle (*Scolytus ventralis* LeConte). Insect and disease surveys from 1992 to 2001 detected primarily scattered patches of mountain pine beetle mortality. The greatest concentration was occurring in the southern portion of the planning area, approximately one-half of this in NNVM. The last large-scale mortality occurred in 1989, also in the southern portion of the planning area. Mortality from the fir engraver beetle and the western pine beetle was also detected.

A stand is considered imminently susceptible to insect attack when tree stocking exceeds certain levels and is likely to experience significant change in structure or character as a result of insect attack in the near future (USDA Forest Service, 1996). In the planning area, ponderosa pine stands with a stand density index greater than 120 to 160 TPA (the equivalent of greater than 120 to 160 or greater trees per acre, trees spaced 16 to 20 feet apart, and 10 inches dbh at 4.5 feet above ground level) are considered imminently susceptible to bark beetle. Refer to page 10 of the Silviculture Report in the Project Record for the methods used to determine imminent susceptibility to bark beetle risk.

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no change to the existing beetle risk within the Kelsey Planning Area. Approximately 37 percent of the planning area would remain imminently susceptible to bark beetle attack (Table 35). Approximately 10,288 acres, 22 percent of the planning area, is lava, rock, or cinder. Much of this is within NNVM. Excluding the areas of lava and cinder, approximately 48 percent of the planning area would remain imminently susceptible to bark beetle attack.

Table 35: Acres Imminently Susceptible To Bark Beetle By Management Allocation (Post-Treatment)

Management Allocation	Allocation Acres	Acres And Percent (%) Imminently Susceptible To Bark Beetle		
		Alternative 1	Alternative 2	Alternative 3
General Forest (GFO) (% Allocation)	5,206	3,392 (65%)	2,489 (48%)	2,041 (39%)
Deer Habitat (DHB) (% Allocation)	13,582	4,490 (33%)	4,054 (30%)	4,000 (29%)
Scenic Views (SV) (% Allocation)	8,467	4,401 (52%)	2,785 (33%)	2,698 (32%)
Old Growth (OGR) (% of Allocation)	254	203 (80%)	203 (80%)	203 (80%)
Newberry National Volcanic Monument (NNVM) (Percent Forested Portion of Allocation)	17,611	4,264 (24%)	3,800 (22%)	3,794 (22%)
Percent Forested Area (7,852 acres)		54%	48%	48%
Deschutes River, Wild and Scenic (% Allocation)	474	366 (77%)	366 (77%)	317 (67%)
Other Ownership (% Allocation)	573	19 (3%)	19 (3%)	19 (3%)
Percent Forested Portion (60 acres)		32%	32%	32%
Planning Area Total	46,167	17,135	13,716	13,072
Percent Planning Area (46,167 acres)		37%	30%	28%
Percent Forested Area (35,879 acres)		48%	38%	36%

Endemic populations of bark beetles would continue to cause tree mortality throughout the planning area. Mountain pine beetle would continue to attack and kill larger diameter trees (greater than 8 inches dbh). Both ponderosa and lodgepole pine would be affected, with lodgepole pine greater than 9 inches dbh generally being attacked first. Western pine beetle and red turpentine beetle could also kill large diameter pines that are slow growing, lightning struck, or heavily infected with mistletoe. The fir engraver beetle would continue to attack and kill white fir. Mortality patterns would vary from isolated trees to clumps of both large and small diameter trees. Potential for beetle activity would be highest in those stands that are imminently susceptible to beetle attack. Scattered, incidental mortality from beetles would also occur in stands that are not imminently susceptible primarily due to stress induced by lightning strikes or high levels of mistletoe infection. Mortality from beetles would most likely occur in periods of both normal and below normal precipitation, with accelerated tree mortality rates possible during periods of low precipitation.

Potential for epidemic levels of mountain pine beetles to become established would be highest in the areas classified as imminently susceptible to beetle attack. If epidemic levels of mountain pine beetles become established in these stands, up to 67 percent of the current basal area, mostly in the largest trees, could have expected mortality (Barrett, 1979).

Cumulative Effects: Fire and past management activities were considered in the classification of beetle risk. Reasonably foreseeable future actions within the project area would have no cumulative effect on beetle risk or potential for pandora moth defoliation within the planning area.

Within the 18 Fire, where fire intensity was moderate or high, few live trees remain. In these areas of moderate to high intensity, beetle risk was classified as low. Where fire intensity was low, there was little change to the pre-fire stand condition. In these areas, no change was made to the original beetle classification. The majority of the fire burned at moderate to high intensity. Within much of this area, there is low risk that bark beetles would substantially change stand structure or character. There is high potential that bark beetles would find suitable habitat in trees killed and injured by the fire that would serve as breeding areas. In approximately two (2) years, beetles could fly into the adjoining forest and attack trees within approximately one (1) mile of the fire perimeter. The greatest risk for tree mortality would be within areas classified as imminently susceptible to beetle attack.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Cutting treatments would reduce stand density on approximately 5,327 acres with Alternative 2 and on approximately 6,060 acres with Alternative 3. Reductions in stand density would make more water, nutrients, and sunlight available to fewer trees. Table 35 displays beetle risk that would remain following proposed treatments. With Alternative 2, approximately 38 percent of the forested portion of the Kelsey planning area would remain imminently susceptible to bark beetle attack. Greatest reduction in beetle risk would occur with Alternative 3. Approximately 36 percent of the forested area would remain at risk. Depending on thinning intensity, thinned stands would remain at low risk to bark beetle attack for 20 to 50 years.

Use of prescribed fire, separately or in combination with mechanical shrub treatment, has the potential to affect susceptibility to bark beetles. Fire can kill foliage and buds in the crown, heat the trunk to such an extent to where part or all of the cambium is killed, and heat and kill the roots (Agee 1993). Trees damaged by fire, would be most susceptible to insect attack. As a general rule, if ponderosa pine trees retain at least 50 percent of the live crown that was present prior to the burn, mortality resulting from beetle attacks should be minimal. If less than this live crown is retained, particularly if less than 30 percent is retained, the survival of the tree is dependent on a number of factors, one of which is climatic conditions. (A. Eglitis, Zone Entomologist, 1999, personal communication)

The majority of trees within proposed burn units would incur some needle/crown and tree trunk scorch. Underburns would be initiated when conditions would most likely limit scorch to less than 50 percent of the existing live crown of dominant and co-dominant trees with little resulting mortality from increased beetle activity. Greatest potential for crown scorch would be in units where no mowing is proposed.

Following the use of prescribed fire, attacks by a variety of bark beetles could increase. Turpentine beetle attacks would not be expected to kill the trees but would make trees more susceptible to other insects. Increase in attacks by the pine engraver beetle, the western pine beetle, and the mountain pine beetle could occur. The pine engraver beetle can be the most significant mortality agent following an underburn. Beetle damage could continue up to 1 to 2 years. Increase in beetle activity would not be expected to expand into unburned stands. Within the burns, undamaged trees would generally not be susceptible to insect damage (A. Eglitis, Zone Entomologist, 1999, personal communication). Since crown scorch on dominant and co-dominant trees would generally be less than 50 percent, minimal mortality, resulting from increased beetle activity would be expected.

As with the no action alternative, endemic beetle populations would continue to cause tree mortality. Scattered, incidental tree mortality from beetles would occur in stands not imminently susceptible, primarily resulting from stress caused by lightning strikes or mistletoe. The potential for epidemic beetle populations would be highest in remaining imminently susceptible stands.

Cumulative Effects: Reasonably foreseeable future actions within the project area will have no cumulative effect on beetle risk within the planning area. Beetles will likely move from within the 18 Fire to the adjoining forest outside the fire perimeter. The Lava Cast planning area would be analyzed for potential treatments that would likely reduce the risk of spread of insect infestations into the Kelsey planning area. Treatments within Kelsey would reduce the risk of an infestation that would begin elsewhere. Thinning treatments proposed adjacent to the western boundary of the 18 Fire would likely not be implemented soon enough to reduce risk of mortality from beetle attack.

Defoliators

Existing Condition

The following insects could defoliate trees within the Kelsey planning area: Pandora moth (*Coloradia pandora*) and the western spruce budworm (*Choristoneura occidentalis* Freeman). Within the planning area, pandora moth populations are currently at endemic levels. Little defoliation is occurring. In the past, pandora moths have caused extensive tree defoliation within the planning area. The last large scale defoliation recorded in the Forest Insect and Disease Aerial Detection Survey was in 1994. Extensive defoliation was also mapped in 1992 and 1990. The western spruce budworm (*Choristoneura occidentalis* Freeman) has not been active on the east side of the Bend-Fort Rock Ranger District or within this planning area. White fir, a preferred species of the spruce budworm, is a relatively small component of the district and this planning area and insufficient to provide habitat to support an outbreak.

Alternative 1 (No Action)

Direct and Indirect Effects: At endemic population levels, defoliation from pandora moth would be scarce and would result in little mortality. Epidemic populations have occurred at intervals of approximately 20 to 30 years. If this pattern holds, the next outbreak could occur within the next 10 to 20 years.

In the event of an outbreak, defoliation would likely be heavy and widespread (similar to what occurred in 1990 to 1994). Defoliated trees would be weakened and susceptible to bark beetle attack, particularly turpentine beetle. While defoliation would occur across the landscape, trees of low vigor would be least likely to survive. Indirect mortality as result of defoliation would be highest within areas classified as imminently susceptible to beetle attack. These patterns of mortality were observed in the planning area during the last outbreak of pandora moth. Historically, outbreaks continue for 6 to 8 years (Personal communication, 2002, A. Eglitis, Entomologist).

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct, Indirect, and Cumulative Effects: Proposed natural fuels treatments would have no direct effect on the potential for trees to be defoliated by the pandora moth. Proposed thinning activities would improve tree vigor. Vigorous trees would more likely recover from defoliation than trees of poor vigor. The risk of mortality resulting from a future Pandora moth outbreak would be lowest with Alternative 3, which proposes the greatest amount of thinning.

DISEASE

Existing Condition

Dwarf mistletoe, both ponderosa pine (Arceuthobium campylopodum) and lodgepole pine (*Arceuthobium americanum*), is the most widespread disease in the planning area. Infection is generally light, with some locations where infection levels are moderate to heavy. Height and diameter growth, wood strength, and seed production and viability are reduced. Tree mortality, flammability, wood knot size, and susceptibility to insect attack, particularly bark beetles are increased (Hawksworth, 1978). Infected branches provide ladder fuels to live tree crowns, increasing dry, dead aerial fuels in decadent stands and mistletoe slash increases the amount of natural ground fuels (Koonce and Roth, 1980).

Western gall rust fungus (*Endocronartium harknessii)* is common to the planning area. It occurs primarily on lodgepole pine, but is also found on ponderosa pine. This rust damages trees by: 1) killing seedlings, 2) producing branch galls so numerous that larger trees may be killed or their growth diminished by loss of branches, and 3) producing trunk cankers that can reduce the strength of the tree and increase the likelihood of wind breakage (USDA, Forest Service 1978).

Armellaria root rot, caused by the fungus (*Armellaria mellea*) has potential to be within the planning area. Its hosts include ponderosa and lodgepole pine. Historically, this disease infected fire-scarred, over mature, stressed, damaged, or weakened ponderosa pine (Hessburg et al, 1994). Infection results in growth loss, root and butt rot, uprooting and tree killing (USDA Forest Service, Undated). Brown cubical butt rot, caused by the fungus (*Phaeolus schweinitzii*) also has the potential to be within the planning area. It can occur in both ponderosa and lodgepole pine. It is common in old-growth trees, particularly those with fire scars (USDA Forest Service, Undated). It frequently causes breakage or windthrow in trees with trunk rot. This disease can also kill young trees.

Alternative 1 (No Action)

Direct and Indirect Effects: In single-story stands, dwarf mistletoe would continue to spread in and between tree crowns increasing in severity over time. Within multi-story stands, crowns of shorter trees would continue to be exposed to mistletoe seeds from taller, infected trees. The upper crowns of understory trees would rarely remain free of dwarf mistletoe, and reduction in tree growth would almost be certain (Parameter, 1978). Without thinning, pruning, or a high intensity wildfire, infection would continue indefinitely, reducing stand growth and increasing tree mortality. Mortality patterns would vary from isolated trees to clumps of trees. Dense stands of ponderosa pine could allow Armellaria root disease to increase (Hessburg et. al., 1994).

Cumulative Effects: Ponderosa pine trees infected with dwarf mistletoe have recently been pruned around Lava River Cave. With the No Action Alternative, no additional thinning would be done in these pruned areas. Dense stocking around pruned trees would reduce potential for pruned trees to increase in vigor.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct, Indirect, and Cumulative Effects: Treatments reducing stand density would have the greatest potential to reduce the amount of disease present within stands. Proposed treatments would generally retain trees with the least amount of mistletoe, gall rust and other diseases. Regardless of level of dwarf mistletoe infection or presence of other diseases, all trees greater than or equal to 21 inches dbh would be retained.

Alternative 2 proposes the most acres of stand regeneration treatment (331 acres) to reduce dwarf mistletoe infection (Table 36). Alternative 3 proposes to regenerate 102 acres. All trees less than 21 inches dbh with moderate to high levels of dwarf mistletoe infection would be removed. Residual trees with dwarf mistletoe infection would be pruned. Ponderosa pine would be planted where minimum tree stocking requirements are not met following stand regeneration treatment activities. Treatment units would be large enough, separately or in combination with adjacent stands, to minimize potential for mistletoe to spread in from adjacent mistletoe infected trees. With proposed stand regeneration, mistletoe would be essentially eliminated.

Approximately 10 percent more thinning **(**Table 36**)** is proposed with Alternative 3 than with Alternative 2. While Alternative 3 proposes more thinning, it proposes approximately 36 percent less thinning to wide spacing **(**Table 36**)**. While all thinning would reduce the amount of mistletoe, wide thinning would be more effective in reducing the spread of mistletoe between trees. Wide thinning would generally be wider than the normal dispersal distance for dwarf mistletoe seed. Thinning would improve tree vigor, which could reduce mortality caused by Armillaria root rot.

Openings of 6 to 12 acres in size would be created and reforested to increase structural diversity. Hawksworth and Johnson (1989) recommend openings be no less than 20 acres to minimize the spread of mistletoe into openings from adjacent stands. The spread of mistletoe into openings would be minimized by not planting within 65 feet of the edge of an opening or pruning trees adjacent to openings.

Table 36: Proposed Treatment Acres Reducing Dwarf Mistletoe

Thinning Prescription *	Alternative 2 (Proposed Action)	Alternative 3
Stand Regeneration Cut: Mistletoe Reduction	330	102
Thin to Wide Spacing		
Thin to low stocking levels (2)	2,743	1,476
Thin to low stocking levels (91) – OSU Study	237	237
Total amount of wide thinning	2,980	1,713
Thin to moderate stocking levels	415	2,097

Underburning has the potential to burn into the crowns of some of the more severely mistletoe infected trees. With underburns being relatively low intensity, there would be little overall reduction of mistletoe throughout the stands. Proposed underburning could increase the incidence of stem decay and butt rot. Fire scars could serve as entry points for Armellaria root rot and brown cubical butt rot.

Some recent pruning has occurred around Lava River Cave. Proposed thinning in these stands would further reduce the amount of mistletoe present. Thinning would remove trees too heavily infected with mistletoe to be selected for pruning. Proposed thinning would make more water and nutrients available to residual trees, improving tree vigor. Thinning, in combination with pruning, would further increase potential for survival of existing large trees.

Forest Plan Consistency

Forest Health

Consistent with FH-3, proposed treatments emphasize prevention of insect and disease problems rather than suppression.

Timber Management: Reforestation

Planting (Clearcuts): To create future deer hiding and thermal cover, Alternatives 2 and 3 propose to create openings (Prescription 8) 6 to 12 acres in size over 30 to 40 percent of the treatment area for wildlife habitat. Units are proposed for either or a combination of mechanical shrub treatment, underburning. Openings would have fuels treatments (site preparation) that would be completed within 2 years of harvest and planting would be done within one year of fuels treatments (TM-13).

Natural Regeneration (Seed Tree Harvest): One lodgepole pine stand (Unit 33) is proposed for natural regeneration using clearcutting method with seed trees reserved. Future removal of seed trees is planned. Natural regeneration is planned where stand and site conditions are appropriate (TM-48). Natural regeneration would meet minimum stocking requirements within 10 years of site preparation (TM-49). Treatment is proposed where the stand would be minimally stocked (100 trees per acre) within 10 years of site preparation at least 80 percent of the time (TM-50). Fuels treatment and site preparation (whole tree yarding and machine piling) would reduce fuel loading to a level where no fuels treatment would be required following seed tree removal in 10 to 15 years (TM-53).

Even-aged groups may be as small as 0.25 acre or, in rare cases, as large as 6 or 7 acres, usually less than 2 acres in size, and no wider than twice the height of mature trees in the stand (TM-16). With group selection, openings of approximately 4 acres in size would be created. This size is considered small enough to allow seeding to occur from trees along opening edge yet large enough to give regeneration room to grow and provide habitat for a variety of wildlife species as regeneration matures. Height of mature trees in stands is estimated to be 85 to 95 feet. Height of majority of trees averages 60 feet. Assuming an approximate square opening, average width would be approximately 220 feet, approximately 2.5 times the height of mature trees and approximately 3.5 times the size height of the majority of trees adjacent to proposed openings. Size of proposed group openings is less than the maximum size guideline.

Timber Management: Uneven-aged Management

Uneven-aged management is proposed in ponderosa pine stands that 1) currently display a mixed size structure, or 2) are immature and even-aged (TM-18). A minor amount would occur in the mixed conifer community type. Ponderosa pine is expected to dominate mixed conifer stands following proposed treatments (TM-20). Uneven-aged management is not appropriate in the lodgepole pine community types (TM-21). Alternative 2 proposes to use uneven-aged management within an area historically dominant to ponderosa pine (Unit 68), but currently dominated by lodgepole pine and mapped as a lodgepole pine community. Following proposed treatment, stand would be dominated by ponderosa pine.

Stands proposed for uneven-aged management are generally on slopes less than 30 percent (TM-23). Dwarf mistletoe will be at low levels and is projected to be maintainable at low levels in stands proposed for uneven-aged management (TM-32).

Two types of uneven-aged management would be implemented: single tree and group selection. These systems are consistent with TM-15. With both systems, establishment of a new age class would occur either by planting or through natural regeneration. With individual tree selection, trees would be thinned wide enough to allow ponderosa pine regeneration to establish under residual trees. Stands treated in this manner would continue to be greater than minimally stocked.

Uneven-aged management is most applicable where there is reasonable assurance that natural regeneration will occur within ten years (TM-38). Within areas proposed for uneven-aged management using group selection, there is a reasonable assurance natural regeneration could occur within ten years for the following reasons:

1. Proposed fuels treatments would reduce understory competitive vegetation.
2. Much of ponderosa pine seed disseminates within 100 feet of the seed source with a maximum potential for dispersal of seed up to approximately 530 feet into a clearcut with strong winds (Barrett, 1979). Assuming a 4-acre opening (217 feet by 217 feet) and variable wind direction, approximately 75 percent of the opening would be within the likely 100 foot distance for seed dispersal. All of the opening would be within the maximum distance for seed dispersal.
3. Ponderosa pine seed from trees 60 to 160 years are more viable than seed from younger or older trees (USDA Forest Service, 1965). At approximately 75 years of age, trees adjacent to openings are of an age that favors production of viable seed.
4. Potential exists for adequate seed to be present within the next 10 years. Seed production is not regularly periodic in the Pacific Northwest (Barrett, 1979). On the average, adequate seed crops can be expected every 4 to 5 years (Barrett, 1979).

Horizontal Diversity (Harvest Unit Size): The Deschutes Forest Plan addresses horizontal diversity in terms of size of created openings (TM-58 through TM-60) and uniform structural conditions (TM-61).

Forest openings created by even-aged silviculture should not exceed 40 acres in ponderosa pine and mixed conifer (TM-58). The Regional Guide allows opening size to exceed the 40-acre limit by as much a 50 percent if visual quality objectives require openings to be shaped and blended to fit the landform. Created openings can exceed 40 acres in size in the lodgepole pine working group if stands have been impacted by the mountain pine beetle or other catastrophic conditions (M8-8). Proposed treatments would not create openings greater than 40 acres.

Timber management activities that create essentially uniform structural conditions should generally not exceed 100 contiguous acres on greater than 95 percent of each implementation unit (TM-61). No even-aged regeneration units, separately or in combination with adjacent areas, would create uniform structural conditions in excess of 100 acres.

General Forest Management Allocation (MA 8)

Uneven-aged management is the preferred silviculture system in the General Forest Management Area and should be prescribed within the mature and overmature ponderosa pine and mixed conifer community types where stand and site conditions are appropriate (M8-7). The majority of stands within the planning area are single story immature ponderosa pine stands. Although uneven-aged management can be applied to all existing stand structures, the best candidates are stands that already display an uneven-aged or mixed size structure (TM-18). Due primarily to the predominance of even-aged, immature stands, limited use of uneven-aged management within General Forest Allocation (Table 32, page 3-31) is proposed, 406 acres Alternative 2 and 221 acres Alternative 3.

Deer Habitat Allocation (MA 7)

Timber harvest is appropriate when required to regenerate new cover stands, maintain tree vigor for resistance to stand-threatening insect damage, or encourage desirable forage in deficient areas (M7-3). Table 37 summarizes by objective the number of acres proposed for timber harvest in deer habitat.

Table 37: Thinning Within Deer Habitat (MA7) By Treatment Objective

Objective[1] of proposed tree removal	Alternative 2		Alternative 3	
	Acres	% of Total	Acres	% of Total
Regenerate new cover stands				
Promote deer hiding cover and vertical stand diversity (WL-5)	138	20%	250	31%
Maintain tree vigor				
Reduce risk of bark beetle outbreak	421	61%	435	53%
Reduce dwarf mistletoe spread	49	7%	49	6%
Encourage desirable forage in deficient areas				
Increase herbaceous and forb species	79	12%	79	10%
Total	687	100%	813	100%

[1] **FOREST PLAN objectives** = bold; Kelsey **Treatment Objectives =** regular type (subset of FOREST PLAN objectives).

M7-5 recommends retaining a crown cover greater than 40 percent with trees 30 feet tall. The standard recognizes that due to low site productivity optimal thermal protection may need to be compromised somewhat in order to moderate the risk of future catastrophic pine beetle damage. It states canopy cover should be managed at the highest percentage that will maintain healthy stand conditions with a low risk of catastrophic damage due to insects or disease. It continues to state that the minimum canopy cover must 40 percent.

In a Deschutes National Forest evaluation (1991), the maximum stocking level that could be achieved before catastrophic insect epidemics become likely for a range of site indexes was displayed. This analysis of how much canopy cover can be provided while retaining a low risk of bark beetle outbreak is applicable to assessing potential to provide deer thermal cover in ponderosa pine stands. In Kelsey deer habitat, ponderosa pine site index ranges from 70 to 90 (Barrett 1978). According to the Deschutes analysis, maximum canopy cover that could be retained on these sites while maintaining a low risk to bark beetle outbreak is 25 to 35 percent canopy cover. Proposed thinning would generally retain the highest canopy cover that would maintain healthy stand conditions with a low risk of catastrophic damage to bark beetles. Canopy cover would, however, be reduced to less than 40 percent.

Scenic Views (MA 9)

Scenic view distance zones within Kelsey include both foreground and middleground. The following Standards and Guidelines describe when trees may be removed within the scenic views allocation:

> M9-5 – Ponderosa pine (Foreground); M9-16 – Ponderosa pine (Middleground); M9-24 – Mixed conifer (Foreground); M9-41 – Mixed conifer (Middleground); M9-55 – Lodgepole pine (Foreground); M9-67 – Lodgepole pine (Middleground).

All listed standards and guidelines state trees may be removed where necessary to: 1) perpetuate the desired visual condition, and 2) control insect and disease problems. Standards and guidelines for the foreground scenic view distance zones state trees may be removed where necessary to: 1) create vista points or enhance a unique landscape feature, such as a rock outcrop or unique vegetation, and 2) provide for safety along travel routes and in recreation use areas. Table 38 summarizes, by objective, the number of acres in scenic views that would have trees removed.

Table 38: Thinning (Commercial And Precommercial) Within Scenic Views (MA9) Allocation By Treatment Objective				
Objective[1] of proposed tree removal	**Alternative 2 (Proposed Action)**		**Alternative 3**	
	Acres	**% Total**	**Acres**	**% Total**
Perpetuate desired visual quality				
Promote open, park-like stands (SV-1)			34	1%
Control insect and disease problems				
Reduce risk of Bark Beetle Outbreak (FH-1)	1,613	60%	1,711	60%
Reduce level of dwarf mistletoe infection (FH-2)	173	6%	173	6%
Maintain/improve plantation growth (FH-3)	552	20%	552	20%
Provide for safety along travel routes and in recreation areas				
Create defensible/safe egress routes (NF-2)	139	5%	139	5%
Reduce wildfire risk within urban interface (NF-3)	8	<1%	27	1%
Create strategic fuel breaks (NF-9)	186	7%	146	5%
Increase sunlight on Cottonwood Road to reduce ice (PS)	39	2%	45	2%
Total	**2,710**	**100%**	**2,827**	**100%**

[1] Forest Plan objectives in bold. Kelsey treatment objectives, a subset of Forest Plan objectives, are in regular type.

M9-11, M9-12, and M9-32 state trees greater than or equal to 24 inches dbh are to be retained. No trees greater than or equal to 21 inches dbh would be removed. Visual quality standards pertaining to size of trees to be retained would be met.

Unit 267, proposed for uneven aged management using group selection, includes both scenic view and general forest allocations that would have created openings. Scenic Views makes up approximately 32 percent of the unit. Proposed treatment would create openings approximately 1 to 4 acres in size over approximately 25 percent of the stand. While creation of openings is allowed within ponderosa pine foreground retention, it is to result from harvesting natural mortality (M9-10). To meet visual quality objectives, openings would need to be less than 2 acres in size in the scenic view portion of Unit 267 and be located at least 300 feet from County Road 40.

Interim Riparian Standard

Interim Management direction for riparian areas has been replaced by: a) Wild and Scenic River Standards and Guidelines and b) Inland Native Fish Strategy Standards and Guidelines. The Kelsey project was not evaluated for consistency with interim riparian standards.

Thinning would occur on 11 acres under Alternative 2 and 22 acres under Alternative 3. No heavy equipment would be allowed in those areas. Late and Old Structure habitat would be protected with a0 decrease in tree density.

Interim Ecosystem Standard

The Kelsey planning area has been characterized for patterns of stand structure by biophysical environment and compared to the HRV (Project Record, Forest Vegetation, Appendix D, Attachment 2, page 61).

Interim Wildlife Standard - *Scenario A*

Scenario A of the interim wildlife standard applies for the single story and multi-story late or old (LOS) stand structure. Both of these structural stages are below the Historic Range of Variability (HRV). According to interim direction, there should be no net loss of late or old structure. No timber sale harvest activities are to occur within LOS stages that are below HRV.

Outside of Newberry National Volcanic Monument and the Deschutes Wild and Scenic River Corridor, no timber harvest is proposed within stands classified as LOS. This is consistent with the interim wildlife standard.

Within NNVM, Alternatives 2 and 3 propose cutting in Units 65 and 87, stands classified as multi-story with large tree. In both units, stand densities and fuel loadings are currently high. To reduce risk of losing large diameter trees to bark beetles and wildfire, commercial thinning would occur. Proposed treatment is consistent with Monument Plan direction. Consistent with the intent of the Interim Wildlife Standard, proposed treatments would not result in the loss of late or old structure.

The majority of harvest proposed in Alternatives 2 and 3 is located outside areas classified as late or old stand structure and would either maintain or enhance late or old structure components as much as possible. Proposed harvest is consistent with interim direction by: maintaining all live trees greater than or equal to 21 inches dbh that currently exist; generally manipulate vegetative structure in a manner that moves it toward LOS; and generally manipulate vegetation to encourage development of large diameter, open canopy structure.

Both alternatives propose to use clearcutting and uneven-aged management using group selection on less than five (5) percent of the area proposed for treatment. This treatment would retain live trees greater than or equal to 21 inches dbh but would not move stand structure towards LOS. Resulting amount of stand initiation structural stage would be within the historic range of variability. Within the planning area, potential would remain to develop late or old stand structure to historic levels.

There would be no harvest of live trees over 21 inches dbh, therefore there would be no change to those areas classified as LOS.

Connectivity is provided by: unthinned areas of the planning area; areas that provide the best connectivity; and including stands that experienced non-lethal wildfire. Reference the wildlife section for more details.

The action alternatives are designed to meet the 100 Maximum Population Potential for MR species.

Action alternatives do not propose to remove down logs or snags. Action alternatives would promote large structure with the potential to provide large snags and down logs over the long-term.

There are no known goshawk nests in the area and the habitat most likely to be used for nesting is not proposed for harvest.

HERBICIDE USE FOR COMPETING AND UNWANTED VEGETATION IN PLANTATIONS

INTRODUCTION

Conditions are currently favorable for competing and unwanted vegetation on the site of the 1995 Green Mountain Fire (Kelsey Unit 106). The stand prior to the burn was dominated by ponderosa pine, including plantations that had been planted in the early 1960s. Conditions following the fire favored the growth of greenleaf manzanita (Arctostaphylos patula) and snowbrush (Ceanothus velutinus) from sprouts and seeds. On remaining sites proposed for planting, tree canopy cover ranges from 15 to 40 percent, not high enough to eliminate manzanita, snowbrush, Idaho fescue (Festuca idahoensis), or Ross sedge (Carex rossii) from the sites, species having the greatest potential to compete with seedlings. Viable seed for competing and unwanted vegetation is likely present in the soil. Maintaining or increasing tree canopy cover would encourage natural control of competing and unwanted vegetation. Refer to Project Record, Appendix E, for the complete Herbicide Analysis.

Greenleaf manzanita has the ability to regenerate quickly in areas with frequent fires, allowing it to perpetually dominate a site. Stands of manzanita can live 20 to 100 years and growth of ponderosa pine seedlings is severely limited by manzanita, primarily due to competition for water, with growth loss up to 60 percent. Where fire is excluded for long periods of time, manzanita may enhance the microclimate for some tree seedlings and soil conditions through the addition of organic material.

Snowbrush regenerates from both sprouts and seeds. Seeds may remain viable for as long as 200 years, is short lived, and is intolerant to shade. Fire commonly stimulates seed germination, although high soil temperatures caused by solar radiation and mechanical abrasion may also be factors. Relatively low germination can be sufficient to produce high densities of snowbrush shrubs. Too frequent or intense fire can eliminate snowbrush. Soil moisture depletion is probably the major factor limiting conifer growth. Snowbrush may be beneficial to the site. It is capable of fixing nitrogen, increasing humidity, decreasing wind velocity, and minimizing soil temperatures. Several studies have documented better initial establishment of conifer species under Ceanothus canopies than in the open (Conard et.al. 1985).

Idaho fescue is a vigorous, native, long-lived, perennial, cool-season, bunchgrass. It reproduces from seeds and tillers (a shoot that sprouts from the base of a grass). Seed production is variable. Tillering may result in rapid increase in plant size in non-competitive environments. This small bunchgrass can survive fire, harmed by more severe fire. Rapid tillering occurs when root crowns are not killed and soil moisture is favorable. (Zouhar. 2000, November).

Ross sedge is a native, long-lived perennial graminoid, regenerating through rhizomes and seed. Seeds may remain dormant for long periods prior to germination and are resistant to fire. Rhizomes survive low to moderate severity fires. Ross sedge increases following fires that heat the soil but do not completely consume duff. Recovery takes two (2) to 10 years to return to pre-burn populations (Cope. 1992).

BACKGROUND

Pronone[R]MG consists of particles of an insoluble clay-based material that is surface coated with hexazinone (SERA 1997). The granules have an outer coating of hexazinone-free material that is designed to minimize the formation of dust (SERA 1997). The product label for Pronone MG (Pro-Serve, Inc 1994) indicates 10 percent of the product formulation is active ingredient (Hexazinone) and 90 percent is inerts.

The Material Safety Data Sheet for PRONONE[R]MG (Pro-Serve 1999) lists one inert ingredient: Pluronic L61. The Material Safety Data Sheet (MSDS) for Pluronic L61 (BASF Corporation 2002) indicates this ingredient is a surfactant. This surfactant (Pluronic L61) is included on the EPA's List 4B of inert ingredients found in pesticides (U.S. EPA 2003b). Inerts found on List 4B have sufficient data to substantiate they can be used safely in pesticide products (U. S. EPA 2003a). List 4B inerts are generally recognized as safe by the EPA.

Hexazinone has been registered for use for general weed control since 1975 and for forestry use since 1977 (U.S. EPA 1994). A Reregistration Eligibility Decision (RED) was completed in September 1994 (U.S. EPA 1994). The Tolerance Reassessment Progress and Risk Management Decision (TRED) for Hexazinone (U.S. EPA 2002) were approved on August 1, 2002. Monitoring of the granular application of hexazinone on the Bend-Fort Rock Ranger District has shown little mortality of vegetation has occurred beyond the circle of direct herbicide application (Matt Deppmeier, 2003, Reforestation Forester, Bend-Fort Rock Ranger District, Personal Communication).

The Bend-Fort Rock Ranger District analyzed alternatives for treating competing and unwanted vegetation growing around tree seedlings (USDA Forest Service 2000a), including the installation of 6 foot by 6 foot plastic mulch mats. It was found that herbicide treatment would reduce or eliminate competing vegetation from around tree seedlings in an efficient and economic manner while providing for worker safety and meeting other resource needs.

Scalping (grubbing) and no treatment were also considered. Scalping the soil with hand tools can be an effective means of removing grass although with limited effectiveness because of a short duration of control. Scalping also removes much of the nutrient rich humus layer of soil, thereby decreasing the amount of nutrients available to the seedlings. Poor seedling survival and growth would result from no treatment, reducing the potential to provide desired deer hiding and thermal cover. In some areas, reduced survival and growth would also reduce potential for meeting timber yield objectives.

ENVIRONMENTAL CONSEQUENCES

Human Health

Existing Condition

The units proposed for herbicide application (Table 12, Page 2-21) nearest private land are units 258 and 259. Unit 258 is approximately 0.3 miles south of private property and approximately 0.7 miles southeast from human habitation[9]. Unit 259 is approximately 0.6 mile south of private property and 1.0 mile southeast from human habitation. These units are approximately 0.8 to 1.0 mile southeast of the High Desert Museum. Remaining proposed herbicide units proposed are 1.0 to 4.5 miles from the boundary of other landowners. There are no developed recreation sites within or adjacent to units proposed for herbicide treatment. Dispersed recreational use would be the primary recreation use of the treatment areas, primarily off highway vehicle (OHV) use and hunting. Within the project areas there is no surface water.

[9] Human habitation considered to be structures visible on 1995 Aerial Photos.

Alternative 1 (No Action)

Direct and Indirect Effects: Without the application of herbicides, there would be no effects to the human health environment.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects

Hazard Evaluation (The characteristic of an object or substance that can inflict injury or illness): Dermal toxicity (poisoning through the skin) of hexazinone is relatively low and is not well absorbed after dermal (skin) exposure. Applying a granular formulation of hexazinone indicates that dermal absorption would occur. With the proposed application of herbicide, worker exposure to hexazinone would be limited by the following: method of application, vegetation and ground conditions, use of personal protective equipment, and restricted entry into the treatment area for 48 hours following herbicide application. Greatest potential for inhalation of dust from the granular form of hexazinone would occur when loading the spot-applicator with herbicide. Use of a respirator or mask during the loading process would minimize the potential for dust inhalation.

Mutagenicity

There is a lack of mutagenic (mutation) activity of hexazinone in several *in vivo*[10] and *in vitro*[11] bioassays. One bioassay for chromosomal damage was positive (SERA 1997, Page 3-4).

Neurotoxicity, Immunotoxicity, and Endocrine Disruption

According to the SERA report, "there is no scientific basis for asserting that hexazinone causes specific toxic effects on the nervous system, immune system, or endocrine function" (SERA 2002, Page xiii).

Neurological Effects

The nervous system is the basis for learning and thinking, sensory perception and movement, behavior and emotion, and regulation of many of the important functions of the cardiovascular system and other internal organs. Chemically-induced impairment of the nervous system *(neurotoxicity)* can produce a variety of effects, collectively referred to as *neurologic effects*, which can encompass any of the above functions and behaviors. *Neurotoxicants* are chemicals that disrupt the function of nerves, either by interacting with nerves directly or by interacting with supporting cells in the nervous system. (SERA 2002, Page viii)

There is no evidence for hexazinone having a direct neurotoxic effect in humans or other animals. Studies designed specifically to detect impairments in motor, sensory, or cognitive functions in mammals or other species exposed subchronically or chronically to hexazinone have not been conducted. These studies have not been conducted because the clinical and experimental toxicology experience with hexazinone provide no reason to suspect a neurotoxicity potential. (SERA 2002, Page ix)

Immunologic Effects

Immunotoxicants are chemical agents that disrupt the function of immune system. These agents can impair immune responses *(immune suppression)* or produce inappropriate

[10] In vivo (Definition) – Occurring in the living organism (SERA 1997)
[11] In vitro (Definition) – Isolated from the living organism and artificially maintained, as in a test tube (SERA 1997).

stimulation of immune responses *(hyperreactivity)*. Suppression of immune responses to microbes or abnormal cells can enhance susceptibility to infectious diseases or cancer. *Hyperreactivity* can give rise to *allergy* or hypersensitivity, in which the immune system or genetically predisposed individuals inappropriately responds to chemical agents (e.g., plant pollen, cat dander, flour gluten) that pose no threat to other individuals or *autoimmunity*, in which the immune system produces antibodies to self components leading to destruction of the organ or tissue involved. (SERA 2002, Page ix)

There is very little direct information on which to assess the immunotoxic potential of hexazinone. The only information with which to assess the potential immune suppressive effects of hexazinone is largely indirect. Hexazinone has been subject to a large number of standard toxicity studies required for pesticide registration by the U.S. EPA. Although these studies are not designed to specifically detect changes in immune function, significant effects on immune function would likely be evidenced by observable changes in lymphoid tissue as well as changes in differential blood cell counts and an increase in the incidence of animals with infection. No such effects are reported by the U.S. EPA in the RED, and such effects were not encountered in the risk assessment prepared by SERA. While chronic studies on hexazinone cannot rule out the possibility of immunologic effects, they provide no evidence that such effects occurred. (SERA 2002, Page xi)

Endocrine Disruption

The endocrine system participates in the control of metabolism and body composition, growth and development, reproduction, and many of the numerous physiological adjustments needed to maintain constancy of the internal environment *(homeostasis)*. The endocrine system consists of endocrine glands, hormones, and hormone receptors. (SERA 2002, Page xi)

Hexazinone has not undergone evaluation for its potential to interact or interfere with the estrogen, androgen, or thyroid hormone systems. Extensive testing in experimental animals provides reasonably strong evidence against hexazinone being an endocrine disruptor. Epidemiological studies of health outcomes of hexazinone have not been reported, nor is there clinical case literature on human hexazinone intoxication. Several long-term experimental studies in dogs, mice, and rats have examined the effects of exposure to hexazinone on endocrine organ morphology, reproductive organ morphology, and reproductive function; treatment-related effects on these endpoints were not observed. In addition, hexazinone did not produce abnormalities in frog embryos at exposures below the LC_{50}. (SERA 2002, Page xiii)

Metabolites

Hexazinone is metabolized extensively in plants and animals, with little parent product recovered in tissue. Therefore, the toxicological effects, if any, of the metabolites are likely to be captured by animal toxicology studies involving whole-body exposure to hexazinone. (SERA 1997, Page 3-8)

Inert Ingredients (Information Ventures, Inc 1995)

An inert ingredient is anything added to the product other than an active ingredient. The product label for Pronone MG (Pro-Serve, Inc 1994) indicates 10 percent of the product formulation is active ingredient (Hexazinone) and 90 percent is inerts. The Material Safety Data Sheet for PRONONE[R]MG (Pro-Serve 1999) lists one inert ingredient: Pluronic L61. The Material Safety Data Sheet (MSDS) for Pluronic L61 (BASF Corporation 2002) indicates this ingredient is a surfactant. This surfactant (Pluronic L61) is included on the EPA's List 4B of inert ingredients found in pesticides (U.S. EPA 2003b). Inerts found on List 4B have sufficient data to substantiate they can be used safely in pesticide products (U. S. EPA 2003a).

Based on references from the published literature, the major component of granular formulations of hexazinone appears to be clay. Based on the acute toxicity of these formulations relative to technical grade hexazinone, there is no indication that the carriers contribute to the toxicity of the granular formulations of hexazinone. If anything, the granular formulations of hexazinone appear to be slightly less toxic than hexazinone itself. This is also evident in the aquatic toxicity studies using formulations relative to hexazinone itself. (SERA 1997, Page 3-10)

Exposure Evaluation (The amount of a potentially harmful substance actually encountered by an organism):

Workers

Occupational exposure generally involves inhalation and dermal exposure, the dermal route generally contributing far more to exposure than the inhalation route (SERA, 1997, Page 3-11). The proposed application rate of 0.26 to 0.32 pounds active ingredient per acre is less than the application rate (1 pound active ingredient per acre) assumed in the SERA risk assessment (SERA 1997, Page 3-15). Workers would likely be exposed to doses less than those assumed in the SERA risk assessment.

Worker exposure would be limited by the following: method of application, vegetation and ground conditions, use of personal protective equipment, and restricted entry into the treatment area for 48 hours following herbicide application. The herbicide would be directed downward during application, reducing potential worker contact with the herbicide. The relatively small percent of treated acreage (approximately 13 to 16 percent of an acre) would provide a low potential of walking through an area treated with herbicide. Shrubs or grasses that resprout following prescribed underburn and mechanical shrub treatments would be generally less than 1 foot tall. With this vegetation condition and the application method, there would be limited potential for workers to have dermal exposure by rubbing against herbicide intercepted by vegetation. All proposed application sites are on relatively flat ground, slopes ranging from 5 to 10 percent. Potential for falling and coming in contact with herbicide on the ground would be limited.

Greatest potential for inhalation of dust from the granular form of hexazinone would occur when loading the spot-applicator with herbicide. Use of a respirator or mask during the loading process would minimize the potential for dust inhalation.

Public

Under normal conditions, members of the general public should not be exposed to substantial levels of hexazinone (SERA 1997, Page 3-18). There would be no potential for the public to receive a dermal dose of the herbicide from drift or from accidental direct spraying. Potential for coming in contact with herbicide found on vegetation or the soil would be relatively low. Treatment areas would be signed to restrict entry for 48 hours (Herbicide mitigation measure, page 2-42. Public use of the treatment areas is relatively low and infrequent. Given the type of vegetation in the proposed treatment areas, there is little to no potential the public would consume plants from the area that might have herbicide residues.

Potential for the public to be exposed to water with herbicide residues would be low, with the lack of surface water in the immediate vicinity of the treatment units. There is no potential the public would drink surface water contaminated with herbicide residues. Exposure by way of groundwater contamination should be minimal due to the great depth to groundwater (see effects to water, page 3-47).

Risk Evaluation (The likelihood of illness or injury based on the results of hazard and exposure evaluation): Risk characterization for occupational exposure to hexazinone, excluding accidental or incidental exposures, is summarized in the SERA risk assessment (SERA 1997, Page 3-29, Table 3-5). Given the lower application rate proposed with this treatment, the hazard quotients at the low end of the range would be expected.

Workers
Risk characterization for workers after accidental or incidental exposure to hexazinone is summarized in the SERA risk assessment (SERA 1997, Page 3-30, Table 3-6), considering the potential for dust from the granules coming in contact with the skin and the hexazinone dissolving from the granules into perspiration. The longer-term accidental scenarios – wearing contaminated gloves and dermal contact with dust-yield hazard quotients that should be regarded with a high level of concern (SERA 1997, Page 3-31). The potential for adverse reproductive effects in female workers is plausible (SERA 1997, Page 3-31).

Public
Risk characterization for the general public is summarized in the SERA risk assessment (SERA 1997, Page 3-32, Table 3-7). Most routine exposure scenarios lead to estimated daily doses in the range of 0.001-0.006 mg/kg/day (SERA, 1997, Page 3-11). This is less than the most recently derived RfD (reference dose) for hexazinone of 0.05 mg/kg/day. Only the exposure scenario of a naked child receiving a direct spray of hexazinone resulted in a hazard quotient greater than unity. There would be no potential for this type of exposure to occur.

The SERA risk assessment (SERA 1997, Page 3-33) identified a sensitive subgroup of people. Because hexazinone was demonstrated to induce fetal resorptions, pregnant women are an obvious group at increased risk. This group is given explicit consideration and is central to the risk characterization. There are no other reports in the literature suggesting subgroups that may be sensitive to hexazinone exposure. There is no indication that hexazinone causes sensitization or allergic responses. Some individuals with multiple chemical sensitivity may be sensitive to hexazinone as well as many other chemicals.

Cumulative Effects: Within the next 5 to 10 years, OHV trails may be developed within or adjacent to the following units proposed for herbicide treatment: Alternative 2 (Units 7, 8, 14, 21, and 259); Alternative 3 (Units 21, 259, and 442). Where trails enter or are adjacent to areas treated with herbicide, signs would be posted for 48 hours to warn trail users (Mitigation Measure 2, page 2-11). Potential for trail users to be exposed to herbicide would be minimized.

The U.S. EPA evaluated the dietary risks associated with hexazinone. It determined there is a reasonable certainty that no harm to any population subgroup will result from aggregate exposure to hexazinone when considering dietary, drinking water and residual exposure and all other non-occupational sources of pesticide exposure for which there is reliable information (U.S. EPA, 2002). There is currently herbicide treatment for unwanted vegetation (noxious weeds) at various locations on the Deschutes National Forest, including along Highway 97 adjacent to the project area.

Terrestrial Animals

Existing Condition

There are no known bird nests within the units proposed for treatments. It may be assumed that the units would provide habitat either as forage, hiding cover, or nesting substrate for birds.

Alternative 1 (No Action)

Direct and Indirect Effects: Without the application of herbicides, there would be no effects to the terrestrial animal environment.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: There is little indication that hexazinone is likely to cause adverse effects in terrestrial animal species. The consumption of contaminated water or vegetation yields hazard indices that are well below a level of concern at any plausible application rate either immediately after hexazinone applications or over prolonged periods after applications. There is no data indicating that birds will consume any of the granular formulations that contain hexazinone. The minor reduction of vegetation associated with proposed herbicide application would have little to no effect on wildlife populations.

Hazard Analysis: The toxicity of hexazinone to terrestrial wildlife species, particularly invertebrates, is not well characterized. The assessment of effects to terrestrial species is based primarily on available data from experiments on mammals. Exposure to hexazinone is associated with decreased weight gain and reproductive effects in several standard test species (SERA 1997, Page 4-1).

When applied at the recommended field rate, hexazinone had little or no measurable effect on microbial community size, activity, or function. Results suggest that hexazinone treatment does not disrupt microbial communities or soil arthropod assemblages. The results of this study raise no concern about direct toxic effects of hexazinone for the soil organisms and processes that were measured. In an earlier study, the indirect effect of vegetation removal resulting from herbicide application was found to be inconsequential to soil biota (Busse et al 2001). There is some evidence suggesting that soil microarthropods may be sensitive to hexazinone treatments (SERA 1997, Page 4-2).

Exposure Analysis: Terrestrial animals may be exposed to any applied herbicide from direct spray, the ingestion of contaminated media (vegetation, prey species, or water); grooming activities; indirect contact with contaminated vegetation; or inhalation (SERA 1997, Page 4-4). It is possible that in addition to consuming contaminated vegetation, certain wildlife species may directly consume granules that contain hexazinone, particularly those granules that are applied dry. For example, birds may consume pellets or granules based on size, color, or texture of the particles. Although there are no reports in the literature suggesting that birds will consume any of the granular formulations of hexazinone, there is no information suggesting that birds will avoid these granules. (SERA 1997, Page 4-8)

Risk Analysis: The U.S. EPA has determined that the registration for this herbicide should be maintained because the herbicide can be used without significant risk to humans or wildlife

(SERA, 2002, Page vii). There is little indication that hexazinone is likely to cause adverse effects in terrestrial animal species. The consumption of contaminated water or vegetation yields hazard indices that are well below a level of concern at any plausible application rate either immediately after hexazinone applications or over prolonged periods after applications (SERA 1997, Page 4-18). The minor reduction of vegetation associated with proposed herbicide application would have little to no effect on wildlife populations.

If birds consume hexazinone granules immediately after application, reproductive effects and possibly overt signs of toxicity might occur. If birds were to preferentially consume these granules, exposure levels could be much higher. In that case, toxic effects including mortality could occur. There is no data indicating that birds will consume any of the granular formulations that contain hexazinone. Without additional information with which to improve the exposure assessment, this risk cannot be characterized further.

Cumulative Effects: Gopher baiting would occur within planted units, although baiting is specific to controlling unwanted seedling damage or mortality from gophers. Herbicide spraying along Highway 97 would not likely have a cumulative effect with this project. Site specific spraying would occur east of the highway on flat ground with low potential to cumulatively affect birds, humans, or other mammals.

A Forest-wide weed EIS is being developed. The proposal will include herbicide use, but the project is in the preliminary analysis.

Terrestrial Plants

Existing Condition

Greenleaf manzanita, snowbrush, Idaho fescue, and Ross sedge are the dominant species with potential to be competing and unwanted vegetation.

Alternative 1 (No Action)

Direct and Indirect Effects: Without the application of herbicides, there would be no effects to the terrestrial plant environment.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Proposed herbicide application would not eradicate any plant species or population of vegetation. A relatively small percent of each treatment unit would be treated with herbicide.

Hazard Evaluation: The differential toxicity of hexazinone to various plant species is based on variations in the ability of different plants to absorb, degrade, and eliminate the herbicide (SERA 1997, Page 4-1). Hexazinone would be toxic to non-conifer plants. It would be non-toxic to ponderosa pine. Expected toxicity is consistent with vegetation response observed on the Bend/Fort Rock Ranger District following the application of hexazinone.

Exposure Evaluation: Vegetation within approximately a three-foot radius around ponderosa pine seedlings would be directly exposed to the herbicide. Approximately 13 to 16 percent of each unit proposed for herbicide application would be exposed to the herbicide. Non-target terrestrial plants may be exposed to the herbicide through unintended direct deposition and soil transport (SERA 1997, Page 4-9).

Risk Evaluation: Proposed herbicide application will not eradicate any plant species or population of vegetation. A relatively small percent of each treatment unit would be treated with herbicide. Outside the area of direct herbicide application, there would be limited potential for nontarget terrestrial plants to be exposed to hexazinone. Ground applications of granular formulations of hexazinone should be associated with little significant drift (SERA 1997, Page 4-19). There would be limited potential for nontarget plants to be exposed to herbicide through soil transport. Slopes are relatively gentle (5 to 10 percent) in the areas proposed for herbicide treatment. The planning area receives relatively low levels of precipitation.

Cumulative Effects: Reasonably foreseeable future actions, in combination with proposed herbicide application, will have no cumulative effects.

Soils

Existing Condition

Soils have developed in volcanic ash deposits originating from Mt. Mazama (Crater Lake) and overlay other older volcanic materials. They have a sand or sandy loam soil surface texture. Thickness of the volcanic ash layer ranges from a depth of 28 inches to greater than 60 inches. Some of these soil types have a subsurface soil layer of finer residuum soil material over bedrock. Others have volcanic ash directly over bedrock. Water infiltration rate in these soil types is rapid. Permeability is rapid to very rapid in the surface layers and rapid in subsurface layers. Organic matter contents in surface horizons ranges from 2 to 4 percent. The soil types are not considered sensitive where the use of herbicides is proposed.

Alternative 1 (No Action)

Direct and Indirect Effects: Without the application of herbicides, there would be no effects to the soils environment.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Hexazinone may remain in the soil at low concentrations for up to three years after application (Information Ventures, Inc. 1995). Annual precipitation, depth to groundwater and soil characteristics in the areas proposed for application are highly likely to limit the direct input of this herbicide into groundwater systems. The relatively high water holding capacity of coarse textured volcanic pumice and ash loamy sands, relatively flat topography, and sufficient organic matter levels and microbial populations to absorb and degrade this herbicide, would combine to limit the extraneous travel and persistence of this herbicide to either private lands or on public lands.

Aquatic Species

Existing Condition

The Deschutes River, adjacent to the Kelsey Planning Area, is home to a variety of aquatic species. Within the Kelsey Planning Area, there is limited habitat for the following amphibians: the pacific chorus frog and the western toad.

Alternative 1 (No Action)

Direct and Indirect Effects: Without the application of herbicides, there would be no effects to Aquatic Species. The closest application of herbicide to the Deschutes River, and aquatic species, would be approximately 1.7 miles away from the river (Unit 27, Alternative 2 and Unit 327, Alternative 3).

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects

Hazard Analysis: Comparable studies on aquatic algae and aquatic animals clearly indicate that most algal species are much more sensitive to hexazinone compared with fish and aquatic invertebrates. Other than lethality, the most common effect noted on aquatic animals is growth inhibition. Only one amphibian study was located, suggesting that amphibians are less sensitive than fish or aquatic invertebrates to hexazinone (SERA 1997, Page 4-1).

Exposure Analysis: In the aquatic environment, exposure levels can be characterized simply as concentrations of hexazinone in water (SERA 1997, Page 4-14). Aquatic species within the Deschutes River would not be exposed to the herbicide. Application of herbicide is not proposed in areas considered amphibian habitat.

Risk Analysis: With no habitat present in units proposed for herbicide treatment, there would be limited potential for amphibians to receive a toxic dose of hexazinone.

Cumulative Effects: Reasonably foreseeable future actions, in combination with proposed herbicide application, will have no cumulative effects.

Water Quality

Existing Condition

The Deschutes River provides the only surface water and borders the western boundary of the planning area. Within the planning area and within the proposed herbicide treatment area, there is no surface water and there are no known springs. During spring snow melt and storm events, very little above ground flow of water occurs. This is due to coarse soil textures with high infiltration rates, relatively low annual precipitation, and relatively flat ground. Within the planning area, groundwater is estimated to be 100 to 800 feet below the surface (Larry Chitwood, 2003, Geologist, Deschutes National Forest, Personal communication). Groundwater would be closest to the surface in the vicinity of Sunriver.

Movement of hexazinone through the soil profile was assessed on the Bend-Fort Rock Ranger District of the Deschutes National Forest between 1998 and 1999 (Herbicide Grass Control Demonstration Project, Deschutes National Forest). Sub-surface soil samples were taken at a depth of 15 centimeters

(6 inches). Samples were taken 1 month, 6 months and 12 months following herbicide application. Sample results generally indicate the herbicide does not appear to be moving into the 15 cm depth and persisting (Craigg 2000, Sussman 1998). Soil types in units proposed for herbicide treatment are similar to those in the demonstration project. Movement of hexazinone through the soil profile is expected to be similar to that found in the demonstration project.

Alternative 1 (No Action)

Direct and Indirect Effects: Without the application of herbicides, there would be no effects to the water environment.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Surface ground water contamination would not occur. The closest application of herbicide to the Deschutes River would be approximately 1.7 miles away from the river (Unit 27, Alternative 2 and Unit 327, Alternative 3). With the manual application of herbicide, there is no potential for herbicide to be directly applied to the river. Due to the distance of application from the river and the limited potential for herbicide to be transported by overland flow of water there would be limited to no potential for the herbicide to come in contact with the river.

Annual precipitation, depth to groundwater and soil characteristics in the areas proposed for application are highly likely to limit the direct input of this herbicide into groundwater systems. Based on the soil sampling results from the Herbicide Grass Control Demonstration Project and the depth to the water table, herbicide would not be expected to move down to the level of groundwater.

Air Quality

Alternative 1 (No Action)

Direct and Indirect Effects: Without the application of herbicides, there would be no effects to the air environment.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: No effects on air quality would be expected as a result the application of hexazinone. Hexazinone does not evaporate easily and the burning of hexazinone-treated wood does not create additional toxic byproducts (compared to the burning of untreated wood) (Information Ventures, Inc. 1995).

WILDLIFE – THREATENED AND ENDANGERED SPECIES AND HABITAT

SUMMARY OF EFFECTS

The Wildlife biological evaluation (BE) determined there would be "No Effect" to any Proposed, Endangered, Threatened, Sensitive (PETS) or Candidate wildlife species or associated habitat.

INTRODUCTION

It is Forest Service policy to avoid all adverse impacts on threatened and endangered species and their habitats except when it is possible to compensate for those adverse impacts. Measures are to be identified and prescribed to prevent adverse modification or destruction of critical habitat and other habitats essential for the conservation of endangered, threatened, and proposed species (Forest Service Manual, FSM 2670.31). The biological evaluation process (FSM 2672.4) reviews the proposed actions to determine the potential for effect on threatened and endangered species and species proposed for listing (FSM 2670.31). Species classified as sensitive by the Forest Service are to be considered by conducting biological evaluations to determine the potential effect of activities on these species (FSM 2670.32). No impacts may be allowed on sensitive species that would result in loss of population viability or create significant trends toward federal listing.

The following biological evaluation evaluates the effects of all proposed alternatives for the Kelsey Vegetation Management Project including the No Action alternative. Effects of the project are evaluated for those PETS species that are documented or suspected to occur within the Kelsey Vegetation Management Project area. Existing management direction is found in the Forest Plan (1990), as modified by the Regional Forester's Forest Plan Amendment #2 (referenced as the "Eastside Screens"; USDA, 1995). Projects proposed in occupied or potential habitat of any candidate, threatened, or endangered species on the Forest must be consistent with the Project Design Criteria (PDC) for the Joint Aquatic and Terrestrial Programmatic Biological Assessment (BA) for Fiscal Years 2003 through 2006 (USDA et al. 2003), referred to as the Programmatic BA. Projects that affect the species addressed by the document, and do not meet the applicable PDCs, must initiate the appropriate level of consultation with the U. S. Fish and Wildlife Service. PDCs for proposed species may be included in the BA, but are optional for the management agencies. For species other than those classified as Proposed, Endangered, Threatened or Sensitive (PETS) refer to the next section, Wildlife – Management Indicator Species (MIS) and Habitat, page 3-60.

PROJECT AREA HABITAT DESCRIPTION

Wildlife habitats within the Kelsey project area are dry forest types including ponderosa pine, lodgepole pine, and mixed conifer. Ponderosa pine dominates the area. Stands are generally relatively young (50-100 years), small diameter (9 to 20 inches diameter at breast height (DBH)), and single-storied. There are few snags and down logs in these stands. Special/unique habitat types include buttes, eco-tones along lava flows and lava rock outcroppings, and wet meadow/riparian habitat along the Deschutes River. There is one man-made water catchment (wildlife guzzler) within the project area that provides water for wildlife.

The Kelsey project area includes mule deer summer range, spring/fall transitional range, and winter range. For the most part, summer and transitional range is designated in the Forest Plan as General Forest (Forest Plan Management Area 8), while the winter range is designated as Deer Habitat (Forest

Plan Management Area 7). Besides the Deer Habitat management allocation, the biological winter range (area actually utilized by deer during winter time) includes areas designated by the Forest Plan as Old Growth and Scenic Views. Significant numbers of deer utilize these areas during late fall, winter, and early spring periods. They migrate from higher elevation summering areas located south and west of the project area in late fall and then return to summering areas during early spring. Elk are also known to regularly utilize the area, with the greatest amount of use occurring during winter months along the Deschutes River in the Ryan Ranch Key Elk Area. Potential calving habitat is found in the Ryan Ranch Key Elk Area in dense stands of lodgepole pine adjacent to the Deschutes River. Mountain lion, bobcat, and black bears are known to inhabit the area. Other predators include a variety of raptors, coyote, American marten, and badger. A variety of small mammals and birds are or can potentially be found in the project area. Refer to the summary table in the Wildlife Report for a partial listing of species. There are no known records of any PETS species occupying the project area.

SPECIES AND HABITATS EVALUATED

Table 39 displays threatened, candidate for listing, or sensitive animal species that are either known to occur or may potentially occur on the Bend-Ft Rock District:

Table 39: Threatened, Candidate, and Sensitive Species
Potential Occurance On The Bend-Fort Rock Ranger District, Deschutes National Forest

Species		**Federal Classification**[12]
Scientific Name	**Common Name**	
Haliaeetus leucocephalus	Northern bald eagle	T
Strix occidentalis caurina	Northern spotted owl	T
Lynx canadensis	Canada lynx	T
Rana pretiosa	Oregon spotted frog	C
Histrionocus histrionicus	Harlequin duck	S, SOC
Bucephala albeola	Bufflehead	S
Falco peregrinus anatum	American peregrine falcon	S
Agelaius tricolor	Tricolored blackbird	S
Centrocercus urophasianus	Western sage grouse	S, SOC
Coturnicops noveboracensis	Yellow rail	S
Podiceps auritus	Horned grebe	S
Podiceps grisegena	Red-necked grebe	S
Gulo gulo luteus	California wolverine	S, SOC
Martes pennanti	Pacific fisher	S
Sylvilagus idahoensis	Pygmy rabbit	S, SOC

CONCLUSION

The pre-field review determined that the northern bald eagle and bufflehead have been documented to occur or have habitat, or both, in or adjacent to the project area. All species on the R-6 TES Species List that have potential habitat on the Bend-Ft. Rock District were considered (Tables 39 and 40).

[12] T=Threatened, S=USFS Region 6 Sensitive, C=USFWS Candidate species, SOC=USFWS Species of Concern (There are no E=Endangered or P=Proposed for Federal listing species known or suspected within the planning area)

Table 40: Pre-Field Review Summary And Field Survey Results Kelsey Planning Area					
Species	**Step #1 Pre-field Review - Habitat Present?**	**Step #2 Field Reconnaissance - Species Present?**	**Step #3 Effects Determination - Conflict?**	**Step #4 Significance - Important?**	**Step #6 USFWS Review - T&E only**
Northern Bald Eagle	**No**	**Yes**	**No**	**No**	**No**
Northern Spotted Owl	No	No	No	No	No
Canada Lynx	No	No	No	No	No
Oregon Spotted Frog	No	No	No	No	No
Harlequin Duck	No	No	No	No	
Bufflehead	**Yes**	**Yes**	**No**	**No**	
American Peregrine Falcon	No	No	No	No	
Tricolored Blackbird	No	No	No	No	
Western Sage Grouse	No	No	No	No	
Yellow Rail	No	No	No	No	
Horned Grebe	No	No	No	No	
Red-necked Grebe	No	No	No	No	
California Wolverine	No	No	No	No	
Pacific Fisher	No	No	No	No	
Pygmy Rabbit	No	No	No	No	

STATUS AND PRE-FIELD REVIEW

Northern Bald Eagle (Haliaeetus leucocephalus)

Status: U.S. Fish and Wildlife Service = Threatened; State of Oregon = Threatened

Pre-field Review: The bald eagle has been observed sporadically in the Kelsey project area. Bald eagle use is incidental, occurring primarily during fall and winter months when a few eagles have been observed feeding on winter-killed and road-killed deer. Bald eagle use of the majority of the Kelsey project area is considered unlikely due to the forested condition and poor foraging habitat. There are no Bald Eagle Management Areas (BEMAs), as identified by the Deschutes National Forest Land and Resource Management Plan (Forest Plan), or bald eagle nest sites in or adjacent to the project area.

Bufflehead (Bucephala albeola)

Status: U.S. Forest Service, Region 6 Sensitive

Pre-field Review: The bufflehead is commonly observed on the Deschutes River that borders the west side of the project area. The bufflehead is a “diving” duck, foraging mostly on aquatic insects, but also aquatic plants and small fish. It nests in small cavities in trees, usually old flicker holes, with most nest sites located within 600 feet of water.

ENVIRONMENTAL CONSEQUENCES

Northern Bald Eagle (Haliaeetus leucocephalus)

Alternative 1 (No Action)

Direct, Indirect, and Cumulative Effects: The no action alternative would maintain current habitat conditions. No direct, indirect, or cumulative effects to the bald eagle are expected to occur.

Alternative 1 would have “No Effect” to the bald eagle.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct, Indirect, and Cumulative Effects: Because any bald eagle use is incidental and opportunistic, no direct, indirect, or cumulative effects to the bald eagle are expected to occur. Alternative 2 would have “No Effect” to the bald eagle.

Bufflehead (Bucephala albeola)

Alternative 1 (No Action)

Direct, Indirect, and Cumulative Effects: The no action alternative would maintain current habitat conditions. No direct, indirect, or cumulative effects to the bufflehead are expected to occur. Alternative 1 would have “No Impact” to the bufflehead.

Alternative 2 (Proposed Action)

Direct, Indirect, and Cumulative Effects: There are 11 acres proposed for commercial treatment near the Deschutes River (Unit 87). No direct, indirect, or cumulative effects to the bufflehead are expected to occur because all large trees (greater than 21 inches dbh) would be retained as well as existing snags. Most activities would not occur within 100 feet of riparian vegetation and would occur in upland vegetation. Unit 87, Benham Falls day use area, does have areas of riparian vegetation intermixed with upland vegetation. Alternative 2 would have “No Impact” to the bufflehead.

Alternative 3

Direct, Indirect, and Cumulative Effects: Alternative 3 proposes to commercial thin approximately 50 acres that are within 600 feet of the Deschutes River. Commercial harvest activities may remove nest trees and if activities occur during the spring nesting season, may disturb nesting buffleheads, and potentially result in direct mortality of nesting ducks and/or young. This potential impact is slight and involves, at best, a few individuals because all large trees (greater than 21 inches dbh) would be retained as well as existing snags. Most activities would not occur within 100 feet of riparian vegetation and would occur in upland vegetation. Unit 87, Benham Falls day use area, does have areas of riparian vegetation intermixed with upland vegetation. Commercial harvest activities may impact individuals but would not negatively affect populations or contribute towards a trend to federal listing.

WILDLIFE – MANAGEMENT INDICATOR SPECIES (MIS) AND HABITAT

INTRODUCTION

The Wildlife report meets the direction provided by the Forest Service Manual (FSM 2600), the Forest Plan, and the Environmental Assessment for the Continuation of Interim Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (referenced as the "Eastside Screens"). This report does not address those species designated as Proposed, Endangered, Threatened, or Sensitive (PETS), or Candidate species for federal listing under the Endangered Species Act. For these species and for those designated as Sensitive by the Forest Service Regional Office (Region 6) refer to the previous discussion beginning on page 3-56 of this DEIS.

Generally three documents provide guidance or species lists for consideration in the management of federal lands. The three documents and associated species lists include the Deschutes National Forest – Management Indicator Species, the US Fish and Wildlife Service Birds of Conservation Concern, and a Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington. Species listed in these documents overlap with each other as well as the threatened, endangered and sensitive species lists. Management actions should minimize negative impacts, promote habitat development or provide habitat protection to some degree for those species that occur within the habitats of federally managed land.

Habitat manipulation affects species differently. An action that may increase habitat for one species may decrease habitat for another species. Federal threatened, endangered, and regionally sensitive species lists are always consulted first. Species that do not appear on these lists but show up as a management indicator species or focal species, or species of concern may have persistence issues at a regional or national level but may not have persistence issues at the state or local level. To understand the level of concern for these species, rankings were obtained from Natureserve Explorer: an online encyclopedia of life, available at http://www.natureserve.org/explorer. Rankings are given for global, national, and state levels. Only the state rankings were used for this analysis.

During the preparation of the Forest Plan (1990), a group of eighteen wildlife species were identified as management indicator species (MIS). These species were selected because their welfare could be used as an indicator of other species dependent upon similar habitat conditions. Indicator species can be used to assess the impact of management actions on a wide range of other wildlife with similar habitat requirements. The species selected for the Deschutes National Forest include the marten, wolverine, three-toed woodpecker, Cooper's hawk, sharp-shinned hawk, elk, golden eagle, great blue heron, mule deer, bald eagle, goshawk, spotted owl, osprey, peregrine falcon, red-tailed hawk, western big-eared bat, waterfowl, and the woodpecker guild.

The wolverine, bald eagle, spotted owl, and peregrine falcon and the associated habitat have been analyzed under the Biological Evaluation (BE) and are designated as Threatened, Endangered or Proposed/Candidate for federal listing under the Endangered Species Act. For these species and for those designated as Sensitive by the Forest Service Regional Office (Region 6), refer to the discussion in the previous section on Proposed, Endangered, Threatened, and Sensitive Species (PETS).

Table 41, lists wildlife species with special designations or status from the sources mentioned earlier (such as the Forest Plan, Natureserve, Birds of Conservation Concern, and Conservation Strategy for Landbirds). Those species known to exist or may potentially exist within the planning area are further discussed in this document. Each species potentially represents a community of animals that have specific requirements, many of the requirements overlapping with other species. Discussion of species and habitats and the effects to those species and habitats occurs throughout this Wildlife section.

Table 41: Selected Wildlife Species Summary – Kelsey Planning Area

Species	Occurrence[13]	Management Indicator Species	FWS Species of Concern	ODFW Sensitive Species	Ecological Indictor Species and Special Habitat Requirements[14]
Cooper's hawk (NTMB)	U	X			
Northern goshawk (NTMB)	U	X	X	X	X (1)
Sharp-shinned hawk (NTMB)	S	X			(4)
Red-tailed hawk (NTMB)	C	X			
Golden eagle	U	X			(6)
Osprey (NTMB)	C	X			
Great Gray Owl	S	X		X	X (1, 4-LPP,PP, 5)
Flammulated owl (NTMB)	S			X	X (1,2, 4, 5-interspersed grassy openings and thickets)
Northern pygmy- owl	S			X	(2, 7-open forests, edges)
Lewis's woodpecker (NTMB)	N	X			X (2-large snags, 7-burns)
White-headed woodpecker	U (declining, local extirpations, BBS)	X		X	X (1-PP, 2, 7-sugar pine foraging, large LOS patches)
Black-backed woodpecker	S	X		X	X (1-LPP, 7-burns)
Williamson's sapsucker (NTMB)	S (declining, BBS)	X		X	X (2-large snags, 7-higher elevations)
Pygmy nuthatch	S			X	X (1-PP, 2, 7-large trees)
Brown creeper	S (declining BBS)				X (1-MC, 7-large trees)
Olive-sided flycatcher (NTMB)	U (declining, BBS)		X	X	X (1, 2, 7 –burns, clearings, edges w/ conifers)
Hermit thrush	U				X (1-MC, 7-dense, multi-canopy conifers)
Chipping sparrow (NTMB)	U (declining, BBS)				X (7- open understory w/regenerating pines)
Rocky Mt. Elk	C	X			(7-grass, shrubs winter range)
Mule deer	C	X			(7-shrubs winter range)
American marten	S	X		X	X (1-MC, LPP, 7-CWM concentrations)
Townsend's big-eared bat (Pacific western)	S	X	X	X	(3-foraging, 6-caves)
Western small-footed myotis	S		X	X	(3-foraging, 6, 7-bark of trees)
Long-eared myotis	S		X	X	(6, 7-open forest, bark of trees)
Long-legged myotis	S		X	X	(6, 7-bark of trees)
Yuma myotis	S		X	X	

[13] **Occurrence: C** = common, **U** = uncommon, **R** = rare, **N** = not expected to occur in the project area, **S** = suspected but not confirmed, i.e. potential habitat available, **Extirpations** = no longer present, **BBS** = Breeding Bird Survey.

[14] **Special habitat requirements codes: 1** = late and old successional forest (LOS), **2** = snags, **3** = mature shrubs, **4** = dense conifers for nesting/foraging, **5** = meadows or grassy openings for foraging, **6** = special/unique habitats (rock, cliffs, caves, etc.), **7** = other, noted. **Abbreviations: LPP** = lodgepole pine, **PP** = ponderosa pine, **MC** = mixed conifer, **NTMB** = neotropical migrant bird, **CWM** = coarse woody materials (logs and limbs > 3" in diameter).

ANALYSIS METHODOLOGY

Effects on wildlife will be evaluated in terms of both amount and quality of habitat and of animal population trends (36 CFR 219.19 9(a)(2)). The following evaluation criteria have been developed in order to measure and compare effects as a result of the alternatives (including no action):

Elk and Deer Habitat (Including Shrub Habitat and Open Road Density)

Estimated hiding and thermal cover levels in relation to Forest Plan standards both within the planning area and over the landscape (Forest Plan, Pages 23 and 26).
Number of acres treated with the primary objective being to promote cover (including planting) (Forest Plan, Page 24).
Estimated winter forage (shrub) structural stage ratios in relation to desired conditions both within the planning area and over the landscape (Forest Plan, Pages 37 and 39).
Open road density in Key Elk Area and deer winter range (Forest Plan, Page 29).

LOS/OGMA and Connectivity

Estimated timeframe in which LOS structure will develop within current stands (Forest Plan, Pages 44 and 46).
Number of acres treated with the primary objective being to promote LOS characteristics (Forest Plan, Page 46).
Number of acres of LOS proposed for treatment (Forest Plan, Page 46).
Number of proposed units and acres located within a corridor (Forest Plan, Page 52).
Miles of road closed that cross corridors (Forest Plan, Page 52).

Dead Wood Habitat: Snags, Coarse Woody Material, and Green Tree Replacements

Number of acres treated that will reduce recruitment of dead wood (Forest Plan, Page 60).
Availability of snags greater than or equal to 10 inches dbh currently and in the future (Forest Plan, Page 53).
Estimated timeframe for the development of large dead wood habitat (Forest Plan, Pages 59 – 62).

Cavity Nesting Species: Black-Backed, White-Headed, and Hairy Woodpeckers and Williamson’s Sapsuckers

Estimated timeframe for the development of habitat Forest Plan, Pages 63 – 70).
Sustainability or level of risk of current and future habitat to wildfire, disease, and beetle mortality (Forest Plan, Pages 64, 66, 68, 70).

Goshawk, Cooper’s, Sharp-shinned, and Red-tailed Hawks, Great Gray Owl, Golden Eagle, Osprey, and Great Blue Heron

Number and percent of acres of potential nesting habitat degraded or eliminated (Forest Plan, Page 78).

Estimated timeframe in which suitable habitat develops (Forest Plan, Pages 77 – 79).

Bats

The maintenance and development of large snag structure (Forest Plan, Pages 59 – 62).
The diversity (ratio) of shrub structural stages (such as foraging habitat) (Forest Plan, Pages 37 and 39).

Landbirds

For the woodpecker, sapsucker, flammulated owl, and nuthatch species, the same evaluation criteria addressed under dead wood habitat and cavity nesting.
For chipping sparrows and olive-sided flycatchers, the availability of suitable habitat (Forest Plan, Pages 90 and 91).
For brown creeper and hermit thrush, criteria would be the same as those listed for LOS habitat.

Marten

The maintenance of habitat elements (such as LOS and CWM) and estimated timeframe for habitat development (Forest Plan, Pages 93 and 94).
The number of acres of potential marten habitat treated (Forest Plan, Page 94).

Species populations and distributions are not discussed in depth, as little quantitative data and a lack of current surveys are available for most species. Rather, effects on habitats are discussed, with the assumption that if appropriate habitat is available for a species, then that species occupies or could occupy the habitat. Effects on species viability were determined by assessing how the alternatives impact the structure and function of the vegetation (such as habitat) relative to current and historic availability along with population status and trend data. Inferences regarding species diversity and relative population levels were made based upon habitat quality, condition, and quantity. Where needed and applicable, professional judgment, supported by the available information, was used to assess habitat conditions and quality.

Some wildlife habitats required a more detailed analysis and discussion. The level of analysis was dependent on the existing habitat conditions, the magnitude and intensity of the proposed actions, the risk to the resources, and the significant issues identified.

The summary of the Silvicultural Report (DEIS, Forest Vegetation, beginning page 3-18) details the historical patterns and structure within the planning area. Field reconnaissance information and Geographical Information System databases provided additional information.

Table 42 lists the past, present, and reasonably foreseeable actions that were used for the analysis of cumulative effects. The effects of the following past projects were included in the existing condition discussion under each subject heading and do not appear as separate projects: Lava Pine Fiber Timber Sale (1981), Garden Timber Sale (1993), Thin Between Timber Sale (1986), Sugar Cast Assessment Area (1987), Road 1801 relocate (1987), Lunabess Hard Rock (1990), Cave Telephone Line (1990), Bug Out Timber Sale (1990), Environmental Rehabilitation of PGT-PG&E Pipeline (1991), Lava Lands ASCO/PIT Project (1997), Green Mt. Fire Salvage (1995), High Desert Demo Project (1997), PGT-PG&E Pipeline Expansion (1989), Natural Fuels 1998 (1999), Sunriver Land Exchange (1999), and Lava Lands RV Pads (2000).

Table 42: Past, Present, And Reasonably Foreseeable Actions In And Adjacent To The Planning Area	
Project Name (year)	**Potential Cumulative Wildlife Effects**
Fuzzy Environmental Assessment (2000): 50,070 acres, treating 16,295 acres); 24,230 acres in MA-7.	Deer winter range hiding and thermal cover, and forage reduction; shrub habitat alteration
Weigh and Safety Station (2000/2001): 5 acres	No anticipated cumulative effects
Improvements to Lava Lands Visitor Center non-commercial thinning (2002): 38 acres; Lava River Cave Mistletoe Reduction (2002): 29 acres	Hiding cover reduction, reduced snag recruitment
Highway 97 Barriers (2003): 3.0 miles	Migration/animal movement barrier; reduction of connectivity
18 Fire EIS (2004): 3,520 acres	Deer winter range effects, increased snags recruitment, road closures
Kelsey Fish Habitat Improvement Project (2003): 5 sites along 1.3 miles of the Deschutes River with 30 trees per site	No anticipated cumulative effects
Wickiup Dam Restoration Project	No anticipated cumulative effects
Kelsey Non-motorized Trail EA (2003): 8.4 miles	Increased recreational disturbance
Cinder Hill Grazing EA (2004/2005): 3,450 acres in Kelsey	Shrub and forage reduction
Opine Planning Area (2006): 54,625 acres, 21,375 proposed treatment acres; 29,050 acres in MA-7	Deer winter range (reduction of cover and forage)
East Tumbull Planning Area (2006): 10,555 acres, 4,210 proposed treatment acres); 2,015 acres in MA-7	Key Elk Area and Deer Winter range (reduction of cover and forage), road closures
Lava Cast Vegetation Management (2004/2005): 35,990 acres, 14,050 proposed treatment acres	Hiding cover reduction, snag recruitment reduction
Access to Lava Lands Visitor Center/Lava River Caves: closing access to Highway 97; new access road (0.8 mile) from Cottonwood to Lava River Cave; new access from Cottonwood to Lava Lands Visitor Center and Benham Falls Picnic Area (2008): 1.7 miles	Snag recruitment reduction, connectivity disruption, and increased disturbance/recreational pressure.
Newberry National Volcanic Monument Wildland Urban Interface Fuels Treatment: 20 acres	Hiding and thermal cover reduction
Widening Hwy 97 from 2 lane to 4 lanes (2007): 2.0 miles	Migration/Connectivity disruption
New Sunriver Interchange (2005-2007): 16 acres; Cottonwood Road Interchange (2005-2007): 2 acres	Migration/Connectivity disruption
Tract C Land Conveyance 40 acres and 910 acres parcels	Raptor and Cavity-nester habitat reduction, big game displacement

DEER AND ELK HABITAT

There are generally two components to big game (deer and elk) habitat: cover and forage. Big game will seasonally use different habitats. Higher elevations are normally considered summer range and lower elevations are considered winter range. Transition range is a term used to describe habitat used while an animal or herd is moving between these two habitat uses. Vegetation is used for security from predators (hiding cover), for protection against weather elements (thermal cover), and for food (forage). In the project area trees provide hiding and thermal cover, while shrubs provide forage and some hiding cover. The project area is largely made up of winter and transition range with a small part being summer range (see Figure 22, page 3-71). High quality big game habitat would be described as a secure area that also provides shelter from wind or precipitation in proximity to forage and allow free movement of individual animals.

The project area is in the northern portion of the winter range for the North Paulina deer herd. The entire winter range for this herd roughly encompasses an area from Hwy 97 on the west to the federal lands to the east, and south to approximately Watkins Butte (G. Ardt, ODFW Habitat Biologist, personal communication 2003). Big game also use the Bureau of Land Management (BLM) lands to the east in the winter, but these areas are largely forage areas. Generally cover is provided by pockets of tall shrubs and juniper trees, but would not meet the Forest Plan definition of thermal cover (M. Kuk, BLM wildlife biologist, personal communication 4/2005). The North Paulina deer herd winter range takes in a large portion of the Deer Habitat allocation (MA-7) on the eastern portion of the Bend-Ft Rock Ranger District and the portion of the Ryan Ranch Key Elk Area within the planning area. It is this scale that cumulative effects are considered useful and relevant, and will be addressed.

Fawning by mule deer generally occurs on summer range, and the quality of hiding cover (security), degree of harassment (such as from public use of roads – open road density), and availability of forage are indicators of fawning habitat quality. There are no specific areas identified within the Kelsey planning area that are known to have fawning, although it is suspected within the planning area.

Providing or protecting areas important to calving by elk is one function of the Key Elk Area (KEA) designation. The project area portion of the Ryan Ranch Key Elk Area, however, does not contain identified calving areas, and is more used by elk in the winter. Indicators of quality winter habitat for elk are similar to those for mule deer.

Humans may be perceived as potential predators and will often cause big game to flee the immediate area. Fleeing uses energy. In winter, the energy expended fleeing may exceed the amount taken in (forage) causing reduced health of the animal. Roads provide one means for human presence in big game habitat that may result in extra energy being expended to a perceived threat. Open road density of an area can help determine the quality of the habitat (such as, the higher the open road density, the lower the habitat quality).

Hiding and Thermal Cover

Existing Condition

Hiding cover is defined as vegetation capable of hiding 90 percent of a standing adult deer or elk from view of a human at a distance equal to or less than 200 feet (Thomas, 1979). Hiding cover is especially important for reducing vulnerability to hunting and poaching pressure by providing concealment in areas that have high open road densities and easy access by hunters. Hiding cover is evaluated in deer summer range (the entire Forest outside the Deer Habitat management allocation) and winter range, per Forest Plan direction. Hiding cover is not limited in the planning area (Table 43, page 3-67). Refer to Figure 20, page 3-70 for existing hiding cover. Estimates of the amount of hiding cover within the Kelsey project area were derived from field inventory and satellite imagery (ISAT).

Thermal Cover is defined as cover used by big game to moderate cold weather conditions and to assist in maintaining a constant body temperature (Thomas, 1979). Tree canopy cover conditions that provide optimal thermal cover are considered to be greater than 75 percent canopy cover in seedling and sapling stands that are greater than 5 feet in height or canopy cover greater than 60 percent in pole sized (5 to 9 inches dbh) trees and larger (Thomas, 1979). Crown cover greater than 40 percent with trees 30 feet tall is recommended for thermal cover on the Deschutes National Forest (Forest Plan M7-13). Optimal thermal cover conditions have been compromised somewhat due to low site productivity for tree growth and insect-pest infestations that have killed or severely damaged tree stands (Forest Plan M7-5). Refer to Figure 21, page 3-71 for existing thermal cover. Estimates of the amount of thermal cover were derived from field inventory, satellite imagery (ISAT), and high density stands.

Ideally, hiding and thermal cover stands would be in close proximity to foraging areas and would make up approximately 40 percent of the land area (Thomas 1979). The optimum distance between cover stands for maximum use by big game is thought to be approximately 1,200 feet with stand sizes ranging from 6 to 26 acres (Thomas, 1979). Table 43 displays the existing amount (acres) of cover and the ratio of cover to foraging habitat and applicable Forest Plan standards and guidelines. The southern portion of the planning area contains transition and summer range (Figure 18). Hiding cover standards cover all three habitat types (winter, transition, and summer range), whereas thermal cover tends to be more relevant in the winter range portions. Cook et al (2004) suggests that thermal cover may not be as crucial a component of winter habitat, and subsequent animal health and survival as the components of quality forage and hiding cover.

A majority of the 18 Fire burned through a portion of Green Mountain WHRU in deer winter range, affecting the hiding and thermal cover levels in the immediate burn area and cumulatively throughout the project area. Winter range habitat units are areas in the biological winter range of mule deer (area utilized by deer during the winter regardless of Forest Plan management allocation) ranging from 15,000 to 20,000 acres where habitat conditions and the potential effects of management activities are evaluated (Refer to Figure 23, page 3-91 for WRHU names). The hiding and thermal cover desired condition is based on a recommendation contained in the Devil's Garden - Winter Range Habitat Unit Analysis Paper (2002). Areas with moderate to high fire intensities were considered as no longer providing hiding or thermal cover. Areas with low burning intensity were considered as still being able to provide marginal thermal cover, but not hiding cover. Small areas towards the southern end of the fire boundary would fit this description (approximately 100 total acres), where thermal cover (canopy) was maintained but hiding cover was reduced by the loss of small tree density (sight distance increased).

Table 43 displays the existing amount (acres) of cover and the ratio of cover to foraging habitat in each of the Forest Plan management allocations and deer winter range habitat units. The applicable Forest Plan standards and guideline (S&G) or Goals and Objectives are displayed as the management objective; where the existing condition is below this level, that level is in **bold**. The management objectives are minimums and not necessarily the preferred or conditions for wildlife. Figure 20 displays hiding cover and Figure 21 displays thermal cover. The Green Mt and Lava River Winter Range Habitat Units were the focus of analysis because of their classification as biological winter range. Hiding cover levels exceed Forest Plan levels.

Table 43: Existing Hiding and Thermal Cover by Forest Plan Management Allocation

	Hiding Cover Acres (percent)[15]	Hiding Cover	Thermal Cover Acres (percent)[16]	Thermal Cover
Kelsey Planning Area[17] (46,050 acres – lava = 35,352 acres)	12,202 (35%)	NA		
Summer Range[18] (15,084 acres)	6,174 (40%)	30% (S&G)^[19]	NA	NA

[15] **Hiding cover** is evaluated in deer summer range (areas outside the Deer Habitat management allocation, LRMP direction). Estimates of the amount of hiding cover within the Kelsey project area were derived from field inventory and satellite imagery (ISAT);

[16] **Thermal cove**r is evaluated in the Deer Habitat and the Key Elk Area management allocations. Estimates of the amount of thermal cover were derived from field inventory, satellite imagery (ISAT), and stands considered as high stocking.

[17] **Overview only.** Not the geographic or management area in which the LRMP standards and guidelines are measured.

Table 43: Existing Hiding and Thermal Cover by Forest Plan Management Allocation				
	Hiding Cover Acres (percent)[15]	**Hiding Cover**	**Thermal Cover Acres (percent)[16]**	**Thermal Cover**
Deer Habitat (15,664 acres)	3,989 (25%)	10% (G&O)^	**3,727 (24%)**	30% (G&O)
Green Mt. Winter Range Habitat Unit (WRHU, 19,982 acres)[20]	5,158 (30%)	30% (DC)^	**4,904 (24%)**	30% (DC)
Lava River Winter Range Habitat Unit (WRHU, 8,651 acres)	2,882 (26%)	30% (DC)	2,664 (31%)	30% (DC)
Key Elk Area in Kelsey (4,604 acres)	1,599 (35%)	30% - Ryan Ranch Key Elk Area (S&G)	1,262 (27%)	20% - Ryan Ranch Key Elk Area (S&G)
Key Elk Area overall (21,462 acres)	9,104 (42%)		8,020 (37%)	

Existing hiding cover levels are, for the most part, above the management objective levels. Currently the summer range allocation approximates the ideal cover to forage ratio of 40:60. Hiding cover is generally well distributed throughout the summer and winter ranges (Deer Habitat and WRHUs) but there are areas where cover stands are either larger or smaller than what is considered to receive maximum use by big game. Stands in the northwestern portion of the planning area north of Lava Butte and stands in the Newberry Volcanic Monument are generally larger than what is considered optimum. In the Ryan Ranch Key Elk Area, the majority of hiding cover is found in lodgepole pine stands along the Deschutes River.

The existing amount of thermal cover is below objective levels of 30 percent cover, with the exception of the KEA and Lava River WRHU. The 18 Fire caused the thermal cover level within Deer Habitat winter range (MA-7), in Kelsey, to go below the minimum objective. Some thermal cover stands are larger than desired or considered optimal particularly in the northern portion of the allocation. Distances between thermal cover stands exceed the desired 1,200 feet in many areas of the northern and eastern portions of Deer Habitat. Current thermal cover levels are also below the objective level within the Green River WRHU. Distribution of thermal cover in the KEA closely matches the distribution of hiding cover.

Cook et al (2004) acknowledge that thermal cover may not be as crucial a component of winter habitat, animal health and survival as the components of quality forage and hiding cover. Thus, the fact that thermal cover levels are not meeting Forest Plan goals and objectives alone may not necessarily result in negative effects to wintering big game. The combination of effects to each component of winter habitat (thermal, hiding cover, and forage) determines the quality of the habitat and subsequently the magnitude of the effects.

[18] **Summer Range:** includes all LRMP management allocations in the Kelsey project area except Deer Habitat. Deer Habitat is evaluated separately.

[19] ^ **S&G** = LRMP Standard & Guideline; **G&O** = Goal & Objective; **DC** = Desired Condition

[20] **Winter Range Habitat Unit**: habitat units are areas in the biological winter range of mule deer (area utilized by deer during the winter regardless of LRMP management allocation) ranging from 15,000 to 20,000 acres where habitat conditions and the potential effects of management activities are evaluated.

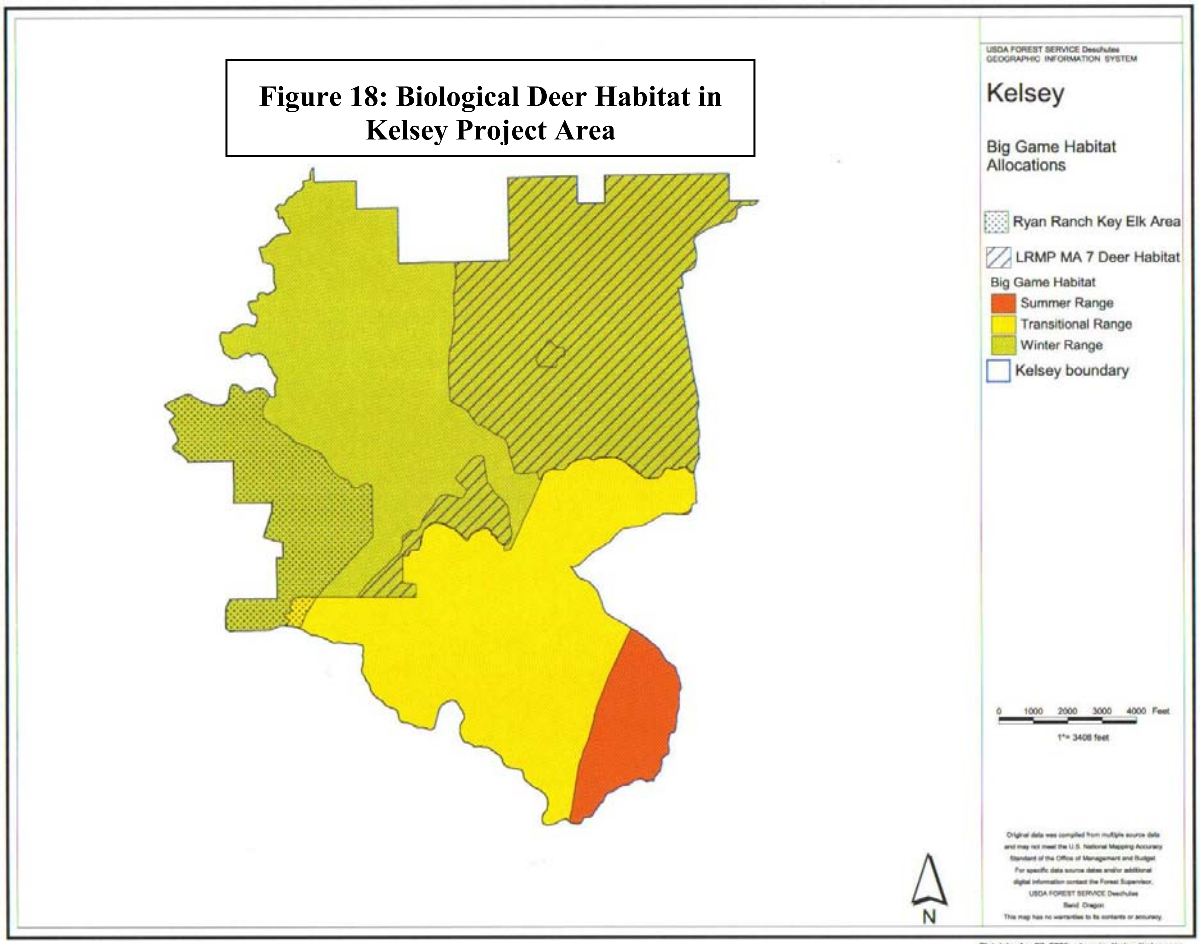

Figure 18: Biological Deer Habitat in Kelsey Project Area

The Kelsey area is in the northern portion of the winter range for the North Paulina deer herd. The entire winter range for this herd roughly encompasses an area from Highway 97 on the west to the federal lands to the east, and south to approximately Watkins Butte (G. Ardt, ODFW, personal communication 2003). Big game use the Bureau of Land Management (BLM) lands to the east in the winter, but these areas are largely forage areas. Generally cover is provided by pockets of tall shrubs and juniper trees, but would not meet the Forest Plan definition of thermal cover (M. Kuk, BLM wildlife biologist, personal communication April 2005). North Paulina herd's winter range takes in a large portion of the Deer Habitat allocation (MA-7) on the eastern portion of the Bend-Ft Rock Ranger District. It is this scale that cumulative effects will be addressed.

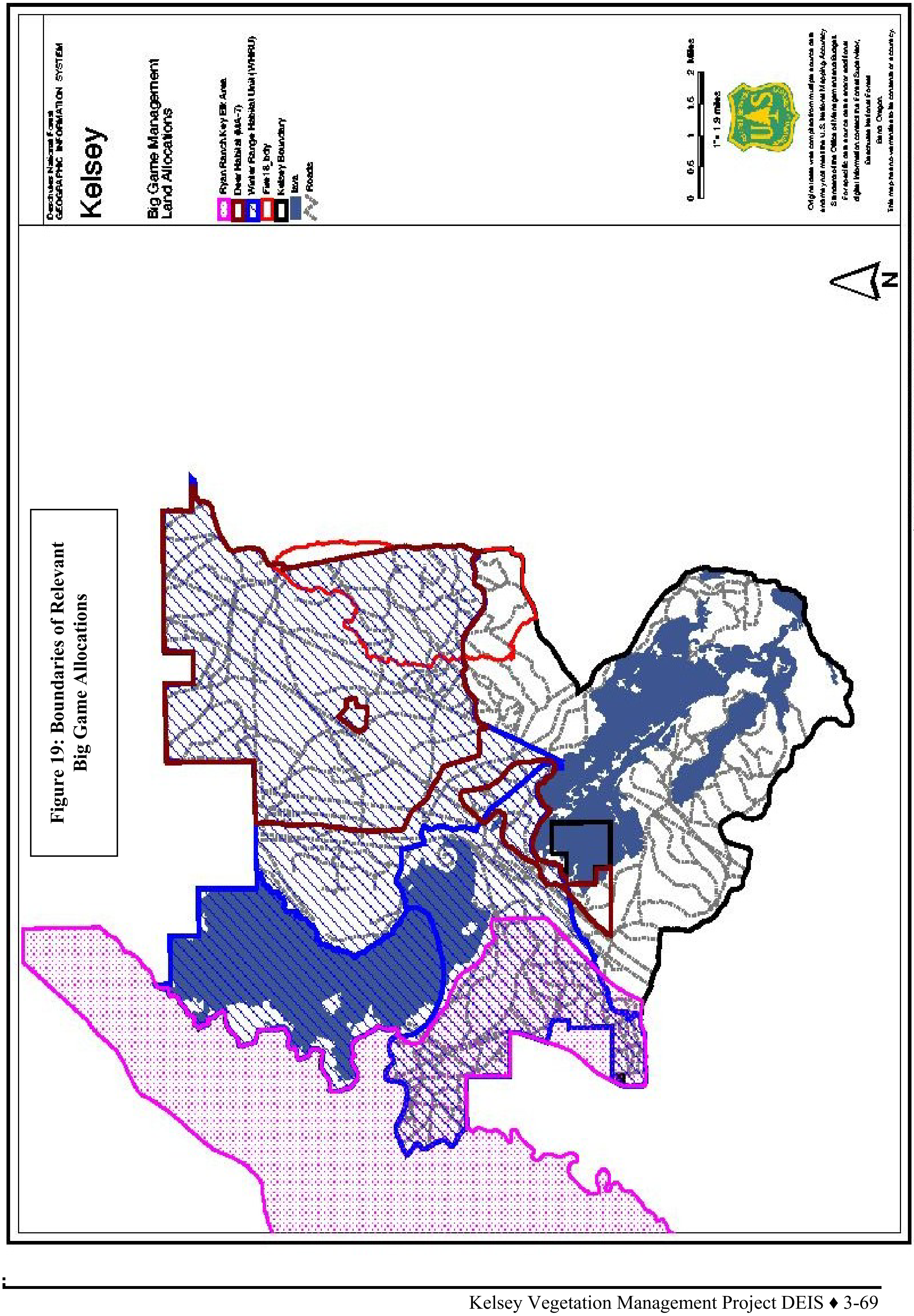

Figure 19: Boundaries of Relevant Big Game Allocations

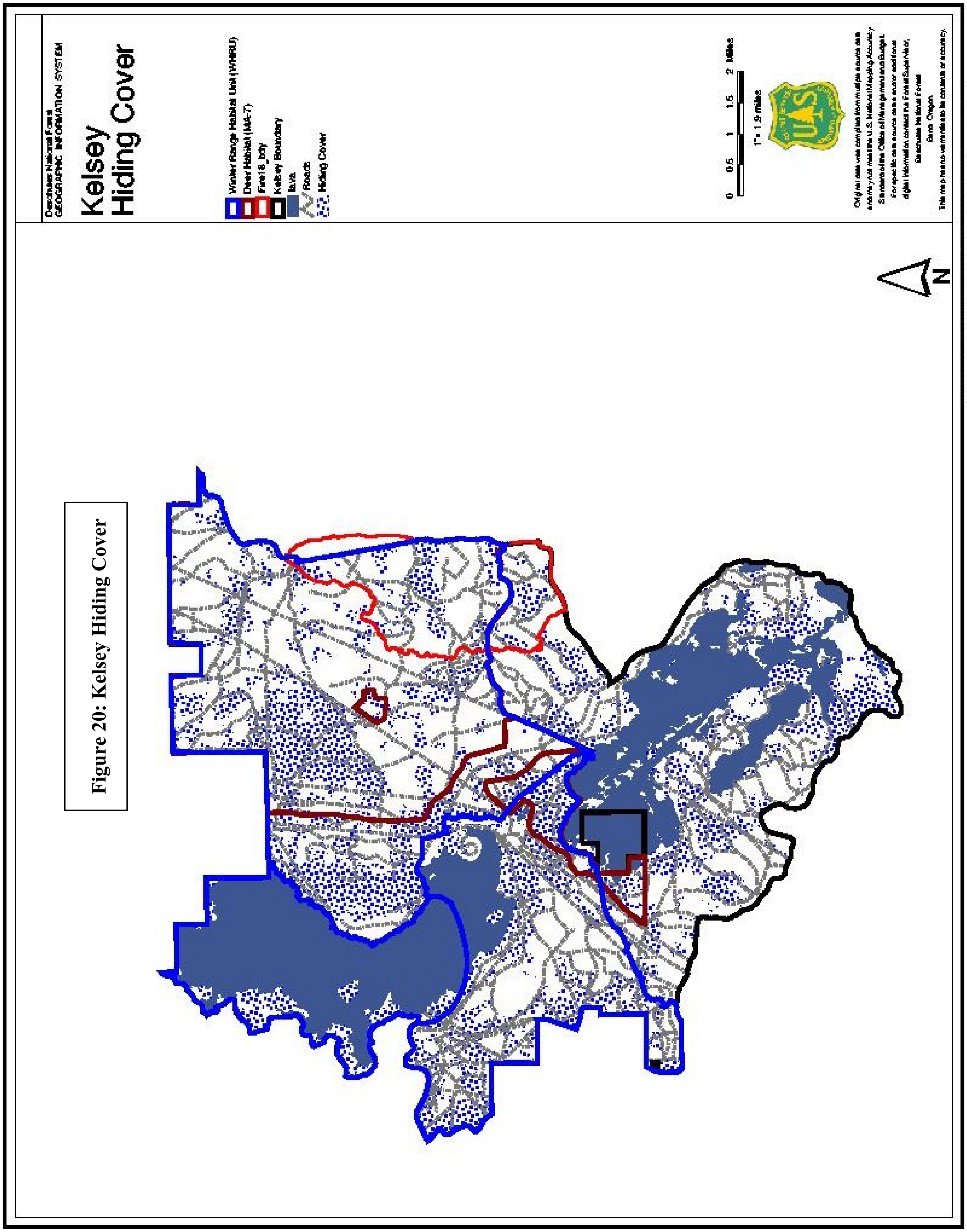

Figure 20: Kelsey Hiding Cover

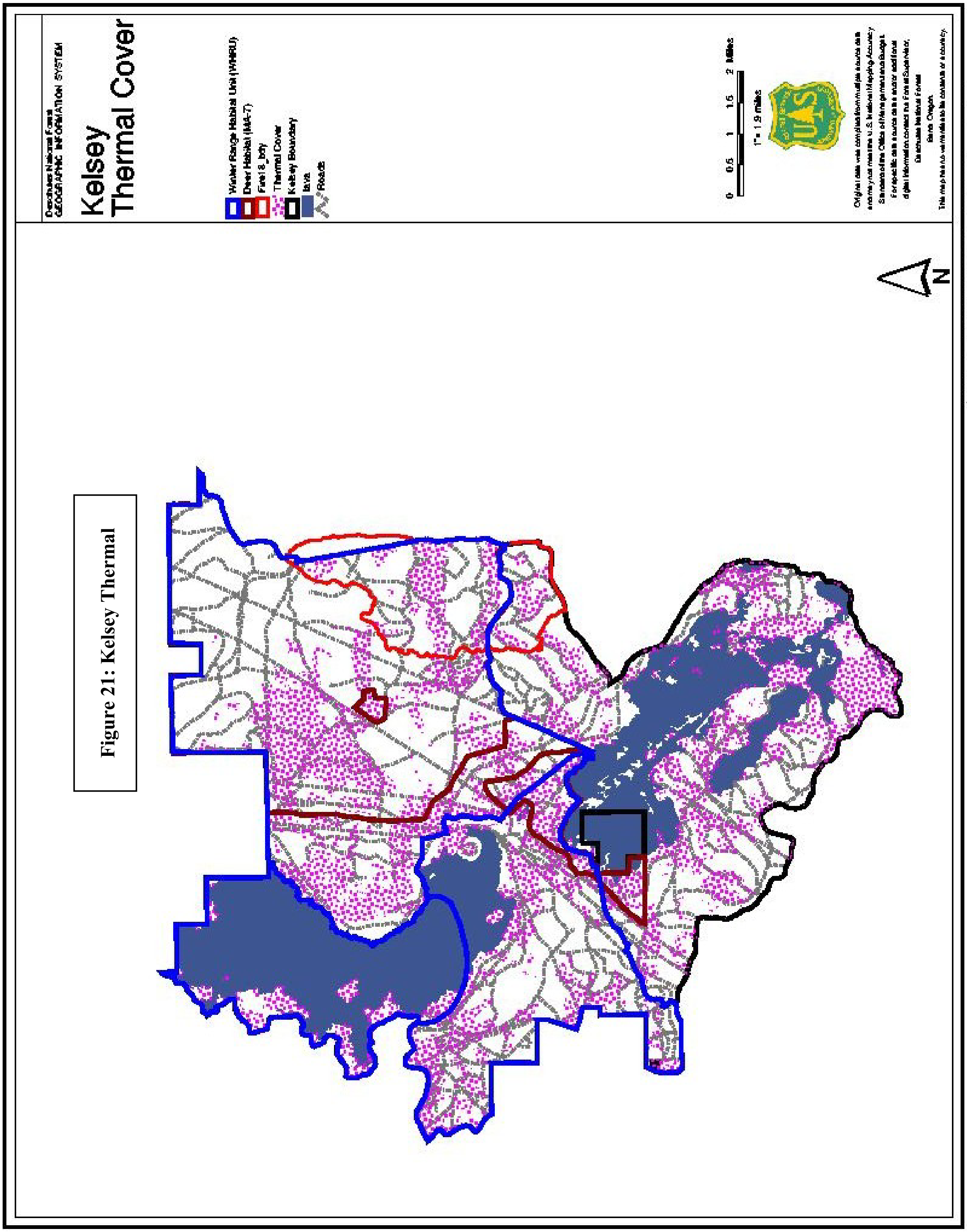

Figure 21: Kelsey Thermal

Alternative 1 (No Action)

Direct and Indirect Effects: Current quantity, quality, and distribution of big game hiding and thermal cover would be maintained during the short-term. Current levels would remain at or below the management objective within ponderosa pine stands. There would be a range of low to high quality cover, with areas where the effectiveness of the cover is low because it is part of a large patch and the interior portions of the patches cannot be utilized efficiently for forage. Long-term (greater than 20 years), hiding cover quality in some ponderosa pine stands would diminish as crowns lift and self-prune, increasing site distances. Reductions of hiding cover may be offset, however, by tree mortality caused by competition and bark beetles or other pathogens and shrub growth. Dead and fallen trees would provide visual screening, maintaining or improving hiding cover. Shrubs in many of the stands that do not currently provide hiding cover are relatively young in age. Growth of green leaf manzanita (*Arctostaphylos patula*) and snowbrush (*Ceanothus velutinus*) could provide hiding cover in some areas. Thermal cover quality and quantity would be expected to remain nearly constant over the long-term provided there are not more natural events such as the 18 Fire. Similar habitat conditions, as present across the landscape, existed within the 18 Fire perimeter. There are now large patches of little to no hiding or thermal cover. Hiding and thermal quality in mixed conifer and lodgepole pine stands would increase in quantity and quality (greater than 10 to 15 years). Regeneration of shade tolerant lodgepole pine and white fir in these stand types would provide visual screening for hiding cover and increased canopy cover for thermal cover. There would be an increased risk for habitat loss and associated human disturbance from insect infestations, disease pathogens, and wildfire.

No action would maintain the remaining cover for the short-term. The level of risk to high intensity wildfire would also remain high. This alternative would forgo the opportunity to close roads. Maintaining fire-susceptible and high beetle-risk stands for cover while still allowing the road density to remain high would not promote quality habitat. Should another fire occur, not only would cover and forage be lost, but also the high disturbance from motorized vehicles and other associated human uses would render the area poor habitat, especially during winter.

Cumulative effects: Within the past 20 years, the planning area, the rest of the Forest, and adjacent federal and private lands have experienced increased societal pressures. The human population of central Oregon continues to grow. Many of the residences that border the project area are less than 20 years old. Residences adjacent to federal lands, Wildland Urban Interface, are often high value properties. As wildfire continues to be a high risk in the adjacent forest, so is the risk to these high value homes. Social expectations along this urban interface have changed such that the wildfire risk should be minimized. Expectations to manage wildlife habitat (such as MA-7 deer habitat; deer cover and forage) and maintain the elements of good winter range (tall shrub forage, and higher canopy closure) can conflict with measures to reduce wildfire risk (maintain low shrub cover and a discontinuous canopy).

Increasing human populations increases the recreational pressure within the planning area because of its proximity to Bend and there is often early snowmelt, allowing easier and earlier access. The types of recreational use range from low-impact to wildlife (such as hiking and bird watching) to high-impact (off-road vehicle use, target shooting, and hunting). As use increases, deer and other wildlife may seek “refuge” from these disturbances on private lands where access is considerably more restricted. This also leads to more wildlife and human conflict within the urban interface. Existing tourist attraction improvements and recreational opportunities adjacent to and within the Kelsey planning area (such as the High Desert Museum, Lava Lands Visitor Center and associated developments, Lava River Cave, and Benham Falls day use area; Kelsey Non-motorized trail: 85 acres and 15.9 miles of additional improvements and safety measures [Refer to Table 42, page 64]) contribute to increases in recreational pressure, disturbance to wildlife, and the need to minimize wildfire risk.

Federal management actions have also contributed to cumulative effects to habitat. Within the winter range allocation for this portion of the district, there is one active vegetation management project (Fuzzy: commercial harvest and other vegetation treatments, 24,427 acres within MA-7 allocation) and planning areas in the planning stages (Opine planning area: 48,259 acres; East Tumbull: 2,014 acres within MA-7 allocation). . Other planning areas, that are within transitional and summer range for deer and adjacent to Kelsey, are currently in the planning stages (Lavacast, 11,108 acres and East Tumbull) or recently completed (Newberry National Volcanic Monument Fuels Treatment – 20 acres; Lava River Cave mistletoe reduction and Lava Lands Visitor Center thinning – 67 acres). Each of these efforts contain actions that would benefit deer populations and habitat (such as road closures, vegetation treatments to increase shrub growth and vigor), but the benefits may not be realized for many years following activity completion, with potential short-term negative impacts of overall reduced cover.

Within the Opine and Fuzzy project areas, deer habitat quality within the winter range allocation is/was an issue. In the adjacent Fuzzy project area, hiding cover was an issue on winter range because the Skeleton and Evans West fires converted much of the winter range to an early seral condition. An action alternative was selected and areas are being treated. The Opine planning effort addresses the lack of thermal cover. Using the same database as the Kelsey area, Opine has a thermal cover level at 25 percent. In the analysis for Opine this figure was field-checked and recalculated to actually be 6 percent thermal cover. Proposed alternatives within the analysis may result in a further decrease of thermal cover to 2 to 3 percent of the MA-7 allocation (Opine Draft Forest Plan Amendment, November 2003). Specific cover levels for Fuzzy were approximately 4 to 10 percent. Cursory analysis shows that within the winter range Forest Plan allocation used by the North Paulina deer herd, thermal cover is below the desired level (Table 44). The action alternative selected for Fuzzy and the proposed action for Opine would further reduce hiding and thermal cover levels (Table 44).

Table 44: Existing Big Game Cover Habitat Across The North Paulina Deer Herd Unit Including The East Tumbull Project Area

Cover Type		Forest Plan Target	Kelsey*	Fuzzy	Opine	Lava Cast	East Tumbull
Hiding Cover	Summer Range	30%	40%	39-44%	35%	54%	48%
	Winter Range	10%	25%	11%	9%	NA	43%
Thermal Cover		30%	24%	4-10%	6%	NA	53%

* includes the effects of the 18 Fire

The default decision made with the no action alternative is the decision to maintain the current level of wildfire risk in big game habitat. Similar stand conditions existed within the 18 Fire boundary prior to the wildfire. By not treating the stands it is expected that a wildfire within the planning area would result in loss of hiding and thermal cover. The number of these acres, additive to acres proposed under other projects are displayed in Tables 47 through 49, page 82.

The North Paulina deer herd has not met the target size (as determined by ODFW in the Mule Deer Plan, Dec. 1990) for years (G. Ardt, Habitat Biologist, ODFW personal communication, February 2004, April 2005). Although it is not likely that this is solely the result of winter range conditions, the winter range habitat may no longer be able to sustain the population objectives. There is a synergistic relationship of reduced cover, increased human disturbance, and reduced forage (see shrub discussion). The effect is that individuals in the populations will have to expend more energy in either fleeing disturbance or seeking quality food. If the animal is expending energy to deal with each of these pressures together, as would be the case in the Kelsey area, then the result is reduced health of the animal and smaller populations. Although there are no cumulative effects of the no action alternative with any past, present or foreseeable actions, foreseeable consequences as a result of no action within the area, in conjunction with foreseeable federal actions within winter range, increased human disturbance, and shifting social pressures on federal lands adjacent to urban/suburban areas, will be a continued lack of quality winter habitat and a decline in the North Paulina deer herd. Subsequent effects of this may be reduced hunting opportunities within the area and increased wildlife/residential conflicts within the urban interface.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Both action alternatives would reduce hiding and thermal cover (Table 44, page 3-73; Table 47, page 3-79; Table 48, page 3-79; Wildlife mitigations 6 and 7, page 2-43). The number of acres that would be affected by each action alternative is similar (Table 45, page 3-75). Stand densities, shrubs, and down logs that provide visual screening and hiding cover would be reduced through commercial harvest treatments, post sale thinning of smaller diameter trees (less than 7 inches dbh), and prescribed underburning.

The short-term, indirect effects of reduced amounts of hiding cover are increased vulnerability of big game to hunting and poaching. Areas of the greatest hunting pressure occur in deer summer range. Alternative 3 would provide slightly better security and areas of escapement in summer range than the Proposed Action. Alternative 3 not only retains more acres of hiding cover but also maintains several strategically located stands untreated that provide quality hiding cover in areas important for home range movements and migration. Poaching has been an issue in the Kelsey planning area, with most known occurrences in the Deer Habitat (MA-7) area. Alternative 3 also provides slightly better security in Deer Habitat than the Proposed Action. Poaching has been an issue in the Kelsey project area, with most known occurrences in the Deer Habitat area and would likely continue.

Within Deer Habitat, both action alternatives would reduce the amount of thermal cover to levels below the Forest Plan objectives. Reduced amounts of thermal cover expose individual deer to wind, deeper snow, and colder temperatures, increasing energy expenditures to stay warm and decreasing animal health. Effects to thermal cover would be mitigated by leaving untreated areas from one-half to six (6) acres in 10 percent of those units (Wildlife Mitigation 6, BG-1, page 2-43). Alternative 2 would cause the greatest immediate reduction of thermal cover (Table 45, page 3-75). Treatments are consistent with the other Forest Plan standards and guidelines including “habitat management will be designed to provide a mosaic of forested conditions (M7-10)”, “forage conditions will be maintained or improved with emphasis on increasing the variety of plants available for forage (M7-14)”, and in most cases “thermal cover will be maintained immediately adjacent to the foraging site (M7-16).”

Despite this reduction of cover, the distribution of cover and forage would improve. Treatments are generally proposed in large blocks of thermal cover that are larger than what is necessary to receive maximum use by deer and the prescriptions are varied. Both action alternatives would result in a better distribution and arrangement of cover and foraging areas, and utilization by deer, than the current condition. Alternative 2 and Alternative 3 identify treatment units for enhancing bitterbrush growth (Units 199 and 120, 106 acres). Units are designed to receive optimum use by deer and maintaining remaining thermal cover stands between the created foraging areas.

The action alternatives include a prescription in which 6 to 12 acre openings would be created over approximately 30 to 40 percent of the stand (Alternative 2, Unit 21 = 112 acres; Alternative 3, Units 21 and 442 = 224 acres). A total of 34 to 44 acres of openings would be created under Alternative 2, and 72 to 88 acres under Alternative 3. The proposed treatment units are small areas that are currently within big game winter range but not meeting hiding or thermal cover definitions. In the future, many of the stands currently functioning as hiding and thermal will transition out of this function as they are thinned, trees grow larger, and crowns lift. Stands of large diameter ponderosa pines that are at low risk to insect and disease epidemics will not achieve the definitions of hiding cover or thermal cover (see Revised Silviculture Report, Kelsey Planning Area, by B. Schroeder, July 2005). The objective of this group opening treatment is to promote deer hiding and thermal cover by increasing within the stand the vertical and horizontal vegetation structural diversity. The created openings will at first function as forage areas, then transition into hiding cover, followed by thermal cover. In the created openings all trees less than 21 inches dbh would be harvested and the openings would be replanted with ponderosa pine seedlings.

Deer frequently use the northern and northeastern portion of the project area along the Wildland Urban Interface (C. Heath, ODFW Biologist, personal communication, February 2004). Little hiding and thermal cover remains in this portion of the project area. Unit 146, Alternative 2 and unit 446 Alternative 3 provide the best patch of thermal and hiding cover in this high use area. Both action alternatives would thin and treat fuels in this area, removing habitat that is known to be high value thermal and hiding cover.

The following treatments would eliminate or substantially degrade the quality of hiding and thermal cover in those areas of treatment: seed tree harvest, overstory removal, partial removal, sanitation cut, uneven-aged management, commercial thinning, noncommercial thinning, mechanical shrub treatment (MST), and underburning. These treatments would be expected to reduce overstory and understory tree density. MST by itself would not be expected to eliminate hiding cover. Natural fuels treatments without harvest would not affect overstory tree density or canopy cover. Thinning treatments would slow recruitment of thermal cover over the long-term.

Table 45: Post Treatment Acres and Ratios of Hiding and Thermal Cover

	Hiding Cover – Alternatives			Thermal Cover – Alternatives[21]		
	1	2	3	1	2	3
Planning Area (46,050 acres)[22]	12,202 (35:65)	9,762 (28:72)	9,942 (28:72)	NA		
Summer Range[23] (15,084 acres)	6,174 (40:60)	4,640 (31:69)	4,896 (32:68)	NA		
Deer Habitat (15,664 acres)	3,989 (25:75)	3,330 (21:79)	3,400 (22:78)	***3,727 (24:76)***	***2,672 (17:83)***	***2,535 (16:84)***
WRHU: Green Mountain (19,982 acres)	5,158 (26:74)	4,361 (22:78)	4,319 (22:78)	***4,904 (24:76)***	***3,548 (18:82)***	***2,972 (15:85)***
WRHU: Lava River (8,651 acres)	2,882 (33:67)	2,169 (25:75)	2,180 (25:75)	2,664 (31:69)	2,251 (26:74)	2,236 (26:74)
KEA: Kelsey (4,604 acres)	1,599 (35:65)	1,413 (31:69)	1,502 (33:67)	1,262 (27:73)	1,076 (23:77)	1,038 (22:78)
KEA: Overall (21,462 acres)	9,104 (42:58)	8,822 (41:59)	8,794 (41:59)	8,020 (37:63)	7,834 (36:64)	7,796 (36:64)

[21] ***Bold and Italicized*** = Below minimum LRMP standards and guidelines and management recommendations provided by the Winter Range Habitat Unit analysis Process Paper.

[22] Displayed as an overview only. Not the geographic or management area in which the LRMP standards and guidelines are measured.

[23] Summer range includes all LRMP management allocations except Deer Habitat and Key Elk Area, which are evaluated separately.

Beneficial indirect effects of the action alternatives are to improve the distribution of cover and foraging areas in the short-term (less than 20 years) and the amount of cover over the long-term (greater than 20 years). Both action alternatives propose commercial treatments in cover stands that are larger than what are considered to receive maximum use by big game (cover patches with distances greater than 1,200 feet). Although commercial treatments would eliminate cover, the treatments are proposed in the portions of stands that are greater than 1,200 feet from foraging areas and are in areas that receive less use by big game. There are approximately 18 different silvicultural prescriptions for commercial harvest. Treatments would either thin stands to minimum stocking levels, reducing competition for soil moisture and nutrients for herbaceous and shrub species, or create small openings. The action alternatives also include planting conifer seedlings in many places that would provide hiding cover, approximately 15 years after planting, and thermal cover. In the long-term, the project area would provide winter range with more diverse forest structure that provides more effective forage and cover distribution.

Table 46: Indirect Effects of Action Alternatives
Acres Treated that will Promote Hiding and Thermal Cover

	Alternative 2 (Proposed Action)	**Alternative 3**
Acres Treated with the Primary Treatment Objective being to Promote Cover * Alternative 2: Units 21,34,35,38,37,47,59,60,61,64,65,66,67,111,121,125,126 152,256-265 Alternative 3: Units 21,335,338,37,347,360,61,65,366,367,411,121,125,126,152 247,256-265	1,583	1,579
Acres Planted that will Provide Cover Alternative 2: 40% of Unit 21 and Units 258, 259 Alternative 3: 40% of Units 21 and 442 and Units 258, 259	118	160
Total	1,701	1,739

* Objectives: **WL-1** - Accelerate development of single-story late or old structure (LOS); **WL-2** - Accelerate development of multi-story late or old structure (LOS); **WL-5 -** Promote deer hiding cover and vertical stand diversity within deer habitat.

The long-term result of these treatments would be an increase in thermal cover levels. The No Action alternative would maintain or cause a reduction in the present levels of thermal cover (Table 49, page 3-79).

The following is a projection of the effect to hiding cover and thermal cover more than 20 years out. As the current cover stands mature, they will likely transition out of the cover definitions. Commercially treated stands will see an immediate loss of cover, while in those not treated, the loss of cover will be more gradual. As the trees grow larger in diameter and height, tree canopy will close but there will be fewer trees per acre and the crowns will be higher from the ground. With repeated thinnings to maintain a low risk to beetle infestation and wildfire, and favor large LOS ponderosa pine, a canopy closure of 40 percent (thermal cover as currently defined in the Forest Plan) will be less common. This reduces the amount of overall hiding cover and thermal cover, although there would still be some present in the landscape. The upper stocking levels, as defined through silviculture (B. Schroeder, Silviculturist, personal communication) of large diameter ponderosa pine dos not appear to allow the simultaneous objectives of providing high quality cover and low risk to insect, disease, and wildfire.

Stands not currently functioning as cover, will mature into cover (hiding cover, then thermal cover) but then gradually, as the trees achieve large diameters (greater than 20 inches), upper stocking levels will not be able to sustain the canopy closure limit for thermal cover. Tables 48 and 49, page 79, portray these scenarios for the Kelsey area. It should be noted that to project actual cover ratios greater than 20 years out involves some speculation, and that over the entire project area there will be areas that transition into and out of cover. More importantly is the observation that it will be difficult to assure that areas of 40 percent canopy closure or higher over 30percent of the winter range acreage will be maintained while also addressing fuel reduction and low risk to beetle outbreak objectives.

Cumulative Effects: In combination with past and foreseeable actions, the trend is toward lower proportions of cover (hiding and thermal) than what the current Forest Plan guidelines set (M7-5). The 18 Fire has broken up a large cover patch, while reducing the overall levels of thermal and hiding cover within the North Paulina deer herd winter range. Thermal cover within deer winter range (MA-7 and Green Mt. WRHU) was reduced below management objectives in the Forest Plan. With other management activities, these levels are further reduced in the North Paulina deer herd winter range. Additive to the 18 Fire are other proposed commercial harvest (such as Fuzzy), past wildfires (Skeleton and Evans West), high road density, and the proximity to the Wildland Urban Interface and human population centers. The winter range becomes less effective and lower quality for the short term (less than 20 years). As units are planted with trees and shrubs respond with increased growth, over a longer period of time (greater than 20 years), cover would return (Tables 47 through 49, page 3-79). A high road density would exacerbate the low quality of hiding and thermal cover. Closing and decommissioning roads, along with a seasonal closure (Wildlife Mitigations 8 and 9, page 2-43), would help offset negative effects of reduced cover.

Over the entire biological winter range there will be a trend of decreasing quality for approximately the next 20 years. Cover and forage have been reduced by wildfires and management actions (Refer to Table 42, page 64) and will likely be reduced further through the Opine, East Tumbull, and Lavacast vegetation management projects. Recreational pressures, including motorized recreation, will continue to increase, which thus increases the amount of disturbance to wildlife in the area

There is a synergistic relationship of reduced cover, increased human disturbance, and reduced forage. The effect is that individuals in the populations will have to expend more energy in either fleeing disturbance or regulating body temperature to survive the winter, or seeking quality food. If the animal is expending energy to deal with all of these pressures together, as would be the case in the Kelsey area, then the result is reduced health of the animal and smaller populations. As a result, it is likely that big game will either 1) move to areas with better forage, cover, or less disturbance (such as private land) possibly increasing human and wildlife conflicts or 2) the big game population will decrease. Subsequent effects of the synergistic relationship of reduced cover, increased human disturbance, and reduced forage may reduce hunting opportunities within the area (over $1 million of state revenue generated in 2001from hunting fees in this unit; with approximately half of the applicants receiving tags) and increased wildlife/residential conflicts within the urban interface.

The following tables (Tables 47 through 49) summarize the direct, indirect (short and long-term) and cumulative effects to big game hiding and thermal cover in the Kelsey project area as well as the cumulative North Paulina Deer Herd Unit. The tables illustrate that in the long-term, the action alternatives would increase thermal and hiding cover levels resulting in an improved cover to forage ratio within the project area (Table 48 and 49). Within the herd unit area, the action alternatives together with past, ongoing, and foreseeable projects will result in a 1 to 3 percent further reduction in hiding cover and a two (2) percent further reduction in thermal cover (Table 47).

Figure 22: Deer Habitat Thermal Cover
Proposed Thinning Treatments

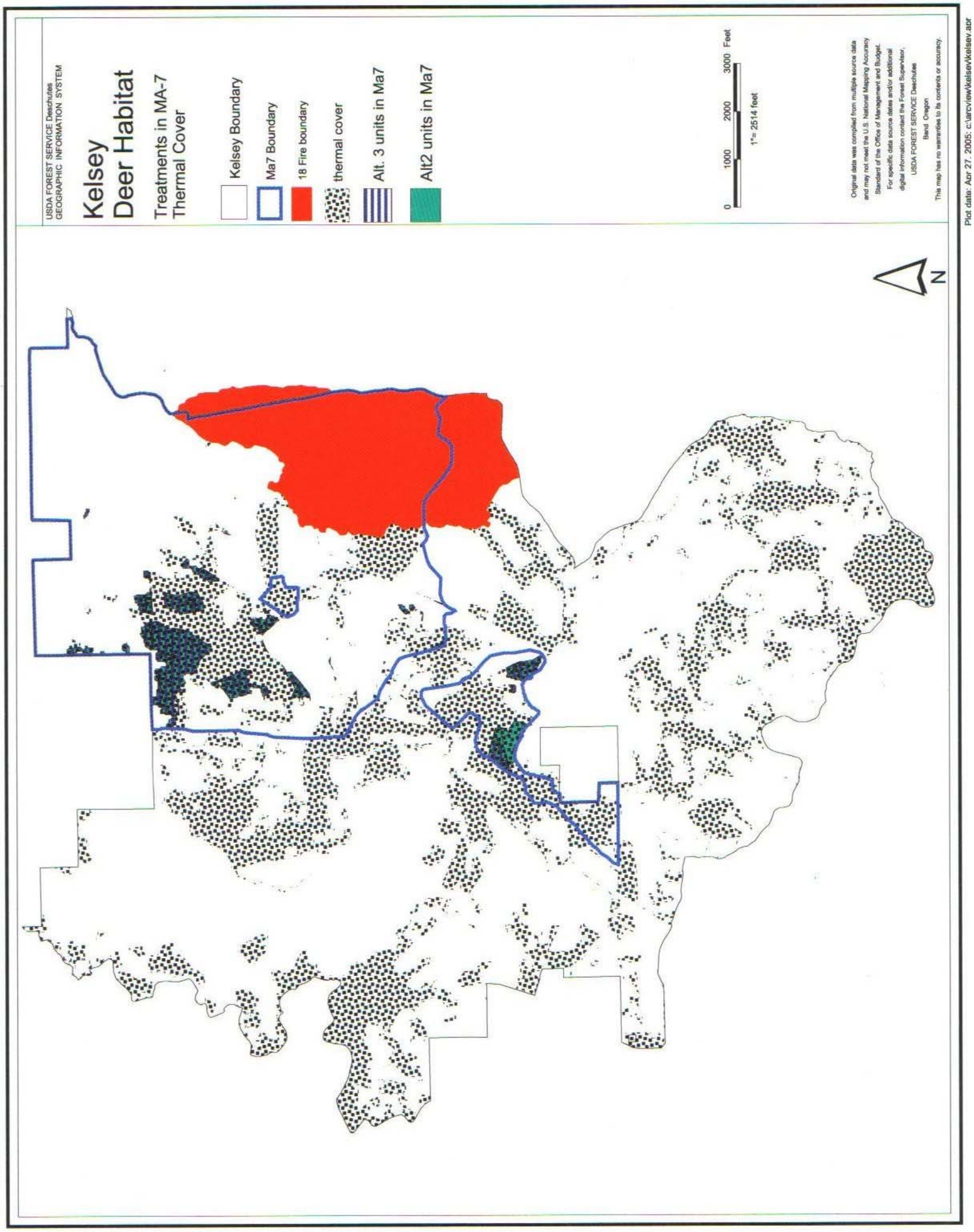

Table 47: Short Term (Acres Removed) And Long Term (Acres Developed) Effects Within The Kelsey Planning Area And Cumulative Effect Within The North Paulina Deer Herd Unit							
	Hiding Cover		Thermal Cover MA-7		Cumulative (0-20 years)		
	Acres Removed	Acres Developed	Acres Removed	Acres Developed	Average % Hiding Cover		Average % Thermal Cover[24]
					Summer Range	Winter Range	
Alternative 1[25]	3,520	---	502	---	42-43	15	11-13
Alternative 2[26]	2,193	485	1,055	1,583	40-41	14	9-11
Alternative 3[27]	1,867	513	1,192	1,579	40-41	14	9-11
Direction	NA	NA	NA	NA	30	10	30

Table 48: Summary Of Effects To Hiding Cover In The Kelsey Planning Area									
		Existing		Alternative 1 (No Action)		Alternative 2 (Proposed Action)		Alternative 3	
		Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Short-term (<20 yrs)	Acres	6,174	3,989	6,174	3,989	4,640 (-1,534)	3,330 (-659)	4,896 (-1,278)	3,400 (-589)
	Percent	40	25	40	25	31	21	32	22
Long-term (>20 yrs)	Acres	N/A		-2,382	-1,138	-1298	-410	-1,034	-320
	Percent			25	18	32	23	34	23

Table 49: Summary Of Effects To Thermal Cover In The Kelsey Planning Area					
		Existing	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Short-term (<20 years)	Acres	3,727	3,727	2,672 (-1,055)	2,535 (-1,192)
	Percent	24	24	17	16
	Ratio	24:76	24:76	17:83	16:84
Long-term (>20 years)	Acres	N/A	-502	+528	+387
	Percent		21	27	26
	Ratio		21:79	27:73	26:74

Forest Plan Consistency

Under each of the alternatives, including the No Action alternative, within the Kelsey project area and cumulatively across the MA-7 Deer Habitat allocation, thermal cover levels are below the Forest Plan goal and objective of 40 percent of land area as cover (3/4 thermal cover and 1/4 hiding cover; or 30

[24] Average percent cover is the calculated percent cover for each Kelsey alternative together with adjacent planning areas (i.e. hiding cover = Kelsey, Lava Cast, Opine, and Fuzzy; thermal cover in MA-7 = Kelsey, Fuzzy, and Opine).
[25] By not treating cover stands currently at high risk of beetle infestation and mortality, potential effects of the No Action alternative are the removal of hiding and thermal cover through stand replacing events. This is anticipated to take a relatively long time and would be considered a long-term effect. Some cover would develop over this long-term, but this newly developed cover may also be at high risk to stand replacing events. No estimates were made as to how much cover would develop under the no action alternative.
[26] **Hiding cover short-term effects:** commercial treatment with pre-commercial thinning or whipfelling; commercial thinning; underburning; and mowing with underburning. **Thermal cover short-term effects:** uneven-aged management and sanitation cut. **Hiding cover long-term effects:** units with the objective to accelerate the development of multi-story LOS; units with the objective to promote deer hiding cover and vertical stand diversity; and those acres replanted. **Thermal cover long-term effects:** units with the objective to accelerate development of single-story late or old structure (LOS).
[27] Same as 33

percent thermal cover and 10 percent hiding cover). Hiding cover will remain above the Forest Plan directed level and meet direction through mitigation measures (WL-54: "Hiding areas must be present over at least 30 percent of National Forest land in each implementation unit."

Travel corridors for big game were designated in conjunction with connectivity corridors for late-seral forest associated species (WL-56 "Travel corridors will be provided where needed…", Refer to Figure 29, page 3-107).

In the Ryan Ranch Key Elk Area, cover levels will remain above the Forest Plan desired levels under all alternatives. Mitigation measures are proposed to meet standard and guidelines: WL-47 "hiding areas must be present over at least 30 percent of National Forest lands in each key area.", WL-49 "hiding areas will be dispersed throughout the key areas", and WL-50 "thermal cover must be present over at least 20 percent of National Forest land in each key area." Following Forest Plan direction for the Ryan Ranch Key Elk Area also satisfies direction within the NNVM Plan RZ-2.

The action alternatives are consistent with the other Forest Plan standards and guidelines including: "even and uneven-aged management will be applied and may include precommercial and commercial thinnings…a crown cover greater than 40 percent with trees 30 feet high is recommended for thermal cover" (M7-5, M7-13); "forage utilization by livestock will be maintained at a level so that sufficient forage is available to support the desired number of deer "(M7-8); "habitat management will be designed to provide a mosaic of forested conditions (M7-10)", "forage conditions will be maintained or improved with emphasis on increasing the variety of plants available for forage (M7-14)", and in most cases "thermal cover will be maintained immediately adjacent to the foraging site (M7-16)." The No Action alternative does not address these standards and guidelines.

Mitigation measures BG-1 and 2 (retention clumps within commercial treatment units) to reduce adverse effects as a result of the loss of hiding and thermal cover help satisfy NNVM standards M-37, LZ-1, and TZ-3 (provide for clumps of hiding cover and some high quality hiding and thermal cover in winter and transition range).

OPEN ROAD DENSITY

Existing Condition

Table 50 displays the existing open road density and target open road density within the specified management allocations (desired based on Forest Plan standards and guidelines). Open road densities are above the target levels identified in the Forest Plan (Table 88, page 3-195).

Table 50: Present Open Road Density By Management Allocation

Management Allocation	Present Open Road Density (miles per square mile)	Target Open Road Density (miles per square mile)
General Forest (MA-8) (15,085 acres)	3.4	2.5 (Forest Plan WL-53)
Deer Habitat (MA-7) (15,665 acres)	4.3	1.0-2.5 (Forest Plan M7-22)
Ryan Ranch Key Elk Area (KEA)		0.5-1.5 (Forest Plan WL-46)
Kelsey Planning Area (4,605 acres)	6.0	
Overall Ryan Ranch (21,460 acres)	*3.8*	
Overall Kelsey Road Density	3.8	Variable

The higher than desired road density allows for increased habitat fragmentation, harassment, and fawning disturbance in both deer and key elk habitat. The Ryan Ranch Key Elk Area (KEA) includes portions of the Wild and Scenic management area and a portion of the General Forest management area. The Wild and Scenic portion contains calving areas located near the Deschutes River. It is difficult to enforce road closures because of the flat terrain within the area, and people attempt to drive around the physical barrier.

The road system provides access within critical mule deer winter range, increasing human disturbance and reducing habitat effectiveness. Roads also provide access within the KEA. Secondary roads cause the greatest reduction of habitat effectiveness and amount of available habitat. Poaching mule deer is a common occurrence. Improved forest roads or highways allowing higher vehicle speeds pose the greatest risk to wildlife mortality.

Alternative 1 (No Action)

Direct and Indirect Effects: The current open road density would be maintained in all management allocations. The No Action alternative may preclude the option of closing system and non-system roads and implementing a seasonal road closure in the Deer Habitat (winter range) area, keeping the area road density at nearly double the Forest Plan desired density. High levels of disturbance of wildlife, and increased vulnerability of big game to hunting and poaching would continue. Open road densities within the Kelsey portion of the Ryan Ranch KEA would remain high.

Cumulative Effects: In conjunction with the increase in human population and recreational pressure is the increase in use of the roads. Within this planning area and adjacent planning areas, road densities are high and it is difficult to enforce closures because of the flat terrain; people simply try to drive around the physical barrier. From a wildlife perspective, any reduction in road density would result in better habitat. The no action alternative would not close any roads within the Kelsey planning area, and some foreseeable projects may add to the existing road density (such as widening of Highway 97 – 2.0 miles, new access to Lava Lands Visitor Center, Lava River Cave and Benham Falls – 2.5 miles). As other planned projects are implemented within the MA-7 allocation, and the associated, planned road closures are implemented, overall road densities would decrease (such as the 18 Fire Salvage and Fuzzy, Table 51).

For the entire winter range allocation, road densities will remain above the Forest Plan target levels. Human disturbance, as a result of road density and an increasing population, will continue. Effects would be similar to that discussed under cover because the negative effects of a high open road density acts synergistically with the negative effects of reduced cover by providing the medium for disturbance which would cause an animal to seek refuge on private/residential land (increasing those conflicts) or to flee. More energy would be expended that affects its health which then may result in death or no reproduction, thus reducing herd numbers and reducing hunting, and associated revenue, opportunities.

Table 51: Project Road Densities In MA-7 Adjacent To The Kelsey Planning Area

Project Name	Deer Winter Range Road Density (Miles Per Square Mile)
18 Fire Salvage	2.7
Fuzzy	1.5 (another 0.5 of OHV trail)
Opine	5.0 (2.9 during hunting season)
East Tumbull	1.3 *(2.8 in Key Elk Habitat)*

Effects Common to Alternative 2 (Proposed Action), and Alternative 3

Direct and Indirect Effects: No new roads would be created. Approximately 49 miles of roads would be closed or decommissioned under Alternative 2 and Alternative 3. Road density within deer habitat would be reduced further with a four-month seasonal closure, from December 1 – March 31 within the Green Mountain WRHU and Ryan Ranch KEA (Table 52). This seasonal closure would mitigate low thermal cover levels and would reduce the risk of deer/vehicle interactions during critical springtime foraging and fawning activities (Wildlife Mitigations 8 and 9, page 2-43). Deer and elk habitat effectiveness would be improved with a decrease in road density.

Table 52: Open Road Densities Under Each Action Alternative

	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3	Target Open Road Density
Deer Habitat (MA-7) ***With Seasonal Closure***	4.3	3.6 *1.9*	3.6 *1.9*	1.0-2.5 (Forest Plan M7-22)
Outside Deer Habitat (MA-7) *Summer Range*	3.4	2.7	2.7	2.5 (Forest Plan WL-53)
Kelsey – Ryan Ranch KEA* ***Seasonal Closure***	6.0 ---	4.1 *1.3*	4.1 *1.3*	0.5-1.5 (Forest Plan WL-46)
Overall Key Elk Area ***Overall with East Tumbull Road Closures*** ***Overall with Tumalo Winter Closure***	4.6 *4.6* ---	3.8 *2.7* *1.2*	3.8 *2.7* *1.2*	

*The Ryan Ranch Key Elk Area overlaps with the East Tumbull Planning Area. Current road density for the whole key elk area is 3.8-miles/sq. mile. As a result of proposed road closures under the East Tumbull planning effort the expected overall density would be 2.7-miles/sq. mile (figures provided by S. Bigby, Road Manager, Bend Ft Rock RD, East Tumbull Summary July 2005).

The action alternatives reduce road densities toward Forest Plan target densities. The seasonal road closure would reduce road densities to within target density during the critical fawning and foraging times in Deer Habitat (MA-7) and in KEA winter habitat (not calving). Road densities would be reduced and better meet road density targets but would remain above target densities in all other allocations. High road densities would continue to provide more than desired disturbance to wildlife, but proposed closures, and seasonal closures, would improve habitat quality somewhat. The proposed closures would reduce the synergistic effect by limiting the amount of disturbance to deer and elk. Other wildlife species would also benefit from the reduced disturbance, by also reducing their energy expenditures and increasing the health of the individual.

Cumulative Effects: Projects adjacent to and within the planning area boundary that contribute to road density disturbance include the new access routes to Lava Lands Visitor Center and Lava River cave, widening of Hwy 97, and the new Cottonwood and Sunriver interchanges.

Forest Plan Consistency

Only in one instance is the target or desired road density met under any of the alternatives. Wildlife mitigation measure 8, page 2-43, to provide a seasonal road closure order for MA-7 and the Kelsey KEA would allow the desired road density to be met within these areas. More physical or seasonal closures would be needed to meet the target road densities in the other allocations. The proposed road density reduction allows road density to move toward the desired density and provides an overall net benefit.

Road densities would remain above the desired density as provided within the Forest Plan (Table 52). The Forest Plan contains direction that specifies when this situation occurs that the project biologist is to perform a further evaluation (Standard and Guidelines TS-13 and 14, M7-22, WL-46). For a further evaluation of road densities within the Kelsey project area, refer to Project Record, Wildlife Report, Appendix F. To summarize, seasonal and permanent road closures combine to help achieve the standard and guidelines and improve the existing condition. Disturbance and harassment to wildlife, as a function of the open road densities throughout the project area, would continue to contribute to a cumulative negative effect to the North Paulina Deer Herd, because the road densities remain at the higher end or exceed these thresholds. These road densities, in conjunction with other effects, contribute to declining habitat and a decline in deer numbers.

SHRUB HABITATS

Existing Condition

Providing high quality winter forage in adequate quantity and distribution to meet nutritional demands of wintering mule deer, and adequate shrub structure and patch size to maintain quality habitat for shrub associated species is a primary wildlife objective. Shrubs need to generally taller than the average snow depth and be in good condition with new growth to be considered high quality winter forage.

Late seral structure shrub habitat provides forage for wintering big game as well as habitat for other wildlife (nesting substrate, roosting, hiding cover, and perches). Mid-seral shrub habitat is able to provide some hiding, forage, and nesting habitat. The early seral shrub habitat often provides the best forage if above snowfall (such as either early or late winter or years of low snowpack).

Shrubs, primarily bitterbrush, provide critical mule deer winter forage. They also provide nesting and foraging habitat for shrub-associated species, such as the yellow pine chipmunk and golden mantle ground squirrel, and neotropical migrant birds, such as Brewer's sparrow, sage sparrow, and green-tailed towhee (Csuti et al, 2001). Many of these species, particularly the seed-caching rodents, such as the yellow pine chipmunk, serve an important ecological role in the regeneration of shrub species (Vander Wall, 1994).

As Cook et. al. (2004) summarized "among habitat attributes that can be managed, two remain fundamentally influential to energy balance: forage quality and quantity and their effect on energy intake and structural attributes of habitat that mediate energy expenditures associated with travel and harassment (such as snow intercept, security cover)." Studies cited in Cook's document found that forage quality and quantity appeared to influence big game winter survival more than the amount of thermal cover.

Eco-types represent groupings of soil and potential vegetation with similar site potentials, expected similar responses to treatments, and reflect similarities in: 1) site carrying capacity, 2) shrub recovery period, 3) plant succession following disturbances, and 4) potential for increases of undesirable plant species such as cheatgrass and rabbitbrush. The desired ratio is 1/3 early, 1/3 mid, and 1/3 late seral shrub habitat in each of the major eco-types within each WRHU. Table 54, page 3-85 displays the existing percentages in each ecotype of each winter range habitat unit.

Shrub habitats are evaluated on a winter range habitat unit (WRHU) and ecological type (eco-type) basis, per guidance and recommendations from the Deschutes National Forest Integrated Natural Fuels Management Strategy (INFMS, 1998), a Memorandum of Understanding between Bend-Ft. Rock Ranger District and Oregon Department of Wildlife (MOU No. 01-MU-11060101-016, March 2001), and the Devil's Garden – Hole-in-the-Ground Winter Range Habitat Unit Analysis Process paper (USDA 2002). These documents also compliment the Forest Plan Standard and Guideline: "M7-14 Forage conditions will be maintained or improved with emphasis on increasing the variety of plants available for forage and a mixture of age classes for shrubs…" (Forest Plan, page 4-114). Table 53 describes the characteristics of each of the major eco-types and plant association (displayed in Figure

23, page 3-91). Ecotypes represent groupings of soil and potential vegetation mapping units (ecological units) found in the Natural Resources Conservation Service (NRCS), North Lake County Soil Vegetation Survey. Plant associations are defined by Volland, 1988, Plant Associations of the Central Oregon Pumice Zone.

Table 53: Characteristics and Management Considerations of the Three Major Eco-types

Eco-type	Plant Association(s)	Shrub and Grass Potential Productivity Percent Cover)	Tree Species Potential Productivity (Percent Cover)	Management Considerations
3	Ponderosa pine/ bitterbrush/fescue (CPS2-11)* Ponderosa pine/ bitterbrush/needlegrass (CPS2-12)*	Bitterbrush trace-50% Idaho Fescue 1-40% Squirreltail: 0-5% Western Needlegrass trace-6%	Ponderosa Pine 5-60% Western juniper 0-10% Mountain Mahogany 0-10%	o Underburning reduces shrub component considerably, increases herbaceous production 3-8 times. Disturbance increases grasses.
4	Ponderosa pine/bitterbrush-manzanita/needlegrass (CPS2-13) Ponderosa pine/bitterbrush-manzanita/fescue (CPS2-17) Ponderosa pine/bitterbrush-snowbrush/needlegrass (CPS3-11)	Greenleaf Manzanita 0-40% Bitterbrush 2-43% Snowbrush 3-50% Idaho Fescue 1-23% Western Needlegrass trace-5% Squirreltail 1-10% Ross Sedge 0-5%	Ponderosa Pine 5-50% Western Juniper 0-5% Mountain Mahogany 0-20%	o Bitterbrush remains codominant or strong subordinate after disturbance; manzanita and snowbrush increase. o Bitterbrush decreases with grazing and canopy closure. o Periodic burning stimulates manzanita and snowbrush. o Goldenweed and gray rabbitbrush increase with site disturbance. o Distribution of bitterbrush and manzanita strongly regulated by Idaho fescue. o Highly disturbed sites may appear as brush fields of manzanita and snowbrush.
6	Lodgepole pine/bitterbrush/fescue (CLS2-14)*	Bitterbrush 0-25% Idaho Fescue 5-30%	Lodgepole Pine 35-60%	o Fescue dominates after ground disturbance. Fescue competition slows reestablishment of shrubs and lodgepole after logging or burning.

Shrub habitats vary widely between ecotypes (Table 54). Ecotypes 3 and 6 show a low abundance of mid-seral shrubs (Figure 24, page 3-92). Ecotype 4, under both WRHUs, approximates the desired level within each seral stage. The 18 Fire within the Green Mountain WRHU reduced the levels of late seral shrubs; converting them to an early seral condition. Table 54 displays the existing acres of early, mid and late seral shrub by WRHU and eco-type.

In a 35 year overstory and understory biomass study conducted in south-central Oregon in the central Oregon pumice zone, as defined by Volland (1985), Peek et al (2001) found that as overstory canopy closure has increased there was a decrease in the productivity of the understory, mainly shrubs. This influences mule deer forage quantity and quality. Salwasser (1979) as cited in Peek et al (2001) has reported that declines in mule deer populations were caused by low-quality diet during late-spring and fawning, that influenced fawn survival, implicating quantity and quality of spring to early summer forage conditions. This information reflects the current declines in mule deer populations within the North Paulina Herd unit, and the stand and forage conditions present within parts of the Kelsey planning area.

To quantify shrub seral stage within the WRHUs, recent events (such as wildfire) and past management activities were queried from the geographical information system (GIS) database. The following assumptions were made on the effects of various management activities and the length of time since completion on shrub seral stage (Management activities considered included: Prescribed underburn, mechanical shrub treatment, seed tree harvest, clearcut harvest, final removal, overstory removal, partial removal, shelterwood harvest, commercial thinning, precommercial thinning, and wildfire). Areas of commercial thin and precommercial thin were considered to be densely stocked and limited shrub growth from competition. After thinning reduced competition would allow shrubs to increase in abundance.

Early Seral: Management activities since 1990. Areas of commercial and precommercial thin were considered to have high tree stocking, limiting shrub growth through competition for light, water, and nutrients.

Mid Seral: Management activities completed from 1970 through 1989.

Late Seral: Management activities that were completed before 1970 and areas with no record of past management activity.

Table 54: Existing Condition – Shrub Seral Stage
By Deer Winter Range Habitat Unit (WRHU) And Major Ecological Type (eco-type).

	Green Mt. WRHU 19,972 total acres		Lava River WRHU 8,651 total acres		
Seral Stage	**Ecotype 3**	**Ecotype 4**	**Ecotype 3**	**Ecotype 4**	**Ecotype 6**
Early	2,972 (42%)	4,425 (34%)	1,849 (52%)	1,167 (36%)	139 (18%)
Mid	1,168 (16%)	4,366 (34%)	350 (10%)	1,034 (32%)	39 (05%)
Late	2,979 (42%)	4,062 (32%)	1,341 (38%)	1,048 (32%)	583 (77%)
Total*	**7,119 acres**	**12,853 acres**	**3,540 acres**	**3,249 acres**	**761 acres**

* Totals do not include the ecotypes of limited extent, or lava, so if added together they will not sum to the acres within the WRHU.

Alternative 1 (No Action)

Direct and Indirect Effects: Shrub habitats would continue to age. Mature shrubs that are above snow levels and accessible to deer (such as winter forage) would increase in abundance through time but as shrubs become decadent the nutritional quality would decline. Some natural regeneration of bitterbrush would occur, especially in the mid-seral shrub age classes, which would develop into winter forage. Herbaceous species, grasses and forbs, which are high in nutritional quality during spring and early summer periods, would decrease in abundance and diversity with accumulation of needle litter, maturity of shrubs, increasing tree density, and lack of disturbance. The desired mix of seral stages would continue to be seen in Ecotype 4 for approximately 10 to 20 years until the shrubs age which would then skew the ratio to predominantly mid and late seral stages. In Ecotype 3, the shrubs would move towards mostly mid-seral stage. The risk of wildfire and potential for loss of critical mule deer winter forage in areas outside of the 18 Fire boundary would remain high and may increase through time. It is noted that portions of the 18 Fire that burned with a high intensity were also areas that had late seral shrubs (Refer to Figures 19 and 24, pages 69 and 92). The No Action alternative would forgo the opportunity to reduce the risk of wildfire occurring in critical mule deer winter forage and the opportunity to improve the abundance of herbaceous forage.

Shrub habitat for species other than mule deer, especially those that depend upon late seral shrubs (nesting songbirds), has been reduced because of the 18 Fire. There would still be the risk of such wildfire events occurring outside of the burned area. Another such event would further reduce this type of shrub habitat, but in the short-term this habitat would remain at the current levels and distribution (Figure 24, page 92).

Cumulative Effects: Within the project area there are nearly equal levels of early, mid, and late seral structure in large patches (approximately 37 percent is early, 24 percent mid-seral, and 35 percent late). This distribution of seral structure can also be seen on an even larger scale (such as the winter range of the North Paulina deer herd), as a result of the recent, large wildfires (Skeleton, Evans West, 18 fire). Management activities such as fuels reduction and grazing tend to create more early structure.

The winter range portion of the Kelsey planning area is within one pasture of the Cinder Hill grazing allotment. Although this pasture serves as a grass bank (such as an emergency pasture in case another pasture is unavailable), either or both sheep and goats would be used within the urban interface to reduce shrub density and height. This effectively reduces winter browse. In efforts to maintain the reduction of the wildfire risk, within the Wildland-urban interface (WUI), it is assumed that late seral shrubs would not develop. The cumulative effect of recent wildfires and past and foreseeable projects in deer winter range (Fuzzy, Cinder Hill grazing allotment, and Opine) is for the shrub structure to tend to be more early seral across the landscape.

The Kelsey area would provide the largest portion of late-seral shrub structure. Moving east, early seral would be provided in larger amounts (40 percent in Fuzzy following treatments; 46 percent in Opine). Cumulatively on the landscape, the diversity in shrub seral structure will be better in the large-scale (hundreds of thousands of acres) versus the project level (thousands of acres).

An advantage to larger patches of shrub seral diversity would be more continuous habitat for the wildlife species that use shrubs for nesting, hiding cover, foraging, roosting, and perches, including the Townsend's big-eared bat and western small-footed myotis. An advantage of smaller patches of diversity would be a better distribution of foraging by big game and higher species diversity over a smaller area.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Natural fuels treatments (mechanical shrub treatment and prescribed underburning) would convert treated areas to early seral conditions. Treatments would reduce the amount of mule deer winter shrub forage and reduce the amount of cover or prey habitat for small mammals and birds (bats and bluebirds that prey upon insects that rely on shrub habitat). Spring and early summer mechanical shrub treatment and prescribed underburning could result in direct mortality of small mammals and birds that nest in shrubs, small trees, or on the ground (such as the chipping sparrow). Mortality of nesting small mammals and birds would be limited with implementation of mitigations 1 through 5, pages 2-42 and 43. Selected wildlife species (Table 41, page 61, Selected Wildlife Species Summary) potentially affected by natural fuels treatments include mule deer, elk, chipping sparrow, mountain blue bird, Townsend's big-eared bat, western small-footed myotis, long-eared myotis, and long-legged myotis. (Mitigations Neo-trop-1 & BG-5, page 2-43).

Tables 55 and 56 display the effects that each alternative would have on shrub ratios, by eco-type and WHRU. The desired condition is a ratio of 1/3 early seral, 1/3 mid seral, and 1/3 late seral shrub habitat. The Proposed Action and Alternative 3 would treat nearly the same number of acres and have nearly identical effects to shrub habitats. Treatments would move the shrub conditions away from what is desired (e.g., Ecotype 4), or result in little change from what exists. Only in Ecotype 6 would shrub conditions will actually move towards the desired condition as a result proposed treatments (Including 30 percent retention within treatment units, Mitigations BG-3 and BG-5, page 2-43).

Table 55: Post Treatment Shrub Seral Stage by Ecotype Green Mountain Winter Range Habitat Unit						
Green Mountain WRHU – 19,982 total acres						
Seral Stage	**Eco-type 3 – 7,119 acres**			**Eco-type 4 – 12,853 acres**		
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 1**	**Alternative 2**	**Alternative 3**
Early	2,972 (42%)	4,368(61%)	4,308(61%)	4,425(34%)	6,839(53%)	6,969(54%)
Mid	1,168 (16%)	812(11%)	869(12%)	4,366(34%)	2,799(22%)	2,665(21%)
Late	2,979 (42%)	1,939(27%)	1,942(27%)	4,062(32%)	3,215(25%)	3,212(25%)

Table 56: Post Treatment Shrub Seral Stage by Ecotype Lava River Winter Range Habitat Unit									
Lava River WRHU – 8,651 total acres									
Seral Stage (By Alternative)	**Eco-type 3 3,540 acres**			**Eco-type 4 3,249 acres**			**Eco-type 6 761 acres**		
	1	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Early	1,849 (52%)	2,199 (62%)	2,200 (62%)	1,167 (36%)	1,627 (50%)	1,665 (51%)	139 (18%)	202 (27%)	218 (29%)
Mid	350 (10%)	207 (6%)	221 (6%)	1,034 (32%)	832 (26%)	757 (23%)	39 (5%)	55 (7%)	38 (5%)
Late	1,341 (38%)	1,118 (32%)	1,119 (32%)	1,048 (32%)	790 (24%)	827 (25%)	583 (77%)	504 (66%)	505 (66%)

Refer to Tables 55 and 56 for the following discussion. Natural fuels treatments in Eco-types 3 and 4 in both WRHUs would reduce the amount of late seral shrub to below the desired condition of 1/3 of late seral. In both WRHUs, the amount of mid seral shrub habitat is below the desired level. The mid seral in the Lava River WRHU is substantially below the desired condition in ecotypes 3 and 6. In both WRHUs approximately half of Ecotype 3 and 4 would be early seral post-treatment. This result moves the winter range forage condition away from the Forest Plan and INFMS/MOU guidelines and recommendations. Mitigation measure BG-5**,** retain some late and mid seral shrub structure within proposed units, would help provide some habitat, although, as Table 55 shows, the ratios would continue to be skewed towards early seral with 30 percent retention. Higher shrub retention (50 percent) would maintain higher levels of late seral shrub habitat, retaining greater diversity in forage conditions, possibly benefiting individual deer health.

Effects of natural fuels treatments in Eco-type 3 (Table 53) would be to increase herbaceous species production. Post treatment, the units would be dominated by Idaho fescue. The length of time for shrubs to regenerate in this eco-type is unknown but is generally thought that it would take 5 to 10 years for shrubs to establish and approximately 30 to 40 years to attain late seral shrub conditions. While treated areas are in the early seral condition, they would provide poor winter forage (abundance, availability, and quality) for mule deer and would not be expected to receive much deer use. During the winter months when there is snow on the ground there would be little forage available above the snow level in treated areas. Mule deer would be expected to utilize mature shrubs in untreated areas between units. Although undesirable from a wintering mule deer perspective, treatments in Eco-type 3 in the Lava River WRHU (partly within the Ryan Ranch Key Elk Area) would be expected to be beneficial to elk by promoting preferred herbaceous forage species.

In Eco-type 4 for both WRHUs, both action alternatives would result in approximately one-half of the eco-type being in early seral post-treatment. Quantities of both mid and late seral shrub would be below the desired condition (Mitigation BG-5, page 2-44). Natural fuels treatments, particularly prescribed underburning, in Eco-type 4 would be expected to stimulate the growth of green leaf manzanita, a non-palatable forage species. Bitterbrush, the preferred winter browse of mule deer, is expected to regenerate with time but be subordinate to manzanita. Treated areas would be poor wintering areas for mule deer until bitterbrush regenerates. This would likely take longer than 10 years. Mule deer would be expected to utilize other stands with mature bitterbrush until treated areas regenerate with bitterbrush tall enough to be available over snow. The length of time necessary for bitterbrush to regenerate in Eco-type 4 would be less than in Eco-type 3 due to better growing conditions in this Eco-type, including more productive soils and higher amounts of precipitation.

Treatments in Eco-type 6 in the Lava River WRHU would also promote Idaho fescue. Similar to the treatments in the other eco-types, treated areas would provide poor winter forage for mule deer and would not receive much use during the winter. Treatments in this eco-type would be beneficial to elk, generally favoring herbaceous species.

Reducing the risk of wildfire occurring in mule deer winter range, would reduce the potential of eliminating large areas of critical mule deer winter forage. Wildfire fire areas are also prone to invasion of noxious weeds (such as cheatgrass and knapweed). Areas with the greatest potential for populations of cheatgrass and knapweed are in Eco-type 3 within the Green Mountain WRHU.

Proposed treatments under both alternatives move the planning area away from what is desired and recommended in the Integrated Fire Management Strategy (INFMS, 1998) and subsequent Memorandum of Understanding with ODFW (MOU, 2001). These efforts were conducted specifically in response to an aggressive fuel treatment program. Greater than 10% of the area is proposed for treatment in an area where there is not a disproportionate amount of late-seral shrubs. The action alternatives incorporate a management recommendation/mitigation to retain 30 to 50 percent of a unit treated for fuels. Although this would only provide a 1 to 2 percent increase in mid-late seral shrubs overall, it would be well-distributed and help off-set some of the negative effects of having a dominance of early seral shrubs. This would benefit other species that utilize shrub habitat.

The dominance of early-seral shrubs would likely be long-lasting. Fuels reduction treatments would likely move the shrub habitat into an early seral condition. Habitat for species dependent on late-seral shrubs and winter forage would be reduced.

Commercial thinning and regeneration cuts (creation of small openings) may aid in the development of higher quality foraging in winter and summer range as shrub growth responds to the decrease in canopy closure. Fuels treatments, especially in the wildland-urban interface, may counter-act some of these benefits. A seasonal road closure would help reduce harassment of and provide a net benefit to big game.

Cumulative Effects: The cumulative effect of the proposed treatments and reasonably foreseeable and past projects over the North Paulina Deer Herd winter range, is a trend toward more early seral conditions. This is particularly true in the lower elevation, most valuable mule deer wintering habitats along the forest boundary and adjacent to the urban interface. As fuel loading issues are addressed in the wildland-urban interface (and early seral habitats effectively maintained) and foreseeable projects are implemented, it will become difficult to achieve the desired winter forage age/structure ratios of 1/3:1/3:1/3 and other recommendations of the INFMS and MOU. Similar to the discussion for No Action, as a result of the action alternatives, shrub seral stage diversity will likely become more simplified on a small scale (thousands of acres), with better distribution of seral stages on the landscape scale (hundreds of thousands of acres); see Table 57. More than 20 years from now, the best quality habitat for late-seral shrub dependent species, will be found away from the wildland-urban interface, in the areas where the shrubs have grown back and allowed to mature.

Table 57: Shrub Seral Stage Ratios (Percent) The North Paulina Deer Herd Winter Range[1]							
Shrub Seral Structure	Fuzzy[2]	Opine[3]	Kelsey Alternative 1	Kelsey Alternative 2	Kelsey Alternative 3	Average For North Paulina Deer Herd Area	Change From Existing Condition
Early	59	26	37	53	54	41-46	+5
Mid	14	10	24	16	16	13-16	-3
Late	27	65	35	26	27	39-42	-3

1 Percentages do not equal 100% due to rounding
2 Early seral stage includes acres categorized as early/mid; Mid includes early/mid/late; and Late includes mid/late
3 Late seral stage includes the acres in the category "decadent"

Winter forage is one component of quality big game winter range. As Cook et al (2004) summarized "among habitat attributes that can be managed, two remain fundamentally influential to energy balance: forage quality and quantity and their effect on energy intake and structural attributes of habitat that mediate energy expenditures associated with travel and harassment (e.g., snow intercept, security cover)." Studies cited in their document found that forage quality and quantity appeared to influence big game winter survival more than the amount of thermal cover. The action alternatives propose treatments in each of these attributes that affects the ratios and densities of forage, cover, and roads (harassments). The action alternatives, in conjunction with past, present and foreseeable actions, would likely move forage ratios away from the desired levels; reduce road densities; and at first reduce cover, but in the long-term cover would increase. As a result of the proposed alternatives (both alternatives have similar effects), forage quality and availability will be reduced. This will likely have greater impact on winter range where it has been determined that availability of quality forage is an important factor to big game health. Similarly, Peek et al (2001) have reported the relationship of forage quality and quantity to mule deer populations and discussed the effects as the individuals move from winter range to summer range (late-spring and fawning). The alternatives will reduce road densities during the winter which will off-set some of the negative impacts from the reduced forage.

In summary, there will likely be reduced herd numbers as a result of the proposed actions in conjunction with other past, present and foreseeable projects due to the reduced cover and forage availability on winter range and increased barriers to movement due to highway projects. Reducing human disturbance through road closures will help off-set some of the reduced herd numbers (specifically as a result of reduced cover) and help reduce wildlife/human conflicts within the urban interface.

Forest Plan Consistency

Forage conditions are specifically addressed within the MA-7 allocation. M7-14 emphasizes improvement of forage conditions through increasing the diversity of forage species and age classes of shrubs. All of the alternatives will meet this direction. The No Action alternative meets this direction through the cumulative effects of wildfires and the Fuzzy project implementation. The action alternatives are additive to the ongoing activities and past disturbances.

M7-15 states "Where forage improvement activities which are not directly associated with manipulation of tree stands (crushing, prescribed burning) are planned, the size of the treatment units normally will be 300-500 acres including unmanipulated islands…" There are no proposed fuels treatment units (such as either mowing or prescribed burning or both) that are more than 500 acres. Most proposed units are less than 100 acres and are associated with "manipulation of tree stands" (such as commercial or noncommercial harvest).

M7-26 states "…Approximately 2.0-2.5 percent of this Management Area could be burned annually." Approximately 2,038 to 3,476 acres (13 to 22 percent) within the MA7 allocation, Alternatives 2 and 3 respectively, are proposed to potentially receive prescribed burning (the proposed prescription leaves the option of mowing and/or prescribed fire) over the entire planning area. The standard and guideline level would be 313 to 392 acres burned annually. Because of the high variability in weather conditions permitting prescribed burning, and the proposed acres would not necessarily be prescribed burned, it is expected that this standard and guideline can be met.

The action alternatives move the project area away from the desired conditions outlined in the Integrated Fire Management Strategy (INFMS, 1998) and subsequent Memorandum of Understanding with ODFW (MOU, 2001). Averaged over the whole deer herd winter range, presently the ratios are not as skewed as those seen on a project level basis (Table 53). The Opine project area is still in the planning phase, and these averaged figures may change when an action is proposed.

Within the NNVM Plan in the Lava Butte and Transition Zones, forage is addressed as part of the standards for big game habitat (LZ-1, TZ-2). Direction is to provide for some high quality winter forage and, for the Lava Butte Zone, 900 acres of bitterbrush away from roads and facilities. Approximately 769 acres of fuels treatments are proposed within the Lava Butte Zone. Mitigation measures to retain some untreated areas within fuels treatment areas, as well as areas other forested areas within this zone will ensure compliance with this standard.

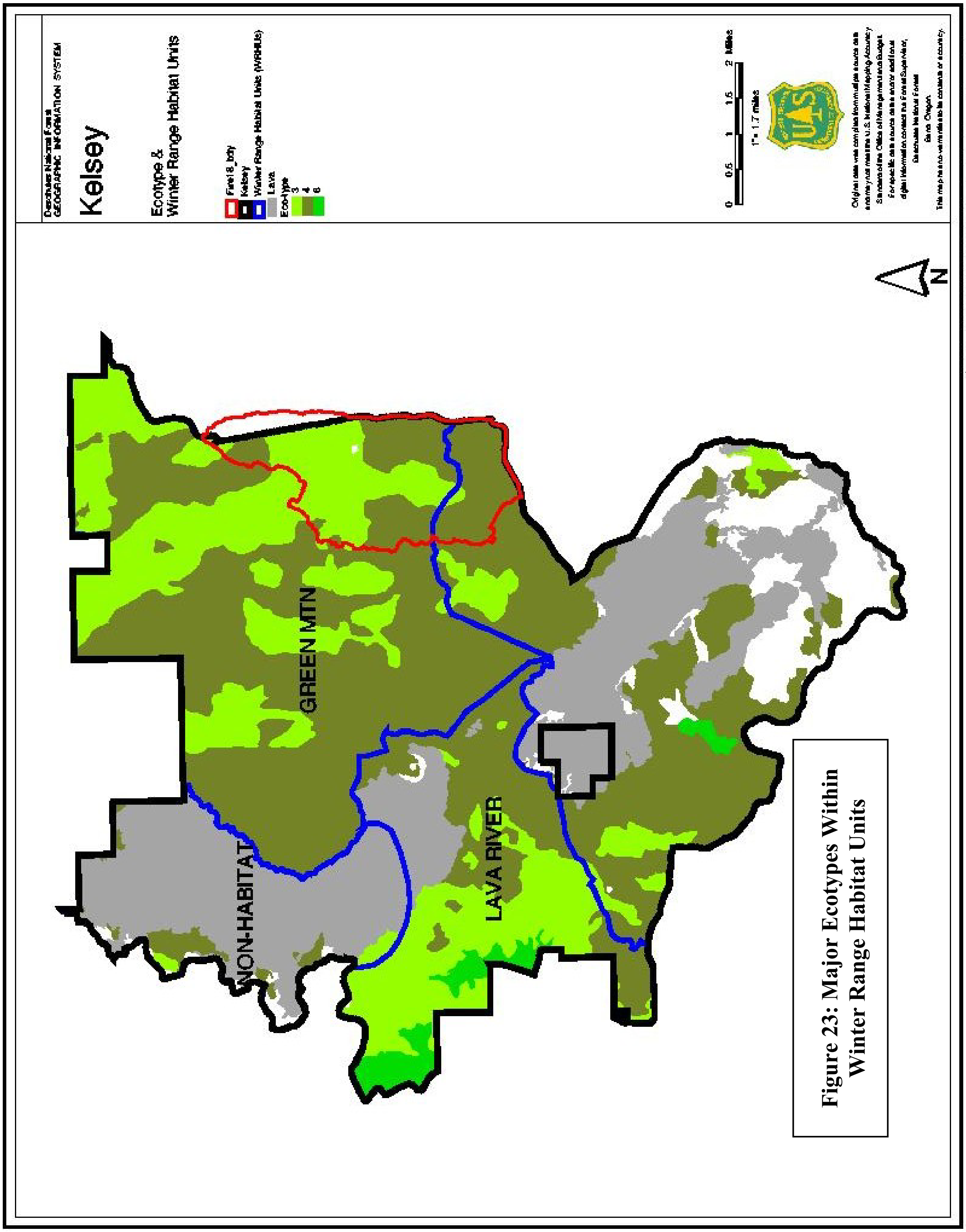

Figure 23: Major Ecotypes Within Winter Range Habitat Units

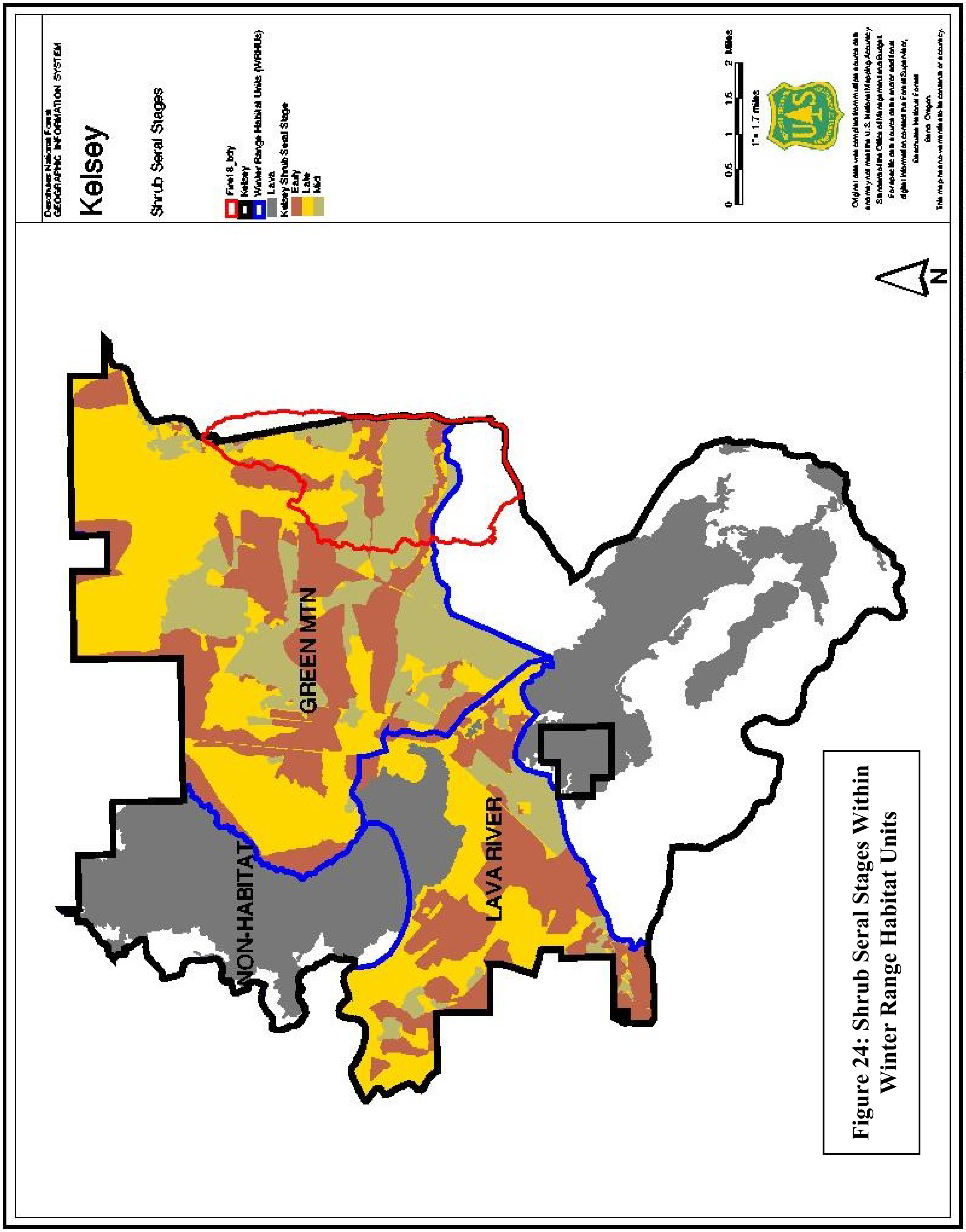

Figure 24: Shrub Seral Stages Within Winter Range Habitat Units

LATE AND OLD STRUCTURE (LOS) FOREST HABITAT, OLD GROWTH MANAGEMENT AREAS (OGMA), LOS CONNECTIVITY

Late and Old Structure Forest Habitat (LOS)

Late and old structure forest habitat is defined by the Eastside Screens as multi-strata stands with large trees (Structural Stage 6) and single strata stands with large trees (Structural Stage 7). A large tree is defined as being greater than or equal to 21 inches in dbh. Multi-stratum stands are comprised of two or more tree canopy layers and two or more size cohorts of trees. Medium and large sized trees dominate the overstory but trees of all size classes may be present. Stand structure and tree sizes are diverse. Single stratum LOS stands are comprised of a single dominant canopy stratum consisting of medium or large sized trees. Large trees are common. Young trees are absent or few in the understory. The stand may appear "park-like".

The amount of late and old structure forest habitat is limited due to extensive timber harvest in the early to mid part of the 20th century. Both structural stages 6 and 7 are below the Historical Range of Variability (HRV), defined as conditions in the pre-European settlement area.

The current proportions of the different structural stages, especially LOS (structural stage 6 and 7) is a reflection or incorporates all past actions. Because past actions have been incorporated into the current proportions, cumulative effects analysis focuses on the additive effects of the proposed actions with present and foreseeable actions. Current low amounts of LOS habitat within the planning area limit the abundance of LOS associated wildlife species in the area, such as the northern goshawk, flammulated owl, white-headed woodpecker, pygmy nuthatch, white-breasted nuthatch, and brown creeper. For further discussion of the HRV refer to pages 29 through 33. Table 58 displays the amount of LOS habitat in the Kelsey project area by structural stage, tree species, and selected LOS associated wildlife species. Figure 25, page 3-103 displays LOS habitat in the project area.

Table 58: Acres of Late and Old Structure (LOS) Habitat
Structural Stage, Plant Association Group, and Associated Wildlife Species

Structural Stage (Eastside Screens)	Plant Association Group (PAG)	Acres	HRV	Selected LOS Associated Wildlife Species
6	Lodgepole Pine Dry	144	10-35%	Northern Goshawk, Great Gray Owl, Black-backed Woodpecker, American Marten
	Ponderosa Pine Dry	160		Cooper's Hawk, Northern Goshawk, Sharp-shinned Hawk, Great Gray Owl, Flammulated Owl, Williamson's Sapsucker, Pygmy Nuthatch, Brown Creeper, Hermit Thrush
7	Ponderosa Pine Dry	0	20-55%	Flammulated Owl, Lewis's Woodpecker, White-headed Woodpecker, Pygmy Nuthatch
Total LOS Acres in Project Area		**304 (less than 1 percent of the project area)**		

Old Growth Management Areas (OGMA)

Existing Condition

Three (3) OGMAs, totaling approximately 467 acres, are within the planning area. The goal of OGMA is to provide naturally evolved old growth forest ecosystems for (1) habitat for plant and animal species associated with old growth forest ecosystems, (2) representations of landscape ecology, (3) public enjoyment of large, old-tree environments, and (4) the needs of the public from an aesthetic and spiritual sense. Old growth areas would also contribute to the biodiversity of the Forest (Forest Plan 4-149).

The distribution and minimum size of the OGMAs are based on the habitat requirements of old growth associated management indicator species (MIS). Representative MIS species are: northern goshawk – ponderosa pine forest type; American marten – mixed conifer forest type; and northern three-toed or black-backed woodpecker – lodgepole pine forest type.

In general, the OGMAs within the project area do not meet the previously identified Forest Plan goals. The majority of the areas do not provide an old-tree environment or a unique representation of landscape ecology. There are no classified LOS stands, stage 6 multi-strata with large trees, or stage 7, single strata with large trees, within the allocated OGMAs. There are portions of two of the OGMAs (a total of 116 acres) that were identified and included in the Deschutes National Forest (DNF) Large Tree Stand Mapping Project (1997) as having large diameter trees, but these areas do not have the number of large diameter trees to meet the regional old growth definition. The areas also do not possess the aesthetic or spiritual value of an old-tree environment (K. Keown, wildlife biologist, personal communication, September 2003). They do meet the goal of contributing to the biodiversity of the forest, providing habitat of other wildlife species such as the Cooper's hawk, hiding and thermal cover for mule deer, and dead tree habitat for numerous species of primary cavity excavators and secondary cavity users. There is a minor amount of suitable nesting habitat of the northern goshawk. Refer to Table 59 for an overview of these OGMAs.

Table 59: Overview of OGMAs Within the Kelsey Project Area

OGMA ID #	Total Acres	Plant Association Group	Structural Stage (Eastside Screens)* And Acres	Old Growth Characteristics?	Northern Goshawk Nesting Habitat (MIS species)	Large Tree** Acres
#32	99	Ponderosa Pine Dry	3 – 15 acres 5 – 84 acres Total – 99 acres	No; dense black-barked Ponderosa pine.	0	0
#47	155	Ponderosa Pine Dry	3 – 45 acres 4 – 38 acres 5 – 72 acres Total – 155 acres	No; scattered large trees with ponderosa pine understory	0	81 acres - 10 trees per acre ≥16" dbh
F-14	213	Lodgepole pine Dry; Mixed Conifer Dry; Ponderosa Pine Dry	3 – 55 acres 4 – 127 acres 5 – 31 acres Total – 213 acres	Yes – limited amount; mixed stand of lodgepole pine, ponderosa pine and white fir.	14	35 acres - 9 trees per acre ≥21" dbh

* Eastside Screens Structural Stages: 3 = closed canopy stem exclusion; 4 = understory re-initiation; 5 = multi-stratum without large trees.

** Areas of large trees were identified by the project, Large Tree Stand Mapping on the Deschutes National Forest, 1997.

In summary (refer to Figure 25, page 3-103), there are a total of 2,510 acres of forest that may serve as LOS habitat (304 acres in Structure Stage 6 and 6L; 2,090 acres of large tree stands; and 116 acres of OGMAs with large tree structure). This encompasses approximately 5 percent of the project area. Because these acres include the Deschutes Large Tree Mapping Project, it is a "best case" scenario of habitat and does not directly match the HRV analysis.

Alternative 1 (No Action)

Direct and Indirect Effects: Late and old structure (LOS) forest habitats and OGMAs would continue to age and mature, developing LOS characteristics (large diameter trees, large lateral limbs, snags, CWM). Earlier structural stage stands (structural stages 1 through 5) would also mature, moving these stands towards LOS habitat. High tree densities in many of the ponderosa pine stands would retard tree growth and increase the amount of time to attain large diameter trees, and also place these stands at risk to insects, disease, and wildfire and may result in loss of LOS and OGMA habitats.

In the long-term (40 years for lodgepole pine and 70 to 90 years for ponderosa pine), assuming there are no large-scale disturbances (such as fires or beetle outbreaks), a growth rate of 1 inch dbh per decade and that there are a number of large trees existing within the stands, LOS may develop from existing understory reinitiation and multi-story without large trees stands. Current LOS will likely remain LOS in the long-term. This would result in approximately 67 percent of the analysis area being in LOS condition (within the upper limits of the historic range of variability).

With no active vegetation management, this area would continue to provide forest habitat for wildlife, with a high risk to beetles and/or wildfire (48 percent of forested stands being imminently susceptible; Kelsey Silviculture report, July 2005). The result of a high intensity fire, such as the 18 Fire, eventually burning the area would be a slower recovery of habitat and associated bird communities with a higher risk of a shift of bird and other animal communities. Forest and LOS habitat, with a low risk to either or both beetles and wildfire, will be provided in the long-term (greater than 20 years) adjacent to the project area through active and foreseeable projects (such as Fuzzy, Opine and Lava Cast project areas).

The Kelsey area and the federal lands adjacent to it, has limited LOS habitat. According to the Historic Range of Variability (HRV) analysis (Table 30, page 3-29), 20 to 55 percent of the project area should be single-storied with large trees (SS7) and 10 to 35 percent multi-storied with large trees (SS6). The current ratios are 0 to 1 percent for both types. For the most part, there are areas of even-aged, uniform forest canopy where the trees are 50 to 80 years old and average less than 21 inches dbh, with some areas containing regeneration. This type of forest can provide some habitat for pygmy and flammulated owls (great gray owls with associated meadows), hermit thrush (mixed conifer associations), Cooper's and sharp-shinned hawks, goshawks, some myotis species, chipping sparrows, pygmy nuthatches, brown creeper (mixed conifer associations), hermit thrush, and olive-sided flycatchers. With current conditions, to retain this habitat would be to maintain a higher risk of losing habitat due to "natural" thinning via bark beetles and/or wildfire. It will take many years (greater than 40 years) for LOS structure to develop within Kelsey.

In areas with a frequent understory burning regime (such as ponderosa pine associations), there would be changes in bird communities with a relatively quick recovery to the community seen before the fire (Smith, ed. 2000). The Kelsey planning area, historically, had this type of regime. In this type of regime where frequent understory burning has not occurred (as present now in the Kelsey planning area), the result of a fire eventually burning the area would be a slower response and recovery of the bird communities. The indirect effect of an increased risk to the existing condition, is the increased risk of a substantial shift of bird and other animal communities.

No treatment within the OGMAs would reduce growth and vigor of trees. This would increase the amount of time needed to attain large tree (greater than 21 inches dbh) diameters and old growth characteristics, and increase the risk of wildfire and insects to OGMAs. OGMA #32 would remain as a dense black-barked ponderosa pine stand, with little old growth/LOS habitat. This OGMA would have slow tree growth and vigor and over time is expected to experience moderate to high bark beetle mortality. Mortality would increase the number of snags and CWM but these habitats would be of small diameter (approximately 7 to12 inch dbh) and less suitable for cavity dependent wildlife than larger diameter material. This OGMA would not provide suitable habitat for old growth associated species such as the northern goshawk or white-headed woodpecker but would contribute to habitat diversity, providing hiding and thermal cover for big game, nesting habitat for the Cooper's hawk, and foraging and nesting habitats of numerous species of primary and secondary cavity nesters. OGMA #47 would grow into a multi-storied ponderosa pine stand that would provide high quality nesting habitat for the associated MIS (such as the northern goshawk). Over time it would also provide quality habitat for other old growth associated wildlife species such as the flammulated owl, northern pygmy owl, pygmy nuthatch, brown creeper, and hermit thrush, as well as provide hiding and thermal cover for big game. OGMA #F-14 would continue to provide suitable habitat for the black-backed woodpecker and American marten, and a small amount (currently 14 acres) of suitable nesting habitat of the northern goshawk. This OGMA would also contribute to habitat diversity, providing hiding and thermal cover for big game and suitable snag and CWM habitat for numerous other wildlife species.

Cumulative Effects of No Action: Cumulative effects analysis for LOS and OGMAs incorporated adjacent planning areas. Because. no current or foreseeable planning effort incorporates treatments to LOS or allocated OGMAs, no additive, cumulative effects are anticipated to these areas.

The 18 Fire illustrated what could happen under the no action alternative. As a result of no action in Kelsey, this particular area would provide continuous forest habitat for wildlife but with a high risk to either beetles or wildfire or both (48 percent of forested stands being imminently susceptible, Table 35, page 35). Forest and LOS habitat, with a low risk to beetles and/or wildfire, will be provided in the long-term (greater than 20 years) adjacent to the planning area as a result of the current and foreseeable projects (East Tumbull – approximately 496 acres LOS; Fuzzy – approximately 1,010 acres LOS; Opine – approximately 11,170 acres LOS; Lava Cast – approximately 1,427 acres LOS).

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Each alternative would treat a total of 39 acres of LOS habitat to obtain the objectives of reducing beetle and wildfire risk, and accelerating the development of large ponderosa pine. Treatments would include commercial and non-commercial thinning and fuels reduction treatments (Table 60, and Table 61).

The action alternatives both identify treatments in stands containing LOS structure (Alternative 2 units 66, 87, and 136; Alternative 3 units 366, 87, 136) for a total of 39 acres for each alternative. These units are within the NNVM. Forest stand treatments within this allocation emphasize protection and management for open, park-like stands of ponderosa pine. Treatments within these units would include commercial harvest and natural fuel treatments Tables 60 and 61. Objectives within these stands include reducing beetle and wildfire risk, and accelerating the development of large ponderosa pine. Unit 136, under both alternatives, contains some LOS characteristics. Treatment objectives for this unit are to strategically reduce wildfire risk.

Table 60: Treatments Within Existing LOS

Unit	Unit Acres	Alternative	LOS Acres	Prescription
66	26	2	8	Uneven-aged management, non-commercial thin, mowing/underburning
366	26	3	8	Uneven-aged management, non-commercial thin
87	11	2,3	11	Partial removal, non-commercial thin, underburning
136	213	2,3	20	Mowing/underburning

Commercial thinning, followed by non-commercial thinning and natural fuels treatments, would have the direct effect of reducing stand complexity and density, including the removal of subordinate trees and seedlings and saplings. Trees greater than or equal to 21 inches DBH would not be thinned. Post treatment, these stands may continue to meet the criteria for structural stage 6, multi-story with large trees and would provide suitable habitat for many of the LOS associated species, particularly those associated with more open stand conditions, including the flammulated owl, and pygmy nuthatch. They may also provide foraging habitat of the sharp-shinned hawk, Cooper's hawk and northern goshawk. They would not provide dense stand conditions over a wide area that are preferred by some LOS associated species, such as the hermit thrush or nesting habitat of the Cooper's hawk and northern goshawk. As tree crowns and understory trees mature and develop (greater than 30 years), these stands would become more suitable as nesting habitat for the goshawk and Cooper's hawk.

Natural fuel treatments would directly affect shrubs, seedlings, and saplings within treated areas but would not change the structural stage classification or the amount of LOS habitat. Like the commercial harvest and non-commercial thinning treatments, the natural fuels treatments would create more open stand conditions by reducing seedling and sapling density, and simplify stand structure. Treated areas would continue to meet LOS definitions and provide suitable habitat for many of the LOS associated wildlife species. Through time the treated LOS within the NNVM units may reflect more of the stand descriptions for stage 7, single-story with large trees. This would align with the NNVM plan goals to manage for more old-growth ponderosa pine. Species that utilize mature and old-growth ponderosa pine stands (such as white-headed woodpeckers) would benefit.

Table 61: Acres of Treatment in LOS Classified Stands by Alternative

	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Acres of Combined Commercial and Noncommercial Thinning, and Natural Fuels Treatment within LOS: Alternative 2: Units 66, 87, 136 Alternative 3: Units 366, 87, 136	0	19	19
Acres of Natural Fuels Treatment Only within LOS	0	20	20
Total Acres of Treatment within LOS	0	39	39
Percent of LOS (Total 304 acres) Treated Acres	0	13%	13%

In time, the effects of the action alternatives would be: 1) to increase tree growth within LOS classified stands, providing a dominance of large diameter trees and in mixed conifer associations, multiple canopy layered stands in the future; 2) to reduce the risk of loss to wildfire by reducing ground and ladder fuels; and 3) to reduce the risk of mortality from insects, primarily bark beetles, by reducing tree competition. A component of structural stage 7 (single-story with large trees) that is currently absent would develop within the NNVM and the dry ponderosa pine associations. This would benefit species associated with this habitat type, such as the white-headed woodpecker and nuthatches. A more immediate or imminent negative effect of the proposed stand treatments is to reduce the immediate recruitment of snags and coarse woody material (CWM) by increasing tree growth and vigor. This negative aspect is offset by the increased tree growth that would in time provide for larger diameter snags and CWM suitable for a greater variety of cavity and down wood associated wildlife. Over time, treated stands would become LOS, provide large diameter trees, and large diameter snags and CWM. Table 62 displays the number of acres treated that would promote LOS habitat given time. Alternative 2 proposes to promote old growth over the most acres.

Table 62: Acres of Treatment Promoting LOS			
Objective and Units by Alternative	**Alternative 1**	**Alternative 2**	**Alternative 3**
Objective to Promote Multi-Storied LOS (Stage 6): Alternative 2: 34,35,3859,60,61,64,65,66,121,125,126 Alternative 3: 35,338,360,61,65,366,121,125,126,247	0 Acres	367 Acres	353 Acres
Objective to Promote Single-Storied LOS (Stage 7): Alternative 2: 37,47,67,111,152,256-264 Alternative 3: 37,347,367,411,152,256-264	0 Acres	964 Acres	964 Acres
Total Acres	**0 Acres**	**1,331 Acres**	**1,317 Acres**

There would be no direct effects to OGMAs or OGMA associated wildlife species. There are no treatments proposed in any of the OGMAs. Most of the old-growth/LOS habitat would remain outside of this allocation.

Without treatments in the OGMAs, tree growth and vigor would be reduced, increasing the amount of time needed to attain large tree (greater than 21 inches dbh) diameters and old growth characteristics.

The action alternatives would reduce the risk of wildfire spreading from areas adjacent to and into the OGMAs. Fuels treatments, including mechanical shrub treatment (mowing) and prescribed underburning, would reduce the amount of flammable material on the forest floor, reducing the rate of fire spread and intensity. Commercial thinning would reduce stand density, increasing the distance between trees and decreasing the likelihood of crown fire, and the potential for fire to spot to other areas including into the OGMAs. There are no treatments proposed around OGMA F-14 but the OGMA is bordered on the southwest side by a lava flow and on the northeast by treatment units of the Fuzzy project. Table 63 displays the amount of fuels treatments that are adjacent to and within 0.25 mile of the respective OGMAs. The greater the amount of natural fuels treatments within 0.25 mile, the lower the risk of fire spreading to the OGMA. Both action alternatives have similar effects. Both action alternatives have similar effects.

Table 63: Miles And Percentage Of The OGMA Perimeter Within One-Quarter (¼) Mile Of Natural Fuels Treatments			
	Alternative 1 (No Action)	**Alternative 2 (Proposed Action)**	**Alternative 3**
OGMA #32 1.7 mile perimeter	0	1.12 (67%)	1.12 (67%)
OGMA #47 2.2 mile perimeter	0	1.64 (75%)	1.95 (85%)
OGMA #F-14	0	0	0

The overall effects to OGMAs would be less reliance on these allocations as islands of habitat for late-successional dependent species. As management actions work towards increasing more resilient habitat and corridors are maintained, old growth habitat, and populations that select for them, would be more stable. The action alternatives would, in the long-term, help in establishing a wider system of LOS/old growth habitats. Activities that promote the development of LOS over time, while minimizing immediate impacts, and protecting the OGMA areas will ultimately most benefit these species.

Cumulative Effects: Over a larger area of adjacent planning areas, 133,357 acres, the current proportions and trends with LOS/old growth habitat are similar and effects within the Kelsey project area are additive to those in adjacent areas. As seen in Table 64, due to the treatments with the specific objectives to promote LOS, the action alternatives would result in a more than 400 percent increase in existing LOS within the Kelsey project area, and a five (5) percent increase in LOS over the cumulative effects area. In the long-term, as larger structure develops as a result of the other vegetation management objectives to increase health, vigor/growth, and resiliency of stands, approximately 28 percent more LOS habitat will become available (approximate acres contributed by each project area: Lava Cast: 10,000 acres, Opine: 5,060 acre, Fuzzy: 16,000 acres, Kelsey: 6,323 acres) over the whole area. Cumulative effects to OGMAs are minimal because the other planning areas have not or do not propose treatments within this allocation.

Table 64: Cumulative Effects To Old Growth/LOS Habitat (Structural Stage 6 And 7)*

LOS	Lava Cast Planning Area	Opine Planning Area	Fuzzy Planning Area	Kelsey Project Area		
				Alternative 1	Alternative 2	Alternative 3
Current LOS habitat	1,024 acres SS6 403 acre SS7	8,604 acres SS6 644 acres SS7	1,010 acres SS6/7	304 acres SS6, 6L 0 acres SS7		
# acres of existing LOS treated: Acres	577	4,640	0	0	39	39
# acres of LOS developed through the specific treatment objective	N/A	N/A	N/A	0	1,331	1,317
# acres thinned projected to develop into LOS	10,000	5,060	16,000		Approximate total: 6,323	
Trend	Without management, a slow increase but with sustained high risk of loss due to catastrophic disturbances. Objectives for acres of LOS proposed for treatment involve reducing risk to beetle/wildlife mortality.			Slow increase but with sustained high risk of loss due to catastrophic disturbances.	Immediate small-scale decrease with long-term increase and a marked reduction in risk of loss due to catastrophic disturbances.	

* The Fuzzy project area, although being actively managed, did not specifically address LOS habitat. Due to differing versions of the GIS database, amounts of LOS habitat were not readily obtainable. Amounts and trends are similar to other, adjacent proposed project areas.

Forest Plan Consistency

Eastside Screens (6. Interim wildlife standard, d. Scenario A): “DO NOT allow timber sale harvest activities to occur within LOS stages that are BELOW HRV.” 2) (a) “maintain all…live trees ≥21” dbh that currently exist. b) manipulate vegetative structure that does not meet late and old structural conditions…in a manner that moves it towards these conditions as appropriate to meet HRV.”

The action alternatives do not propose to remove any trees greater than or equal to 21 inches in diameter nor does the project propose to enter any designated old-growth management areas (MA-15). The action alternatives do propose commercial thinning within 19 acres of LOS that does not have the objective to promote LOS (Unit 87 and 36/366 under both alternatives). Activities proposed within LOS may degrade the short-term function of the LOS but will not likely completely remove its value as LOS habitat. Unit 136 under both alternatives, does not propose any commercial activities within LOS. Other proposed treatments are also expected to move the project area towards the HRV.

Late and Old Structure (LOS) Connectivity

Management Direction

Eastside Screen direction is to maintain or enhance the current level of connectivity between LOS stands and between all Forest Plan designated old growth (OGMA) habitats by maintaining stands between them. LOS stands and old growth (OGMA) habitats need to be connected to each other inside the project area, as well as to adjacent project areas, by at least two directions. Connectivity corridor stands should be those in which medium diameter or larger trees are common, and canopy closures are within the top one-third of site potential. Stand widths should be at least 400 feet wide at their narrowest point. If stands meeting this description are not available then the next best stands should be used for connections. The length of corridors between LOS stands and old growth management areas should be as short as possible.

Management direction related to maintaining travel corridors for big game (deer and elk) is provided by the Forest Plan. Travel corridors may be provided where needed by linking stands that meet hiding cover definitions for deer and elk (Forest Plan WL-48 & WL-56). For the Kelsey project, many of the big game travel/movement corridors are the same as the LOS connectivity corridors since many of the connectivity corridors were the densest available.

Existing Condition

Maintaining connectivity between habitats, particularly LOS habitat, including OGMAs, is believed to be important for numerous wildlife species. Connectivity of habitats is believed to allow free movement, interaction of adults, and dispersal of young.

Connectivity corridors, meeting Eastside Screens direction, were identified within the project area. These corridors connect all planning area OGMAs to stands classified as LOS, and to OGMAs and LOS stands in adjacent planning areas. Two corridors in the south portion of the fire area (one (1) in LOS condition and the other a big game travel corridor), although burned, were not completely destroyed. These two connections are reduced in quality and are the remaining corridors across the 18 Fire area (Figure 25, page 3-103). These corridors are considered the best available habitat rather than forest immediately adjacent but outside of the fire perimeter.

Roads also influence corridor effectiveness. Highway 97 is an effective east/west barrier to land animal movement. Forest roads do not have the same effect as a paved highway, but disturbance and harassment as a result of a high road density can reduce the effectiveness of a corridor. The Kelsey Non-motorized Trail EA (2003) has helped to address harassment on forest roads due to recreational traffic. Past, current and foreseeable actions that potentially disrupt connectivity and movement across the landscape include: Highway 97 road barriers (past action), widening of Highway 97 (future action), and the new access and interchanges around Cottonwood Road, Lava Lands Visitor Center, and Lava River Cave (future actions).

Alternative 1 (No Action)

Direct and Indirect Effects: Similar to the discussion for LOS and old growth habitat, connections to these stands would also be at risk to wildfires and beetle infestation. These linkages may provide for dispersal and movement until the surrounding treated areas develop LOS characteristics (greater than 40 years). The current levels of connectivity in the project area would be maintained given no major disturbance events occur. Approximately 1,578 acres within LOS corridors are at high risk of beetle-caused mortality. These acres are dispersed over a number of linkages. If beetle-caused mortality were to occur, connectivity would be disrupted across the landscape.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Similar to the No Action Alternative, connections with other LOS and OGMAs (MA-15) are established. As shown in Table 65, portions of corridors would have vegetation management activities. The acres affected by each of the action alternatives are nearly the same, with treatment prescriptions retaining the treated portion of the unit, within the corridor, at the upper one-third of site potential for canopy closure. Treatments would not be expected to affect the connective value of the stand, with function for movement and dispersal of wildlife continuing to be maintained.

The primary treatment objective in the majority of these stands is to reduce the risk of mountain pine beetle outbreak with the secondary treatment objective being to accelerate the development of multi-story (stage 6) LOS habitat. The prescriptions would thin stands to stocking levels that would maximize stand growth while reducing the risk of bark beetles for the next 20 years. Post treatment, these stands would continue to provide suitable connective habitat for wildlife species associated with LOS ponderosa pine (Table 41, page 3-61, Selected Wildlife Species Summary). These linkages would remain with a lower degree of risk from disruption due to a wildfire or beetle outbreak. As trees develop more full crowns and larger diameters, connective habitat would improve and provide suitable breeding habitat.

Table 65: Units Within Late and Old Structure (LOS) Corridors			
Alternative 2 (Proposed Action)		**Alternative 3**	
Unit	**Prescription***	**Unit**	**Prescription***
67	HTH, UB	367	HTH, UB
69	HSL, SPC, MST/UB	369	HSL, SPC, MST/UB
102	HTH, SPC, MST/UB	102	HTH, SPC, MST/UB
150	HTH, SPC, MST/UB	150	HTH, SPC, MST/UB
		202	HTH, SPC
		203	HTH, SPC
		204	HTH, SPC
		271	MST, SPC
Total acres in corridors	**5,117 acres**	**Total acres in corridors**	**5,117 acres**
Total acres proposed for treatment in corridor	**369 acres**	**Total acres proposed for treatment in corridor**	**437 acres**
Percent of corridor acres proposed for treatment	**7 percent**	**Percent of corridor acres proposed for treatment**	**8 percent**

*__HTH__ = commercial thin; **SPC** = non-commercial thin; **HSL** = uneven-aged management; **MST** = mowing; **UB** = underburning

Roads do cut across the corridors. Ideally, a corridor would not have barriers, such as roads, to disrupt movement. Roads going through corridors, although narrow, may limit movement of small, ground-dwelling species. Forest roads that intersect corridors are not expected to have measurable impacts to birds, such as forest hawks, or large mammals, such as mule deer. Both alternatives propose to close or decommission approximately 49 miles of road. Approximately 5.3 miles of these roads intersect corridors. The quality of those individual corridors would improve with road closure. A seasonal closure within deer winter range and KEA would increase the quality of 6 or 7 LOS corridors.

Cumulative Effects: Designation of connectivity corridors across the project area would provide linkages to old growth areas throughout this portion of the district. This would help to assure opportunities for movement and dispersal for species that select for closed forest canopy. Similar to the discussion under LOS habitats, the corridors would remain intact without localized beetle outbreak or wildfire. Loss of connectivity due to tree mortality would disrupt movement within the project area and across the landscape.

Past, current and foreseeable actions that potentially disrupt connectivity and movement across the landscape include: Highway 97 road barriers (past action), and the future actions of widening of Highway 97, and the new access and interchanges around Cottonwood Road, Lava Lands Visitor Center, and Lava River Cave. Major roadways can provide a barrier to movement. Highway 97 is an effective east/west barrier to land animal movement. Forest roads do not have the same effect as a paved highway, but disturbance and harassment as a result of a high road density can reduce the effectiveness of a corridor. The Kelsey Non-motorized Trail EA (2003) has helped to address harassment on forest roads due to recreational traffic.

Additive effects as a result of the proposed alternatives would be minimal and not useful nor relevant to the decision of an alternative because by and large the designated corridors will not receive treatment that would eliminate their function. Effects could be more pronounced in the event of a large wildfire or beetle-mortality that eliminates large areas of forested cover.

Forest Plan Consistency

Eastside Screens, #6 Interim wildlife standard, d. Scenario A, 3) "Maintain connectivity and reduce fragmentation of LOS stands by adhering to the following standards…(1) …a contiguous network pattern by at least 2 different directions…(2) canopy closures are within the top one-third of site potential. Stand widths should be at least 400 ft. wide…(4) Harvesting within connectivity corridors is permitted if all the criteria in (2) above can be met, and if some of understory…is left in patches or scattered to assist in supporting stand density and cover. Some understory removal, stocking control, or salvage may be possible activities, depending on the site."

All alternatives meet Forest Plan and Screens direction by the designation of corridors connecting OGMAs and LOS habitat by at least two ways (Figure 25, page 103). Vegetation treatment proposed within any corridors will meet the above criteria. The alternatives also meet the big game travel objectives within the Forest Plan and NNVM Plan.

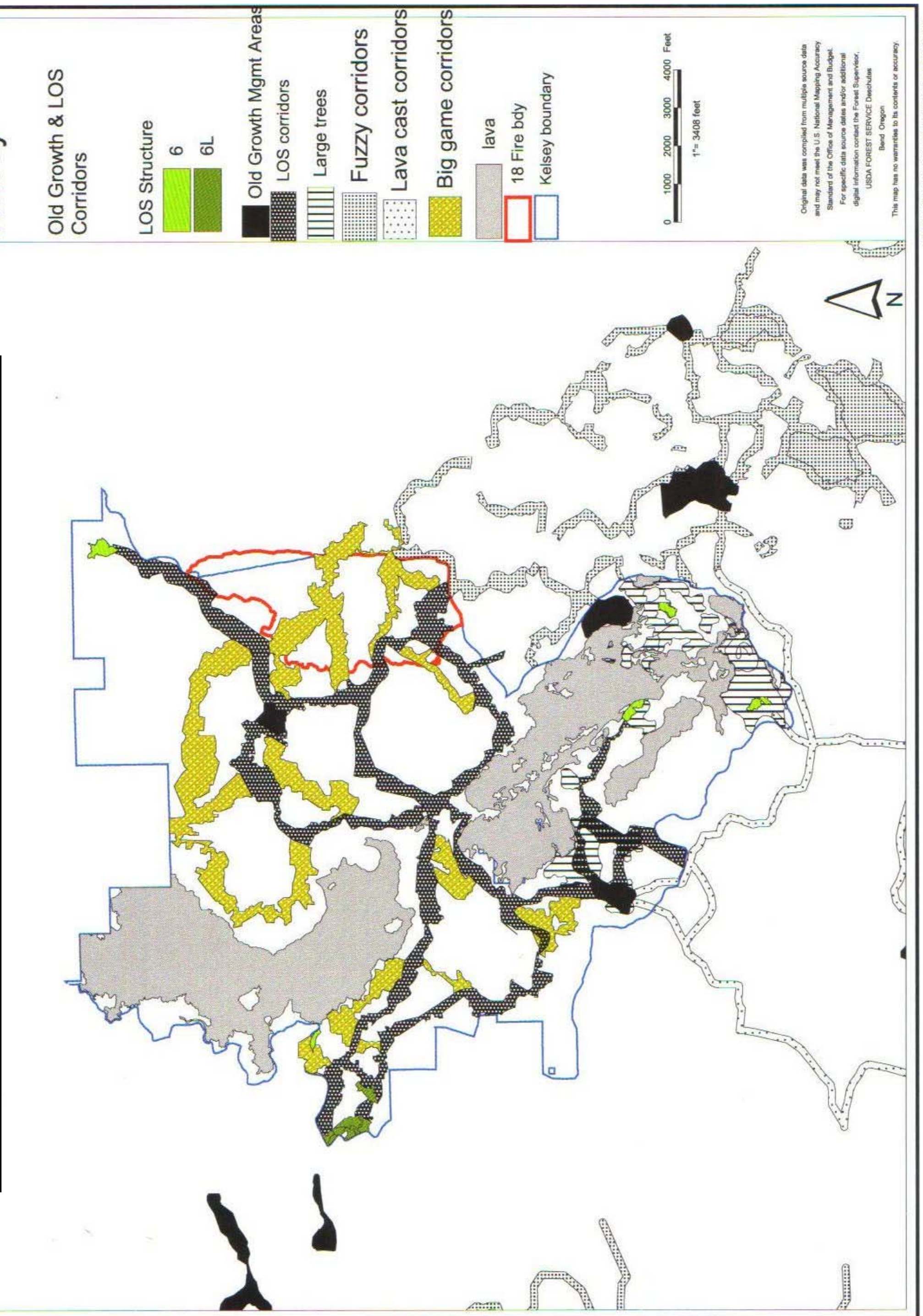

Figure 25: OGMAs, LOS And Corridors In The Kelsey Project Area

DEAD WOOD HABITAT AND GREEN TREE REPLACEMENT

Snags

Existing Condition

Numerous species of animals use snags and coarse woody material (CWM) for foraging, nesting, denning, roosting and resting. A snag is defined as a dead tree that is over 10 inches dbh and taller than 10 feet. Coarse woody material is considered to be dead and down material that is greater than 8 to 10 inches in diameter. The most notable species that use snags and CWM are the primary cavity nesters; woodpeckers and nuthatches that excavate nest cavities in decayed wood in standing trees. Vacated cavities are subsequently used by many other birds and small mammals (secondary cavity users). Selected wildlife species known or suspected to occur in the Kelsey planning area that utilize these habitats include the flammulated owl, white-headed woodpecker, black-backed woodpecker, Williamson's sapsucker, pygmy nuthatch, brown creeper, American marten, western small-footed myotis, long-eared myotis, and long-legged myotis. Refer to Table 41, page 61, for species management status and occurrence within the planning area.

Desired conditions of snag and CWM habitat were determined using current direction and newer research, including the DecAID (Decayed Wood Management Advisor; Mellen, et al 2003). A complete description and methodology for using this tool can found in the Project Record, Appendix 3. The DecAID Advisor is a web-based advisory tool to help managers evaluate effects of forest conditions and existing and proposed management activities on organisms that use snags and downed wood. This tool uses the best available science and most recent research for species dependent on snags and coarse woody material. Densities are given in the form of tolerance levels at the 30, 50, and 80 percent levels. Using the inventory data, an 80 percent tolerance level means that 80 percent of the area in this habitat and structural type had less than the reported number of snags and 20 percent had greater than the reported number. Information in regards to existing snag and log densities and sizes were available through stand exam data and other similar sources.

The Kelsey project area is predominantly the ponderosa pine/Douglas-fir habitat type with small to medium sized trees. There are areas of LOS that would be considered as the large-tree component. For the lodgepole pine habitat type, Rose et al (2001) and Ohmann and Waddell (2002) were used to consider an appropriate level of snags and logs. In these documents, figures representing the means (or averages) were translated as the 50 percent tolerance level (K. Mellen, personal communication, February 2005; see a Statistical Basis for DecAID). From this point, plant series, fire regime, topography, and structural condition were all taken into consideration to arrive at an appropriate tolerance level for which to manage (Table 66, page 3-108). Newly created snags as a result of the 18 Fire are incorporated into the cumulative effects analysis. Although a much larger area was considered in the analysis, habitat type delineations for the Kelsey project area are illustrated on Figure 26, page 3-106. Effects to snag and log levels within the larger analysis area are found within the cumulative effects discussion.

Table 66: Comparison of DecAID and associated literature[28] reported range of snag densities (snags $\geq$ 10" dbh/ acre) to directed and existing levels within the Kelsey DecAID analysis area.

Existing Snag Levels, Current Direction, and DecAID	Tolerance Level (TL) for Habitat and Structural Type[29] Ponderosa Pine (PP)/Douglas Fir (DF) and Lodgepole Pine (LP)				
	50% TL		80% TL	50% TL	50% TL
	PPDF S/M	PPDF Large	PPDF S/M	LP Early Seral	LP Mid Seral
DecAID & Associated Literature	2.7 snags 1.1 $\geq$ 20"dbh	6.5 snags 3.6 $\geq$ 20"dbh	7.3 snags 2.5 $\geq$ 20"dbh	6-7 snags 0.3 $\geq$ 20"dbh	10-12 snags 1 $\geq$ 20"dbh
Current Screens Direction[30]	4 snags, 1 $\geq$ 20" dbh			6 snags	
Existing within the Kelsey Planning Area	1.49 snags 0.09 $\geq$ 20"dbh	1.49 snags 0.09 $\geq$ 20"dbh	8.69 snags 1.12 $\geq$ 20"dbh	2.21 snags 0.06 $\geq$ 20"dbh	
Existing: Kelsey, Opine, 18 Fire Salvage and Lava Cast combined[31]	8.3 snags 1 $\geq$ 20" dbh	1.49 snags 0.09 $\geq$ 20" dbh	5.3 snags 1.5 $\geq$ 20" dbh	2.7 snags 0.6 $\geq$ 20" dbh	

Using the studies and information within DecAID, it is entirely expected and realized within this analysis area that distribution of snags will be clumpy (some areas have no snags while others have many snags). Since most of the planning area falls within the small/medium tree types, the clumps of snags would be expected to be small (2 to 5 per acre) with the majority of these snags being less than 20 inches dbh. The large tree type would have more of the larger snags.

Due to historical harvesting methods and the current age of the stands, the project area is below the levels portrayed in DecAID in the PPDF Large habitat type and overall for snags greater than 20 inches dbh, Table 66. The higher density of snags 10 to 19.9 inches dbh in the PPDF Small/Medium 50 percent tolerance level (small to medium sized trees in the ponderosa pine PAGs) in the larger analysis area, and PPDF Small/Medium 80 percent (dry mixed conifer PAG) for the project area (Table 66) may also be the result of historical harvesting and the existing predominance of dense, younger-aged stands throughout the area. Low densities in the lodgepole habitat types may be the result of past salvage and hazard tree removal around popular recreational sites (such as the Deschutes River).

Coarse Woody Materials (CWM)

The DecAID advisory tool gave downed log (CWM) recommendations in terms of size and percent of area covered by downed material. Using the DecAID analysis and background information, in the unmanaged areas, all of the PPDF acres had some coarse woody material and most of it was greater than or equal to five (5) inches dbh. There are very few large concentrations and few large pieces. This suggests that even in the driest areas, some coarse woody material can be retained.

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[28] Mellen et al (2003), Rose et al (2001), and Ohmann and Waddell (2002).

[29] Habitat type determined using DecAID and the plant association groups within the planning area. PPDF = Ponderosa Pine/Douglas-fir. Small/Medium trees refers to the average tree diameter size throughout the type, generally less than 20" dbh. "Large Tree" are areas where the average diameter was 20" or larger. This habitat type includes all associations with large trees (structure stages 6, 6L), even mixed conifer-dry associations, because of the capability to support larger diameter snags. S/M= small/medium trees; L= large trees; Early = early seral; Mid= mid-seral (mature stands without large trees; literature did not have the lodgepole associations in a "late" seral condition). The 80% tolerance level was chosen to take into account the mixed conifer plant association group. Mixed conifer stands within the planning area reflect a higher moisture regime and better capability to support higher snag levels.

[30] Current direction calls for 100% maximum population potential (MPP) based on most recent research. Rose et al (2001) states that is a flawed technique. Refer to Project Record, Wildlife Report, Appendix 3..

[31] Represents an average of the snag densities within each of these planning areas.

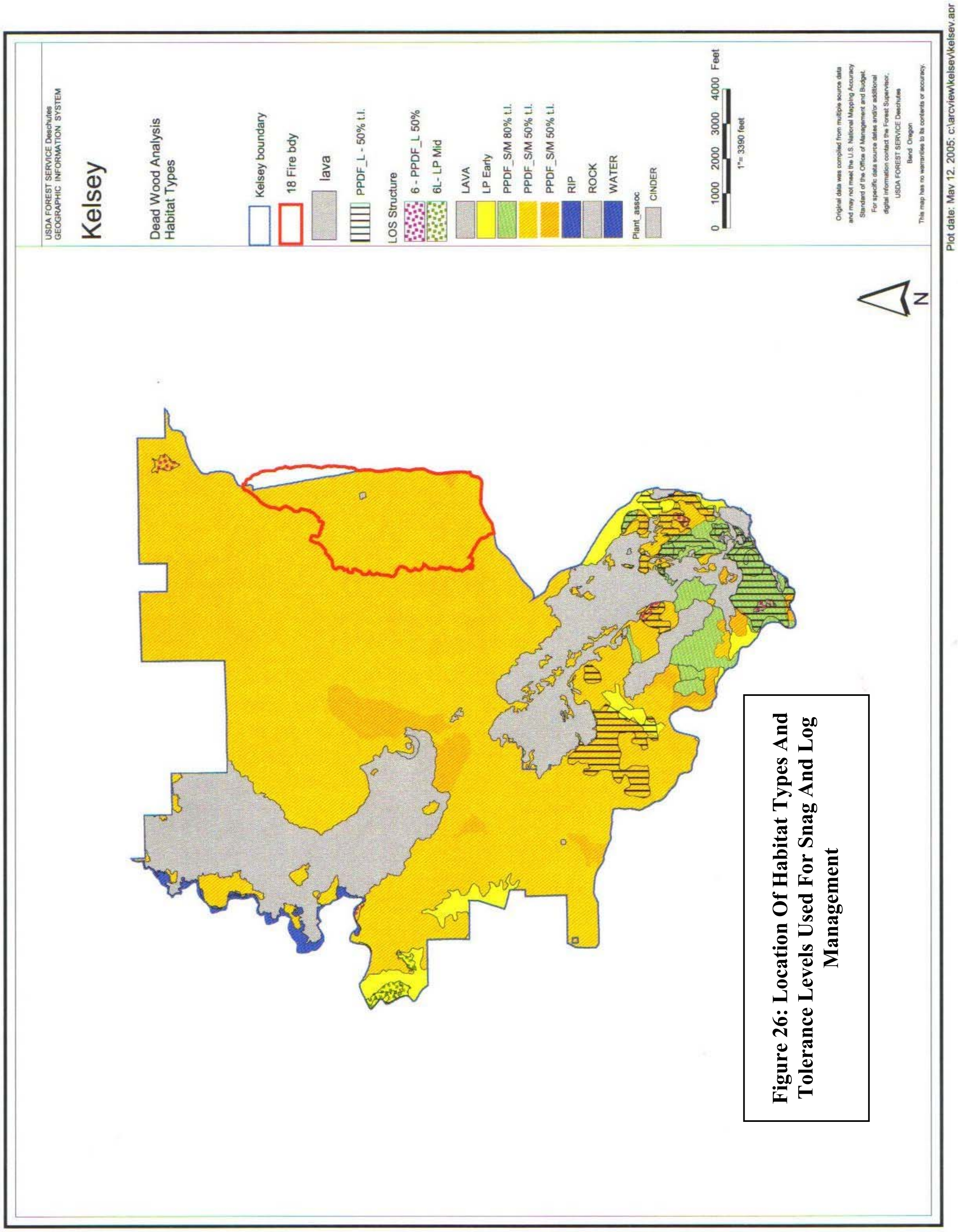


Figure 26: Location Of Habitat Types And Tolerance Levels Used For Snag And Log Management

Table 67 shows that the current CWM levels within the project area are similar to those seen in the DecAID regional averages. It is assumed that since these levels are similar, the directed levels are currently being met in the project area.

<table>
<tr><th colspan="4">Table 67: Comparison of Existing and DecAID/Ohmann and Waddell (2002) Coarse Woody Material (CWM) coverage by Habitat Type</th></tr>
<tr><th>Habitat Type</th><th>DecAID/ Ohmann and Waddell (2002) level of CWM[32] ≥ 6 feet long</th><th>Existing (not broken into structure size)</th><th>Directed level of CWM[33]</th></tr>
<tr><td colspan="4">Ponderosa Pine/Mixed Conifer</td></tr>
<tr><td>PPDF _ Small/Medium
50% tolerance level</td><td>1-2% cover > 5” dbh
29 pieces/acre > 5” dbh
309 ft^3/acre > 5” dbh
4 tons/acre > 5” dbh</td><td rowspan="4">1.4% (estimated)
pieces/acre not available

320 ft^3/acre > 9” dbh
4 tons/acre > 9” dbh

379 ft^3/acre > 20” dbh
5 tons/acre > 20” dbh</td><td rowspan="2">Ponderosa pine:
% cover not available
177.5-354 ft^3/acre
3-6 pieces/acre
2.2-4.4 tons/acre</td></tr>
<tr><td>PPDF _ Small/Medium
80% tolerance level</td><td>3% cover > 5” dbh</td></tr>
<tr><td>PPDF _ Large
50% tolerance levels</td><td>1.8% cover > 5” dbh
18 pieces/acre > 5” dbh
359 ft^3/acre > 5” dbh
4.5 tons/acre > 5” dbh</td><td rowspan="2">Mixed Conifer:
% cover not available
885-1,180 ft^3/acre
15-20 pieces/acre
11-15 tons/acre</td></tr>
<tr><td colspan="2">For all tolerance levels:
0.3% cover > 19.7” dbh
177-203 ft^3/acre > 19.7” dbh
2.5-3 pieces/acre > 19.7” dbh
2.2-2.5 tons/acre > 19.7” dbh</td></tr>
<tr><td colspan="4">Lodgepole Pine</td></tr>
<tr><td>Early 50% tolerance level</td><td>2-3% cover
82 pieces per acre > 5” dbh
715 ft^3/acre > 5” dbh</td><td rowspan="3">% cover not available
pieces/acre not available

731 ft^3/acre > 9” dbh
9.5 tons/acre > 9” dbh

357 ft^3/acre > 20” dbh
4.6 tons/acre > 20” dbh</td><td rowspan="3">15-20 pieces/acre > 8” dbh
585-780 ft^3/acre
8-10 tons/acre</td></tr>
<tr><td>Mid 50% tolerance level</td><td>65 pieces per acre > 5” dbh
786.5 715 ft^3/acre > 5” dbh
9-10 tons/acre > 5” dbh</td></tr>
<tr><td colspan="2">For all tolerance levels:
0.2% cover
101.5-130 ft^3/acre > 19.7” dbh
1.2-2.4 pieces/acre > 19.7” dbh
1.3-1.7 tons/acre > 19.7” dbh</td></tr>
</table>

When comparing the different measurement units, the existing levels of CWM appear to be within the directed ranges, especially within the ponderosa and lodgepole pine habitat types. Directed levels within these habitat types also appear to be compatible with desired fuel loadings (5 to 10 tons per acre less than 3 to 5 inches dbh, Maurice Evans, Fire and Fuels Management). Mixed conifer habitat types appear to be low and the directed levels are at the upper end or exceed desired fuel loadings. The Mixed Conifer habitat type is uncommon within the Kelsey planning area, but CWM within this habitat type is important for some wildlife species not common within the planning area (for example, American marten). Units associated with this habitat type are Alternative 2 units 33 – 38, 64, and 66; and Alternative 3 units 33, 37, 65, 247, 335, 338, and 366.

[32] DecAID uses a percent cover figure whereas sources of data for the existing conditions came in lineal feet and cubic feet measurements. Exact measurements of what currently exists are probably not exact following the reconciling of the different measurement units. Mellen, et. al. 2003 explains the rationale for using percent cover as the desired measurement for CWM levels. Since DecAID has no information for Lodgepole habitats, we use the data for lodgepole habitat types in Ohmann and Waddell (2002). Pieces/acre and cubic feet are estimated from Ohmann and Waddell (2002: Tables 4 and 8).

[33] The Screens direction did not give levels in terms of tolerance level.

Over the entire DecAID analysis area, too many data gaps exist to conclusively determine that CWM levels are adequate. As presented in Table 68 CWM levels are met or exceeded in the northern and eastern portions of the analysis area (Kelsey, 18 Fire, and Opine), but below these levels to the south (Lava Cast).

Table 68: DecAID/Associated Literature And Existing Coarse Woody Material (CWM) Levels In The Analysis Area*

	PPDF_S/M 50% Tolerance level	PPDF_S/M 50% Tolerance level	PPDF_L 50% Tolerance level	Lodgepole Early 50% Tolerance level	Lodgepole Mid 50% Tolerance level
DecAID and associated literature	1-2	3	1.8	2	3
Kelsey	1.4 Not Broken into Structure Type			>2	>3
Opine	1.6	N/A	N/A	Unknown	Unknown
Lava Cast	0.5	0.4	N/A	0.25	N/A
18 Fire	5	N/A	N/A	N/A	N/A

*? = information not known; N/A = habitat type not present

Green Tree Replacements (GTRs)

Green tree replacements (GTR) are trees that are managed through time to provide future snag or CWM habitat. The treatment unit is the area of accountability for meeting GTR objectives (Deschutes National Forest Wildlife Tree and Log Implementation Strategy [WLTL], 1994). The objective for treatment units is to provide patches of habitat, or GTRs in a distribution pattern suitable for home range needs of primary cavity excavators (WLTL 1994). According to the WLTL, green tree replacements do not need to be provided on every acre in the forested ecosystem.

A mosaic distribution across the landscape maintaining viable populations and ecological functions is the desired condition. The desired condition is based on the assumptions that: 1) deficits or surpluses, whether natural or related to past management activities, will continue to be part of the landscape; 2) treatment units will be designed to meet WLTL objectives each entry or treatment; and 3) that some treatment units will not provide WLTL habitat due to preference given to other resource issues.

The Eastside Screens direction requires maintaining GTRs greater than 21 inches dbh, or the representative dbh of the overstory layer if less than 21 inches, at 100 percent maximum potential population levels (MPP) of primary cavity excavators. Although the DecAID advisory tool does not explicitly present data on green tree replacements, Table 69 illustrates the number of GTRs per acre that would be needed to meet current direction and DecAID levels assuming the average diameter of the stands after the proposed treatments is at least 9 inches.

Table 69: Estimated Green Tree Replacement (GTR) Trees Per Acre Required To Meet Current Direction And DecAID And Associated Literature Levels					
	Habitat Type				
	Ponderosa Pine			Lodgepole Pine	
	PP/DF_S/M 50%	PP/DF_S/M 80%	PP/DF_L 50%	LP Early	LP Mid
DecAID & Associated Literature	2.7 Snags Per Acre	7.3 Snags Per Acre	6.5 Snags Per Acre	6-7 Snags Per Acre	10-12 Snags Per Acre
GTRs - 9" DBH Residual Stand*	13-14 Trees Per Acre	36-37 Trees Per Acre	32-33 Trees Per Acre	19-22 Trees Per Acre	32-38 Trees Per Acre
Current Direction (100% MPP based on most recent literature)	4 Snags Per Acre			6 Snags Per Acre	
GTRs - 9" DBH Residual Stand	20 Trees Per Acre			19 Trees Per Acre	

*Estimates were calculated by increasing the GTR level in the DWTL (1994) guide proportionately to the difference in snag density between Thomas (1979) and DecAID and associated literature (e.g. PP/DF_S/M 50% tolerance level: the DecAID level is approx. 1.2X higher than 2.25; 1.2X more GTR at a 9" residual stand would be approximately 13 trees per acre or (1.2 x 11.2) = 13).

Alternative 1 (No Action)

Direct and Indirect Effects: Snag, CWM and green tree replacement habitats would be maintained in the current condition during the short-term (less than 20 years). Natural disturbances, such as wildfire, wind events, insect and disease pathogens, and lightning, would recruit snag and CWM habitat, increasing the density of these habitats; particularly in high tree density stands. High tree density in some of the ponderosa pine stands would retard the development of large diameter (greater than 21 inches dbh) trees and future snags. High tree density may also hasten the development of smaller diameter snags and CWM as a result of mortality from bark beetles or fire.

Retaining the current forest habitat conditions means maintaining an increasingly higher risk of losing the habitat due to either bark beetles or wildfire mortality, or both. Snags resulting from beetle or wildfire mortality would be less than 21 inches dbh because the trees are smaller. Subsequent logs in CWM habitat would be smaller. It would take many decades for large snag and log structure to develop within the planning area.

In areas that naturally have a frequent understory-burning regime, such as the ponderosa pine associations within Kelsey, there would be changes in bird communities after a wildfire with normally a relatively quick recovery to the community seen before the fire (Smith, ed. 2000). In the project area, this type of regime of frequent understory burning has not occurred partly due to aggressive fire suppression efforts. The result of wildfire in the area may be slower recovery of bird communities.

The effect of no action is the increased risk of a dramatic shift of habitat and the associated bird, and other animal communities (such as a forested community to a mosaic with grass or shrub openings).

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The action alternatives do not propose salvage of snags or coarse woody material (CWM). Snags that pose a hazard to human safety during project activities would be cut. In the short-term, thinning activities would directly affect green tree replacements (GTR) by reducing the number of trees in treatment units. The units would retain enough GTRs to exceed currently directed levels (Table 69) It is estimated that in units receiving widely spaced thinning, 30 to 50 green trees per acre would be retained with a minimum of 9 inches dbh. In units with more tightly spaced thinning, 40 to 90 green trees per acre would be retained that are at least 9 inches dbh. This would meet the current direction and meet many of the levels based on the snag information in DecAID. Non-commercial thinning would have no direct effect to snags or CWM. Alternative 2 would treat more acres with a widely spaced thinning prescription than Alternative 3, leaving more GTRs across the project area with Alternative 3. Non-commercial thinning would have no direct effect to snags or CWM. Non-commercial and commercial thinning would, in the long-term, contribute towards the development of larger GTRs and ultimately dead wood.

Prescribed underburning in the ponderosa pine/Douglas fir and lodgepole pine habitat types would have direct effects to snags and CWM. Burn objectives and mitigations would reduce the loss of snags and CWM. Incidental mortality of GTRs may occur but is expected to be minimal. The exact number of snags and CWM lost to prescribed fire or recruited from prescribed fire is unknown, but with Implementation Guidelines (Snag-1, CWM-1, CWM-2, & CWM-3), DEIS, Appendix F, the overall amount of dead wood would likely remain at directed levels. Prescribed burning, depending on burn intensity, may result in a reduction in the number of existing snags. Mortality of larger diameter green trees (greater than 15 inches dbh) may occur as a result of prescribed fire, supplementing snag numbers in the short-term and CWM over the long-term. Direct effects include a reduction in the amount of CWM either by length and diameter reduction, or overall abundance. Post treatment, the numbers of GTRs would likely exceed minimum management levels. Mechanical shrub treatments would have no direct effects to snags or CWM.

Thinning activities, removal of trees, would decrease the overall potential of the recruitment of snags and CWM by reducing the risk of mistletoe infection and the mortality caused by bark beetles or wildfire. Although the recruitment of dead wood habitats would slow, silvicultural treatments (commercial and non-commercial thinning, pruning) would provide benefits by promoting faster growth of GTRs, ultimately providing larger diameter snags and CWM. Natural fuels treatments (prescribed underburning and mechanical shrub treatment) would provide the indirect benefit of reducing fire risk and maintaining these habitats over the long-term. Alternative 2 would thin more acres to reduce bark beetle risk for the greatest amount of time (30 years) and the greatest number of acres to reduce mistletoe occurrence. Alternative 3 would have the greatest indirect effect on snags and CWM, by treating more overall acres (Table 70) than Alternative 2.

Table 70: Reduction In The Recruitment Of Snags And CWM And The Promotion Of Large Dead Wood (Acres)

Proposed Activity	Alternative 2	Alternative 3
Total Acres of Commercial Harvest	4,749	5,324
Acres Treated that would reduce Beetle Risk for 30 Years	2,642	1,393
Acres Treated to Reduce Mistletoe Occurrence	696	640

Cumulative Effects: Proposed, past, and foreseeable treatments, including continued fuels treatments within the wildland/urban interface, would have short-term reductions in the amount and recruitment of snags and CWM across the landscape. Thinning would improve the health of the stands and make them less susceptible to beetle-induced and/or wildfire mortality (greater than 5,000 acres of thinning in each of the adjacent planning areas – Fuzzy, Lava Cast, Opine).

This may affect the density of dead wood in the small and medium tree structure stages in the short-term, but is not expected to substantially change the current ratios seen over the dead wood analysis area. Reduced tree competition over the long-term (greater than 30 years) would accelerate tree growth, providing future large diameter (20 inch dbh or greater) snags and CWM, substantially improving the density of large snags and log available over the analysis area. It is this size structure that is currently the most lacking.

Improvement of dead wood densities on federal land away from developed areas has become more relevant within recent years. Management of high dead densities may not be appropriate or desired within the wildland-urban interface, in areas of road improvements (interchange and highway widening), recreational improvements (Lava Lands, Lava River Cave, and High Desert Musuem), or areas of conversion of forest land to private ownership (Tract C lands). This effectively reduces the amount of land where densities of dead wood illustrated through the DecAID tool can be managed.

Salvage efforts within the boundary of the 18 Fire have decreased the amount of new snags and logs available to wildlife. Salvage decreased the initial increase (pulse) in snags and logs created by the wildfire. The remaining snags are immediately available and may stand long enough to provide a patch of snag habitat through time throughout the whole project area. As snags fall and become CWM, snags will be created elsewhere through natural agents.

Forest Plan Consistency

Snags

Eastside Screens (6. Interim Wildlife Standard, d. Scenario A, 4) a) Snags, Green Tree Replacements and Downed Logs: (1) "All sale activities…will maintain snags and green tree replacement trees of greater than or equal to 21 inches dbh, (or whatever is the representative dbh of the overstory layer if it is less than 21 inches), at 100 percent potential population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current snag models or other documented procedures. NOTE: for Scenario A, the live remnant trees (greater than or equal to 21 inches dbh) left can be considered for part of the green replacement tree requirement."

No snags would be removed under either Alternative 2 or Alternative 3, other than incidental removal for safety concerns during project activities. There would be no direct impacts to snags levels. Snag levels are below desired levels in some habitat types. No further reduction in snag habitat would likely occur with the implementation proposed activities. None of the proposed treatment activities are expected to reduce the current level of snags below the desired or directed level where it is currently being met.

Coarse Woody Material

WL-72: "…An average of at least 3 cull logs-per-acre, plus 3 additional logs-per-acre…will be retained after timber management activities. Minimum qualifying sizes are 10 inches in diameter at the small end and 15 feet long…"
WL-73: "Where logs…are not available, and average of 1 slash pile…or concentration…per acre will be retained to supplement qualifying logs."

Eastside Screens (6. Interim wildlife standard; d. Scenario A, 4) Snags, Green Tree Replacements and Down Logs; [2]) revised these standards to read: " Pre-activity (currently existing) downed logs may be removed only when they exceed the quantities listed below…It is not the intention of this direction to leave standing trees for future logs in addition to the required snag numbers…" Quantities of logs: 3 to 6 pieces greater than 6 feet long and 12 inches dbh or greater be maintained in ponderosa pine types (15 to 20 in mixed conifer), and 15 to 20 pieces greater than 8 feet long and 8 inches dbh be maintained in lodgepole pine types.

Existing levels appear to generally meet those proposed by current direction (Table 68, page 3-108). No downed wood would be removed under any alternative, with current levels likely to remain following proposed activities. The action alternatives may have minor impacts to long-term downed log recruitment.

Green Tree Replacement

Eastside Screens, 6. Interim Wildlife Standard, d. Scenario A, 4) a) Snags, Green Tree Replacements and Downed Logs: (1) "All sale activities…will maintain snags and green tree replacement trees of greater than or equal to 21 inches dbh, (or whatever is the representative dbh of the overstory layer if it is less than 21 inches), at 100 percent potential population levels of primary cavity excavators. This should be determined using the best available science on species requirements as applied through current snag models or other documented procedures. NOTE: for Scenario A, the live remnant trees (greater than or equal to 21 inches dbh) left can be considered for part of the green replacement tree requirement."

Forest Plan direction refers to Deschutes WLTL for GTR numbers. This document gives figures based on Thomas 1979. In Bull et al (1997) it is suggested that Thomas figures were not high enough to cover all habitat needs. Using Eastside Screens direction to use most recent research, the GTR figures given in the WLTL were recalculated to reflect the updated 100 percent potential population levels based on newer research (Project Record, Appendix F, Wildlife Report).

Rose et al (2002) and Mellen et al (2003) determined that the "potential population level" is a flawed technique. Mellen et al (2003) uses statistical "tolerance levels" in the DecAID tool. DecAID is not part of the Screens direction; therefore its use was for comparison purposes. DecAID represents the best available science, but because Screens direction uses population potential, the two were displayed for comparison purposes.

As illustrated in Table 68, page 3-108, GTR levels following project implementation are expected to be met. Proposed treatments are expected to retain 30 to 90 trees per acre, which will meet directed levels for the ponderosa pine types. These levels exceed the baseline GTR levels given in the Eastside Screens direction and WLTL that were based on Thomas (1979).

MANAGEMENT INDICATOR SPECIES (MIS) WOODPECKER AND CAVITY-NESTING SPECIES

The Deschutes Forest Plan lists "Woodpeckers (Cavity Nesters)" as a management indicator species (MIS). Table 41, page 3-61, displays the MIS woodpecker and secondary cavity nesting (such as flammulated owls) known or suspected within the project area. Pileated and Lewis' woodpeckers are not suspected nor have they been found within the project area due to the dominant stand types and average size of trees within the stands.

Pileated woodpeckers, although found in areas with ponderosa pine, are more likely to be found in more wet mixed conifer areas (Douglas-fir/fir dominant). It has been rare to see or hear one within this portion of the Bend-Fort Rock District (M. Gregg, K. Keown, Wildlife Biologists, personal communication July 2004).

Lewis' woodpeckers are associated with large, open ponderosa pine stands (Winkler, et al 1995, Csuti, et al 2001). It is more common (personal experience) to hear and see the Lewis woodpecker in relatively open ponderosa pine stands, mostly large trees (greater than 20 inches dbh), and near the fringe of the forest. They are also associated with recently burned forests and may possibly be found within the 18 Fire area. The remaining habitat in the project area is not suitable habitat. It has been rare to see or hear one within this portion of the Bend-Fort Rock District.

Three-toed woodpeckers are associated with higher elevations and lodgepole pine habitat. They are not likely to be found within the project area because 1) the elevations are lower than those commonly reported for this species and 2) there is only a small amount of lodgepole pine habitat.

The planning area is considered suitable habitat for other MIS woodpecker species. It is assumed, within this document, that by managing for the needs of these other MIS species, the needs of secondary cavity nesters such as pygmy and flammulated owls and cavity-nesters (white-breasted and pygmy nuthatches) are met (specifically by hairy and white-headed woodpeckers and Williamson's sapsuckers; Marshall, 1997). These MIS species and specific habitat characteristics are illustrated in Table 71. Often, the densities of snags selected, by the different MIS species, were not displayed in the referenced literature. The habitat descriptions shown in Table 71 were used in conjunction with DecAID to determine effects to these MIS species. DecAID was used for certain habitat types in order to illustrate what snag densities would "normally" occur in such habitat type at that developmental stage. The assumption is: if the "normal" conditions were present, then habitat for MIS species was present at levels to support populations.

Table 71: Summary Of Habitat Features Of Selected MIS Woodpecker Species*

Species	Habitat	Home Range (Acres)	Nest Stand Canopy Closure (%)	Log Cover (%)	Average Nest Tree Size (dbh - inches)	Average Forage Tree Size (dbh - inches)	Number Of Years Dead For Forage Tree
Black-backed woodpecker	Ponderosa and Lodgepole pines	956	46	6	11-14	13	Less than 2 years dead and live trees
White-headed woodpecker	Large diameter ponderosa pine	800 (fragmented landscape)	24-41	-	25-32	17	Live
Hairy woodpecker	Ponderosa and lodgepole pine	-	39	9	16	10-15	Less than 5 years dead
Williamson's sapsucker	Ponderosa pine	-	60	10	27	8	-

*Data presented are from the following sources: Bull et al (1986); Goggans et al (1988); and Dixon (1995) as cited in Marshall (1997)

Black-backed Woodpecker

Existing Condition

According to Goggans (1988) and Bull et al (1986), this species uses mature ponderosa pine and lodgepole pine habitat types at relatively low elevations (less than 4,500 feet), but can be found at higher elevations. Altman (2000) designates the black-backed woodpecker as a focal species for old-growth lodgepole pine. The planning area ranges in elevation from approximately 3,900 to 6,000 feet. This species has been observed in the 18 Fire area, although no nesting activity reported. Based upon the extent of the ponderosa pine habitat, It is likely that this species could be found within the planning area due to the small amount of mature lodgepole pine habitat (1,945 acres of mature lodgepole habitat; 83 acres of lodgepole LOS).

As seen in Table 71 the black-backed woodpecker will use smaller snags for nesting as well as foraging. Bull et al (1986) suggested that this use of smaller diameter snags for nesting is a way of competing with other woodpecker species in the same habitat (such as white-headed woodpecker, northern flickers). The planning area and adjacent areas have snags of this size class that can serve as potential habitat (Refer to Table 66, page 3-105). Saab and Dudley (1998) found black-backed woodpeckers selecting for clumps of snags and unlogged control plots in their study on fire and salvage logging. The proposed units do have habitat for this species, although the degree of "clumping" of the existing snags is unknown. The largest patch of habitat for this species is within the 18 Fire area.

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no short-term, direct effects to populations of this species as a result of No Action. Habitat for this species would continue to be found throughout the project area. In the long-term, habitat for this species may increase as the areas with high risk for beetle-induced mortality become infested and trees die, creating patches of nesting and foraging habitat patches. In areas with mistletoe likely to spread to the understory, it is possible that development of habitat within these areas would be delayed. Mistletoe infestation may grow to the point of having the understory remain small creating a patch of no habitat. Black-backed woodpecker populations in and around the planning area may increase within the project area as high-risk stands succumb to insect and or fire mortality.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: There would be no short-term, direct effects to populations of this species. The development of larger patches of habitat may be delayed by treating stands with a high risk from beetle mortality. This would reduce the likelihood that the habitat conditions on which this species can capitalize would occur.

In the long-term (greater than 20 years), by reducing the mistletoe infestation, protecting existing snags within units, and providing for some larger green trees (GTRs within units), the treatment units may achieve mature conditions more quickly than no action. These areas would become the mature tree and snag habitat in the future that is associated with black-backed woodpecker habitat. Forest activities that improve the growth and health of the forested stands would increase the resilience of these stands to disturbance such as beetle outbreaks and fires. Black-backed woodpeckers can take advantage of these outbreaks as foraging habitat. By increasing the resilience of the stands there is less likelihood that wide-scale outbreaks would occur. This type of foraging habitat may become limited in the future. Because this alternative decreases the likelihood of wide-scale beetle outbreaks, populations of black-backed woodpeckers would likely remain the same as they are today.

Alternative 3

Direct and Indirect Effects: There would be no short-term, direct effects to populations of this species as a result of this alternative. Although the effects to habitat are similar to those for Alternative 2, this alternative reduces some of them. Fewer acres that treat mistletoe and reduce beetle risk for 30 years (Table 69, page 3-109) would mean fewer reductions in potential foraging and nesting habitat. In the long-term, this alternative may result in larger patches of habitat on the landscape because fewer acres will be treated intensely for beetle risk and mistletoe. Long-term, indirect effects to foraging habitat would be similar to those described under Alternative 2.

Cumulative Effects of Action Alternatives

Past, current, and foreseeable future actions often have the objective to reduce beetle and wildfire risk (such as Lava Cast: 10,000 acres with approximately 2,000 acres in stands with a lodgepole pine component; Fuzzy: 16,000 acres of mostly ponderosa pine treated to improve health of stand, Opine: 5,060 acres of mostly ponderosa pine treated to improve health of the stand). Large, widespread outbreaks are expected to become less common but still occur in small pockets. Foraging and nesting habitat in the future will likely be distributed in smaller densities across the landscape.

Cumulative effects to this species and its habitat would be negligible due the similarity of habitat throughout the landscape and the common history of past logging. The proposed actions in the Kelsey project area would add approximately 1 to 2 percent of lodgepole pine habitat over the landscape (the combined adjacent project areas: Fuzzy, Opine, and Lava Cast) that would be treated to increase tree resiliency to both wildfire and insect attack and to reduce insect outbreaks. Reducing the risk of insect outbreaks and wildfire may reduce available habitat for this species. Management for higher snag densities would help offset this effect. Over the landscape, populations are expected to initially decrease due to the effects of management, but will in the long-term stabilize through better management of snag densities

Forest Plan Consistency

WL-37: "…sufficient snags will be maintained to provide 40 percent of potential population levels of cavity-nesting species within eve-aged harvest units…groupings of green replacements will be preferred implementation technique. Compliance will be based on the harvest unit area…"

The Eastside Screens revised this standard and guideline to reflect the 100 percent potential population level. This standard was addressed in the Snag discussion, page 3-104.

WL-38: "Specific guidance will be provided by the Deschutes National Forest Wildlife Tree Implementation Plan."

This analysis was used to determine green tree replacement habitat for future black-backed woodpecker habitat. See Green Tree Replacement discussion, page 108.

Forest Plan direction for this MIS species is met through the consideration and management of current and future habitat. Dead Wood analysis has shown that current estimates of snag densities generally meet the directed level except in the lodgepole pine habitats and for large snags. The project alternatives would not directly affect current snag densities.

White-headed woodpecker

Existing Condition

White-headed woodpeckers utilize both live and dead ponderosa pine, frequently selecting the large diameter tree that has more seeds for foraging and more decayed large snags that provide more suitable nesting habitat. Having large ponderosa pine does not assure this species' presence. Indications have been made that a well-developed understory of trees and shrubs may encourage mammalian predation on nests (Marshall, 1997). They are absent from early seral ponderosa pine stands. These woodpeckers are poor excavators and generally select a more moderately decayed or softer snag in which to nest (Dixon 1995 as cited in Marshall 1997). This habitat can also be an indicator for goshawk, flammulated owl, and pygmy nuthatch habitat.

Existing habitat would be within the ponderosa pine LOS habitat (Figure 25, page 3-103) but even here there is a lack of large diameter ponderosa pine snags in densities recommended in Bull et al (1997 [Table 66, page 3-105]). Many of the proposed treatment units are not currently habitat for this species because of the lack of large trees and snags.

Alternative 1 (No Action)

Direct and Indirect Effects: There would not likely be short-term direct or indirect impacts to any existing habitat. In the long-term there may be added recruitment of ponderosa pine snags (less than 21 inches dbh) due to either or both insect outbreak and wildfire, especially in high-risk areas. Development of new, large ponderosa pine may be compromised by the retention of dense stands.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: No trees greater than or equal to 21 inches dbh would be removed. Slightly fewer acres would be treated (4,750) than Alternative 3 (5,325 acres). Alternative 2 proposes to more intensely thin more acres (2,640) than Alternative 3 (1,395 acres; Table 63, page 3-98). This alternative would not provide as much potential to develop into white-headed woodpecker habitat. Although this alternative would not directly impact white-headed woodpeckers, indirectly, in the short and long-term, habitat may not be readily available. The habitat that would be available in the long-term would be of higher quality because of projected better growth rates of remaining ponderosa pine in the stands.

Alternative 3

Direct and Indirect Effects: No trees greater than or equal to 21 inches dbh would be removed. Although more acres would be treated, more acres would be thinned that would retain more trees per acre. This would provide more potential habitat for white-headed woodpeckers.

Cumulative Effects of Action Alternatives

There is no large, continuous tract of unharvested white-headed woodpecker habitat within or adjacent to the planning area. Extensive tracts of land with large diameter ponderosa pines are limited or non-existent, because of past harvest. Past, ongoing, and future vegetation management actions on federal land tend to focus on either or a combination of reducing beetle and wildfire risk and promoting ponderosa pine and large tree habitat, as in the Lava Cast (approximately 7,856 acres), Opine (approximately 5,060 acres), and Fuzzy (approximately 16,000 acres) planning areas. White-headed woodpecker habitat would be expected to increase across the landscape over time. In the long-term, the proposed activities would increase LOS ponderosa pine habitat approximately four (4) to five (5) percent. White-headed woodpecker habitat is expected to increase over the landscape over time (an approximate 26 percent increase due to vegetation management objectives in Kelsey, Opine, Fuzzy, and Lava Cast).

Because each of the alternatives either does not remove snags or trees greater than or equal to 21 inches dbh (potential white-headed woodpecker habitat), no cumulative effects to white-headed woodpecker populations are expected. In the long-term, due to shifting emphasis in vegetation management to accelerate the development of LOS ponderosa pine habitat and management of higher snag densities, habitat for the white-headed woodpecker is expected to increase. As habitat develops for this species, so does habitat for nuthatches, owls, and other secondary cavity nesters. Likely trends are that populations of white-headed woodpeckers would increase.

Forest Plan Consistency

WL-37: "…sufficient snags will be maintained to provide 40 percent of potential population levels of cavity-nesting species within eve-aged harvest units…groupings of green replacements will be preferred implementation technique. Compliance will be based on the harvest unit area…"

The Eastside Screens revised this standard and guideline to reflect the 100 percent potential population level. This standard as been addressed under the Snag discussion, page 3-93.

WL-38: "Specific guidance will be provided by the Deschutes National Forest Wildlife Tree Implementation Plan."

This document was used to determine green tree replacement habitat for future black-backed woodpecker habitat. See Green Tree Replacement discussion and/or Project Record, Wildlife Report, Appendix F.

Forest Plan direction for the white-headed woodpecker would be met through the consideration and management of current and future habitat. Dead wood analysis has shown that current estimates of snag densities generally meet the directed level except for large snags. Proposed activities would not directly affect current snag densities, and would likely improve habitat in the future.

Hairy Woodpecker

Existing Condition

Bull et al (1986) reported hairy woodpeckers use both lodgepole and ponderosa pine habitats and a variety of snag sizes. This species utilize mature stands and snags greater than 10 inches in diameter (Table 66, page 3-98) for nesting and foraging. Based on the dead wood analysis, habitat for this species exists across the project area and adjacent landscape (Tables 66 and 67, page 3-105 and 107).

Alternative 1 (No Action)

Direct and Indirect Effects: Similar to discussion for other species, the No Action Alternative will not likely have any direct or short-term indirect effects to hairy woodpeckers. Development of larger snags for nesting may be delayed as a result of stagnating, dense stands.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: There would be no direct effects to hairy woodpecker habitat; no snags are proposed for harvest. Short-term indirect effects to habitat would include removal of potential nest trees, trees with a dbh between 16 and 21 inches. Long-term, habitat may develop more quickly as retention trees respond to the thinning, individuals die, and more large snags are created.

Alternative 3

Direct and Indirect Effects: Effects would be similar to Alternative 2. This alternative proposes more acres for a "lighter" thinning, retaining a variety of green tree densities. This variety of densities would benefit hairy woodpecker habitat in the long-term, helping to reduce short-term indirect effects.

Cumulative Effects of Action Alternatives

Hairy woodpecker habitat would remain on the landscape. Hairy woodpecker habitat currently exists over the landscape. No proposed activity or ongoing or reasonably foreseeable project proposes to cut snags, maintaining habitat. In the long-term, habitat over the landscape would develop and become more widespread than currently exists. Populations of hairy woodpeckers would likely remain stable.

Forest Plan Consistency

WL-37: "…sufficient snags will be maintained to provide 40 percent of potential population levels of cavity-nesting species within eve-aged harvest units…groupings of green replacements will be preferred implementation technique. Compliance will be based on the harvest unit area…"

The Eastside Screens revised this standard and guideline to reflect the 100 percent potential population level. This standard was addressed in the Snag discussion, page 3-104.

WL-38: "Specific guidance will be provided by the Deschutes National Forest Wildlife Tree Implementation Plan."

This document was used to determine green tree replacement habitat for future black-backed woodpecker habitat. Refer to either the Green Tree Replacement discussion, page 108.

Forest Plan direction for the hairy woodpecker would be met through the consideration and management of current and future habitat. Dead wood analysis has shown that current estimates of snag densities generally meet the directed level except for large snags. Proposed activities would not directly affect current snag densities, and would likely improve habitat in the future.

Williamson's sapsucker

Existing Condition

Williamson's sapsuckers often utilize ponderosa pine habitat, also utilizing mixed conifer habitats. In the project area, the dominant habitat type for this species is ponderosa pine. Similar to the white-headed woodpecker, this species will utilize dead and live trees for foraging and select for large (greater than 20 inch dbh) snags for nesting (Bull et al 1986). Within the planning area, habitat quality and location for this species is similar for those discussed under the white-headed woodpecker. The lack of large diameter snags, limits habitat for this species.

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no direct or short-term indirect effects to this species as a result of this alternative. In the long-term there may be added recruitment of ponderosa pine snags (less than 21 inches dbh) from either or both insect outbreak and wildfire, especially in the high-risk areas. Development of large snags may be compromised by the retention of a dense stands.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: Under this alternative no live trees greater than or equal to 21 inches dbh would be removed and no snags are proposed for removal. This alternative would heavily thin more acres than Alternative 3, reducing canopy closure over a greater area, ultimately reducing available sapsucker habitat (60 percent canopy closure; Table 69, page 3-109). In the long-term, large snags will develop, but as objectives to reduce wildfire and beetle-induced mortality risk are realized, stands with a 60 percent canopy closure may become limited. These types of stands will be more common on the northern slopes of the buttes or in other more moist areas.

Alternative 3

Direct and Indirect Effects: Effects are similar to Alternative 2. More potential habitat for this species would likely remain because activities proposed in this alternative would not intensively thin as many acres.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Cumulative: There is no large, continuous tract of unharvested Williamson's sapsucker habitat within or adjacent to the planning area. Large tracts of land with large diameter ponderosa pines are limited because of past harvest. Past, ongoing, and future vegetation management actions on federal land tend to focus on either or both reducing beetle and wildfire risk and promoting ponderosa pine and large tree habitat (such as Lava Cast, Opine). Ongoing and foreseeable actions on federal land may reduce canopy closures, but will also accelerate the development of large snags.

Some habitat over the landscape (adjacent project areas) would be reduced due to commercial thinning, but as large trees and snags develop and stands become more resilient to fires and insect outbreaks, potential sapsucker habitat will remain stable. Because of the similarity across the landscape (Kelsey, Fuzzy, Opine, and Lava Cast), both physically and management objectives (retaining large trees, improving stand health, and promoting diameter growth), the cumulative effect would be minimal with long-term beneficial effects. Effects from the proposed activities would be additive to that of the adjacent planning areas (an additional five (5) percent of LOS habitat developing; an additional 11 percent to existing LOS). There would be no direct effects to sapsucker habitat. There may be an initial decreasing trend in populations as habitat is thinned, and then a stable trend as large snags develop and habitat becomes more stable.

Forest Plan Consistency

WL-37: "…sufficient snags will be maintained to provide 40 percent of potential population levels of cavity-nesting species within eve-aged harvest units…groupings of green replacements will be preferred implementation technique. Compliance will be based on the harvest unit area…"

The Eastside Screens revised this standard and guideline to reflect the 100 percent potential population level. This standard was addressed in the Snag discussion, page 3-104.

WL-38: "Specific guidance will be provided by the Deschutes National Forest Wildlife Tree Implementation Plan."

This document was used to determine green tree replacement habitat for future black-backed woodpecker habitat. See Green Tree Replacement discussion and/or Project Record, Wildlife Report, Appendix F.

Forest Plan direction for the Williamson's sapsucker would be met through the consideration and management of current and future habitat. Dead wood analysis has shown that current estimates of snag densities generally meet the directed level except for large snags. Proposed activities would not directly affect current snag densities, and would likely improve habitat in the future.

OTHER MANAGEMENT INDICATOR SPECIES (MIS), ECOLOGICAL INDICATOR SPECIES, AND SPECIES OF CONCERN (SOC)

Raptors: Goshawk, Cooper's Hawk, Sharp-Shinned Hawk, Great Gray Owl, Red-Tailed Hawk, Golden Eagle, Osprey

Existing Condition

The Kelsey planning area provides habitat or potential habitat for several species of raptors. Species that have been documented within the planning area, include the Cooper's hawk, northern goshawk, red-tailed hawk, osprey, and golden eagle and there are active, or recently active, nests for some of these species. Other species with potential habitat that are suspected to occur include the sharp-shinned hawk and great gray owl. The goshawk, Cooper's hawk, and sharp-shinned hawk can collectively be referred to as "accipiters".

Surveys of potential northern goshawk habitat were conducted in 1998, 2000, 2001, and 2005. A more localized survey was conducted for northern goshawks near the High Desert Museum in 1996. Goshawk responses in 1998, 2000, and 2001 were within known territories but nesting was not always confirmed (Project Record, Appendix F, Wildlife Report). In 2005, a survey was conducted in areas partially surveyed in previous years. There were no goshawk responses. In the 2005 effort, known territories were avoided because the Kelsey planning effort had already considered these territories active and protections/restrictions were incorporated. Surveys for great gray owls were conducted in 2000 in potential habitat along the Deschutes River. Potential habitat across the river was surveyed in 2003 and 2004 as part of the East Tumbull planning effort. No goshawks or great gray owls were reported. Maps and survey forms are located in the District wildlife project files.

GOSHAWK, COOPER'S HAWK, SHARP-SHINNED HAWK, AND GREAT GRAY OWL

Per direction provided by the Interim Wildlife Standards of the Eastside Screens, nest stands consisting of 30 acres of the most suitable nesting habitat and 400 acres post fledgling areas have been identified for northern goshawk sites. Post fledgling areas incorporate suitable alternate and future replacement nest stands. Potential nesting habitat of the northern goshawk, Cooper's hawk, sharp-shinned hawk, and great gray owl having specialized habitat preferences, was identified using satellite imagery and timber stand exam data. Based on each of the species habitat preferences and Forest Plan standards and guidelines, Table 72 summarizes the existing condition of nesting habitat in the Kelsey project area and potential habitat for each species is displayed in Figures 27 through 30, pages 3-125 through 3-128.

Table 72: Existing Condition of Potential Nesting Habitat for Selected Raptor Species*

Species	Acres of Potential Nesting Habitat	Acres of Habitat Meeting Forest Plan Definition
Northern Goshawk	2,285	1,530
Cooper's Hawk	2,740	1,385
Sharp-shinned Hawk	915	605
Great Gray Owl	235	---

*Forest Plan definitions for each species are as follows: **Northern goshawk** – mean canopy cover of 60 percent or greater, tree density of at least 195 trees per acre, stand age of 100 years or more (Forest Plan WL-9); **Cooper's Hawk** – mean canopy cover of 60 percent or greater, tree density of at least 365 trees per acre, stand age of 50 to 80 years (Forest Plan WL-17); **Sharp-shinned Hawk** – mean canopy cover of 65 percent or greater, tree density of at least 475 trees per acre, stand age 40 to 60 years (Forest Plan WL-25); **Great Gray Owl** – lodgepole pine dominated overstory, overstory tree density of 67 trees per acre for trees greater than 12 inches diameter at breast height, canopy cover of 60 percent (50 to 70 percent), distance to nearest meadow 440 (63-1,070) feet (Forest Plan WL-31).

Alternative 1 (No Action)

Direct and Indirect Effects: In the short-term, there would be no effect to goshawks, Cooper's hawks, sharp-shinned hawks, or great gray owls. Potential habitat would remain, with a majority of the potential nesting habitat for these species remaining in areas of high risk to beetle-induced mortality and wildfire.

In the long-term, there would be increasing risk for the potential loss of nesting habitat from both beetle-induced or uncharacteristic, stand replacement wildfire mortality (1,290 acres of potential accipiter and 80 acres of potential great gray owl nesting habitat classified as having high risk to beetle outbreak). Loss of nesting habitat could effectively displace these species from the project area. It would take decades for nesting habitat to be reestablished.

Populations for these species would remain stable only in the absence of natural disturbances such as beetle outbreak and wildfire. It is more likely that there would be a declining trend in populations as a result of habitat loss due to natural disturbances.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Given adherence to the identified mitigation measures **(**Mitigation, Nest-1, page 2-42**)**, neither Alternative 2 nor Alternative 3 would have any direct effects to raptor species or known nesting sites (Table 73). Treatments are not proposed in known nest stands or surrounding no-treatment buffers (Forest Plan designated acreage according to each species) and seasonal restrictions would prevent disturbance during the breeding seasons of various raptors.

Potential nesting habitat of the Cooper's hawk, northern goshawk, sharp-shinned hawk, and great gray owl would be affected. The types of forested stands in which these species prefer to nest in are usually those stands that pose the highest risk for insect epidemics and uncharacteristic, high intensity wildfire and in which many of the proposed activities would occur. Treated stands would reduce stand density and simplify stand structure to the extent that these stands would not provide the characteristics of optimum nesting habitat, primarily mistletoe infected trees (with mistletoe brooms and forked tops), which are often selected as nest sites. Except for sharp-shinned hawk habitat, Alternative 3 would treat slightly more acres of potential nesting habitat than Alternative 2 (Proposed Action). The difference would not be substantial and treated stands would not provide foraging habitat for the great gray owl, because openings are not being treated.

Table 73: Direct Effects To Potential Nesting Habitat Of Selected Management Indicator Species (MIS) Raptor Species

Species	Great Gray Owl			Northern Goshawk			Cooper's Hawk			Sharp-shinned Hawk		
Alternative	1	2	3	1	2	3	1	2	3	1	2	3
Potential Nesting Habitat: Acres	236	230	205	2,283	1,944	1,944	2,740	2,363	2,352	915	768	778
Potential Nesting Habitat Degraded or Eliminated*: Acres	0	1	26	0	249	203	0	264	224	0	123	67
Potential Nesting Habitat Degraded or Eliminated*: %	0	<1	11	0	13	10	0	10	8	0	13	7
Nesting Habitat: Acres	NA	NA	NA	1,531	1,248	1,244	1,383	1,137	1,153	606	463	522

Table 73: Direct Effects To Potential Nesting Habitat
Of Selected Management Indicator Species (MIS) Raptor Species

Species	Great Gray Owl			Northern Goshawk			Cooper's Hawk			Sharp-shinned Hawk		
Nesting Habitat Degraded or Eliminated*: Acres	NA	NA	NA	0	135	88	0	246	179	0	143	38
Nesting Habitat Degraded or Eliminated*: %	NA	NA	NA	0	9	6	0	18	16	0	24	6

*Degraded or Eliminated = selective harvest (HSL), commercial thin (HTH), seed tree harvest (HCR), partial removal (HPR), and pre-commercial thin. Does not include these harvest types where the objective is to maintain or enhance goshawk habitat (Forest Plan WL-4). The No action alternative, by retaining high risk stands, has the potential of degrading or eliminating 1290 acres of accipiter habitat and 80 acres of great gray owl potential nesting habitat.

The proposed activities would improve foraging habitat of the northern goshawk, Cooper's hawk, and sharp-shinned hawk. The commercial harvest and non-commercial thinning would create more open stand conditions. This would allow greater maneuverability, visibility, and access to prey and would promote habitat for: 1) a wide variety of birds, the primary prey of the northern goshawk and Cooper's and sharp-shinned hawks and 2) small mammals, the primary prey of the red-tailed hawk. Given adherence to mitigations measures, neither, the Proposed Action or Alternative 3 would have any direct effects to raptor species or known nesting sites.

There would be long-term benefits to these species by treating potential habitat. Reducing the risk of beetle-induced mortality and wildfire in forested stands will help develop and maintain potential habitat in the project area. Short-term (less than 30 to 40 years) negative effects of habitat degraded or eliminated by harvest treatments will give way to long-term benefits of more stable higher quality habitat at lower risk. Populations of these species within the project area would then become stable.

Cumulative Effects: Past actions (Table 42, page 64) are either no longer having effects that would overlap the effects of the proposed action in time and space, or if their effects are ongoing, these effects have been incorporated into the existing habitat conditions and it is not useful nor relevant to the decision making process to analyze them separately. Other past projects that overlap in time and space with the proposed actions do contribute effects that are additive to the proposed actions and may be useful and relevant to the decision-making process.

Foreseeable treatments would provide a downward trend in the amount of dense stands that have potential for nesting use by the northern goshawk, Cooper's hawk, sharp-shinned hawk, and great gray owl (approximately 36,000 acres [27 percent of the total] within Kelsey, Lava Cast, and Fuzzy planning areas). There will be an additional 18 acres of habitat eliminated and 4.5 miles of road added in the planning area due to Hwy 97 widening and interchange development and rerouting access, 67 added acres degraded in the planning area due to mistletoe treatment and thinning around Lava Lands Visitor Center and Lava River Cave. Within 2 to 4 miles of the planning area, adjacent to the community of Sunriver, 950 acres were conveyed to private ownership. With the likely development of these parcels, this acreage would not likely provide nesting habitat for these raptor species but may provide some foraging (especially in winter) and dispersal habitat. More emphasis would be needed on protecting known sites on federal land. Any known nest sites within the planning area of each of these raptor species are protected from disturbance (Mitigation, Nest 1, page 2-42) with nest core areas designated and deferred from treatment; as would occur in the Fuzzy and Lava Cast planning areas.

Through time, nesting habitat will be at lower risk to wildfire and beetle-induced mortality and of higher quality because of increased diameter growth due to thinning. In conjunction with current management objectives to develop more LOS habitat (often the best potential nesting habitat), this will help in creating a more stable habitat in the future. The result would be more stable populations throughout the landscape, and little risk of displacement.

Forest Plan Consistency

The Eastside Screens provides direction for goshawk habitat management on the Deschutes National Forest. In summary it states that all active and historic goshawk nest will be protected from disturbance, with a 30 acre no harvest buffer around the nest tree and designation of a 400 acre post-fledging area that will retain LOS stands and enhance younger stands to become LOS (Interim wildlife standard Scenario A, (5) Goshawks, a-c pages 12-13). A historic nest site is defined as one that has had nesting activity within the prior 5 years of the date of the Screens (1994/1995, page 13). Based on this definition, the two nest sites would be considered historical.

Both nest sites have a designated 400 acres post-fledging area (PFA) and a 30-acre nest core. Treatments within the PFA address the direction to retain and enhance LOS characteristics. The one proposed unit within a PFA is within foraging habitat. Prescriptions for the unit would retain patches of dense trees and a variable thin throughout the rest of the unit. This would provide a more structurally diverse stand (a mosaic of dense and thinned patches) and improve prey habitat. In 2004 a Cooper's hawk nest was located within this unit, and larger retention patches were designated to accommodate the nest. The proposed activities are consistent with the following Forest Plan standards and guides.

WL-6: "Nesting habitat for at least 40 goshawk pairs will be provided in mixed conifer, mountain hemlock, and ponderosa pine forests…Habitat for an additional 30 pairs in lodgepole pine forest…"
WL-7: "Nesting habitat is available in ...old growth (MA15)…"
WL-9: "Nest sites will be selected on the basis of present or past use whenever possible.."
WL-13: "Nesting habitat for at least 60 pairs of Copper's hawk will be provided in mixed conifer and ponderosa pine forests outside of wilderness and the Oregon Cascades Recreation Area."
WL-16, 26: "Prospective sites with appropriate vegetative structure …will be identified before they have been precommercially thinned.
WL-21: "Nesting habitat for at least 60 pairs of sharp-shinned hawk will be provided…"
WL-28: "Active nest sites should be protected from disturbing activities within ¼ mile…by restricting operations…April 15-August 31.
WL-30: "Habitat suitable for 8 great gray owl nesting pairs will be provided."
WL-31/33: "Active nests will be protected…"

The 1995 Eastside Screens amended the standards and guidelines for the northern goshawk. Current Forest Plan direction largely revolves around active nest sites. Forest Plan direction for Cooper's and sharp-shinned hawks involve maintaining nest habitat for at least 40 pairs of goshawks, 60 pairs of Cooper's hawks and sharp-shinned hawks, and 8 pairs of Great gray owls across the forest (WL-6, 13, 21, 30). The Forest Plan does not state how these pairs are to be distributed across the Forest. It does include descriptions of nest stands and guidelines to reduce or eliminate disturbance within nest stands. For each of these raptor species an analysis of potential habitat based on Forest Plan descriptions and the effects of the alternatives has been conducted.

Pairs of the Cooper's hawk in eastern Oregon have been found at a density of one for every 4,589 acres (Henny, 2003). One nest for every 6,793 acres was found in southern Oregon for sharp-shinned hawks (White Scheuering and McAtee, 2003). Considering only the forested habitat within the Kelsey project area, there could be upwards of 8 pairs of Cooper's hawks and 5 pairs of sharp-shinned hawks in the project area based on the territory size reported by Henny (2003) and White Scheuering and

McAtee (2003). Currently there are 3 or 4 known Cooper's hawk nests within or adjacent to the project area, and no sharp-shinned nests known. The adjacent planning areas have a similar amount of forested habitat, thus it appears there is ample habitat for Cooper's and sharp-shinned hawks.

There are currently at least 5 pairs of great gray owls in the northern portion of the Forest (Sisters Ranger District, L. Turner, Wildlife Biologist, personal communication, September 2005). In the central portion of the forest (Bend-Fort Rock Ranger District), great gray owls have been heard or seen in the vicinity of the Deschutes River and wet meadows, but nests have not been located (J. Lowrie and M. Gregg, Wildlife Biologists, personal communication, September 2005). There is one known great gray owl nest site in the southern portion of the Forest, with potential habitat for three or four more pairs (Crescent Ranger District, J. Kittrell, Wildlife Biologist, personal communication, September 2005). Based on this information, there appears to be suitable habitat on the Forest, outside of the Kelsey project area, to support 8 pairs of nesting great gray owls. This is consistent with recorded sightings of great gray owls on the Forest. There have been 42 recorded sightings on the Forest, with none of the sightings located east of LaPine (M. Gregg, personal communication, September 2005), based on sightings in the NRIS Fauna National Wildlife Database).

All alternatives appear to comply with current direction. Potential nesting habitat will remain within the planning area and the watershed. The action alternatives will create more nesting habitat in the long-term. Any new nests discovered will be protected from disturbance (see Mitigation Measures).

Red-tailed Hawk

This species has an extremely wide tolerance for habitat variation. Generally, the species prefers open woodland areas associated with forest edges and large trees for nesting. The project area provides habitat, especially near the forest fringe and the 18 Fire area. The red-tailed hawk is relatively common in the area, being found on the forest and within the city of Bend.

Alternative 1 (No Action)

Direct and Indirect Effects: This Alternative would have no direct effect to this species. Due to this species' generalist nature, it is expected that availability of habitat would remain stable in the long-term.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: There would be no effect on nesting habitat for this species because no trees over 21 inches dbh would be cut. Mitigation Nest-2, page 2-42, is proposed in the event an active nest is located during project implementation.

Prey habitat would improve. Commercial and non-commercial thinning would create more open stand conditions, allowing greater maneuverability and greater visibility and access to prey. Mechanical shrub treatment (MST) and prescribed underburning would promote greater plant diversity, providing habitat for a wide variety of small mammals, the primary prey of the red-tailed hawk (Refer to shrub habitat discussion beginning on page 3-83). Gopher baiting/trapping, within the proposed seedling planting areas, may limit this benefit of increased prey opportunities. Red-tailed hawks, however, are known to take a variety of prey species, not only small mammals but also birds and reptiles.

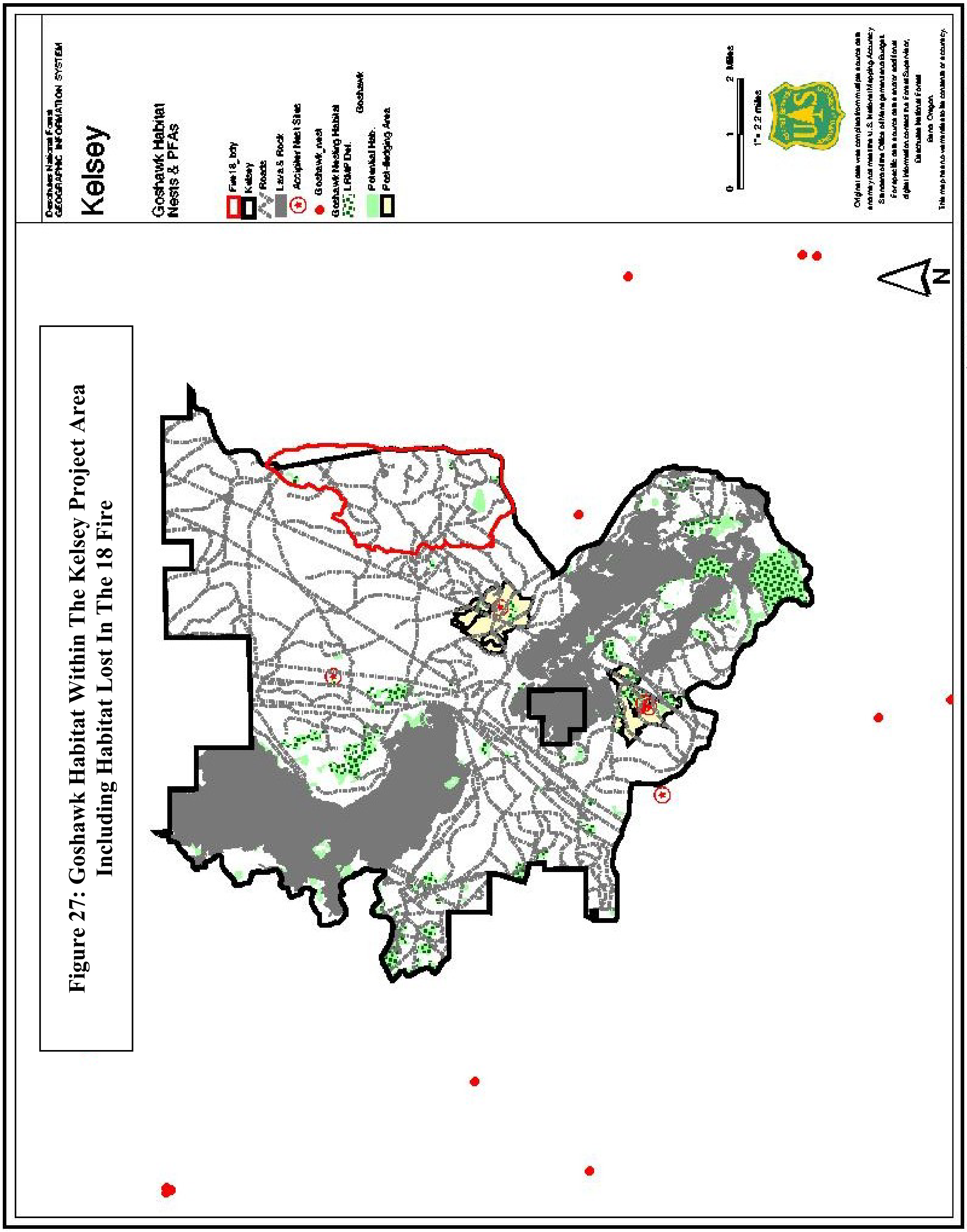


Figure 27: Goshawk Habitat Within The Kelsey Project Area Including Habitat Lost In The 18 Fire

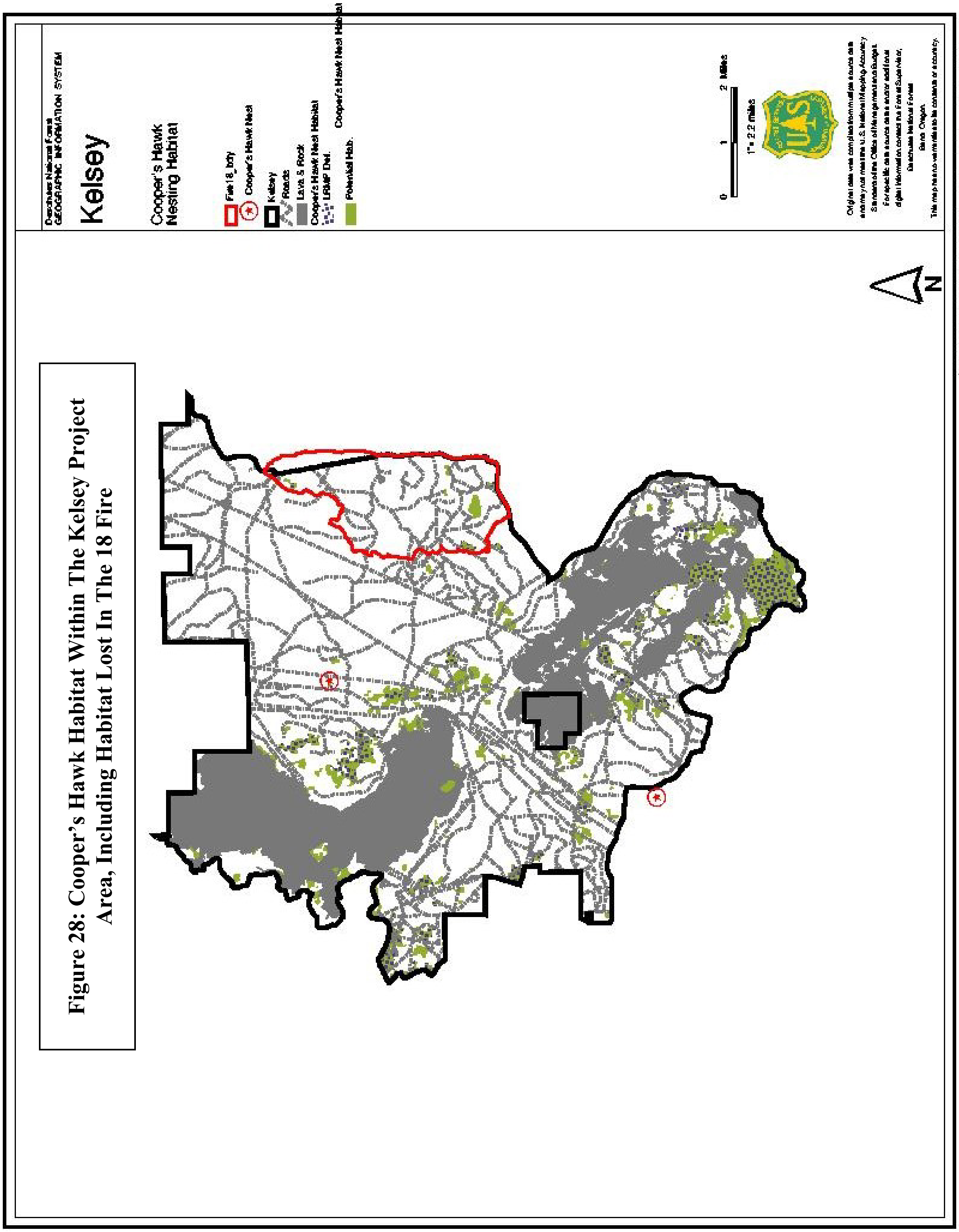
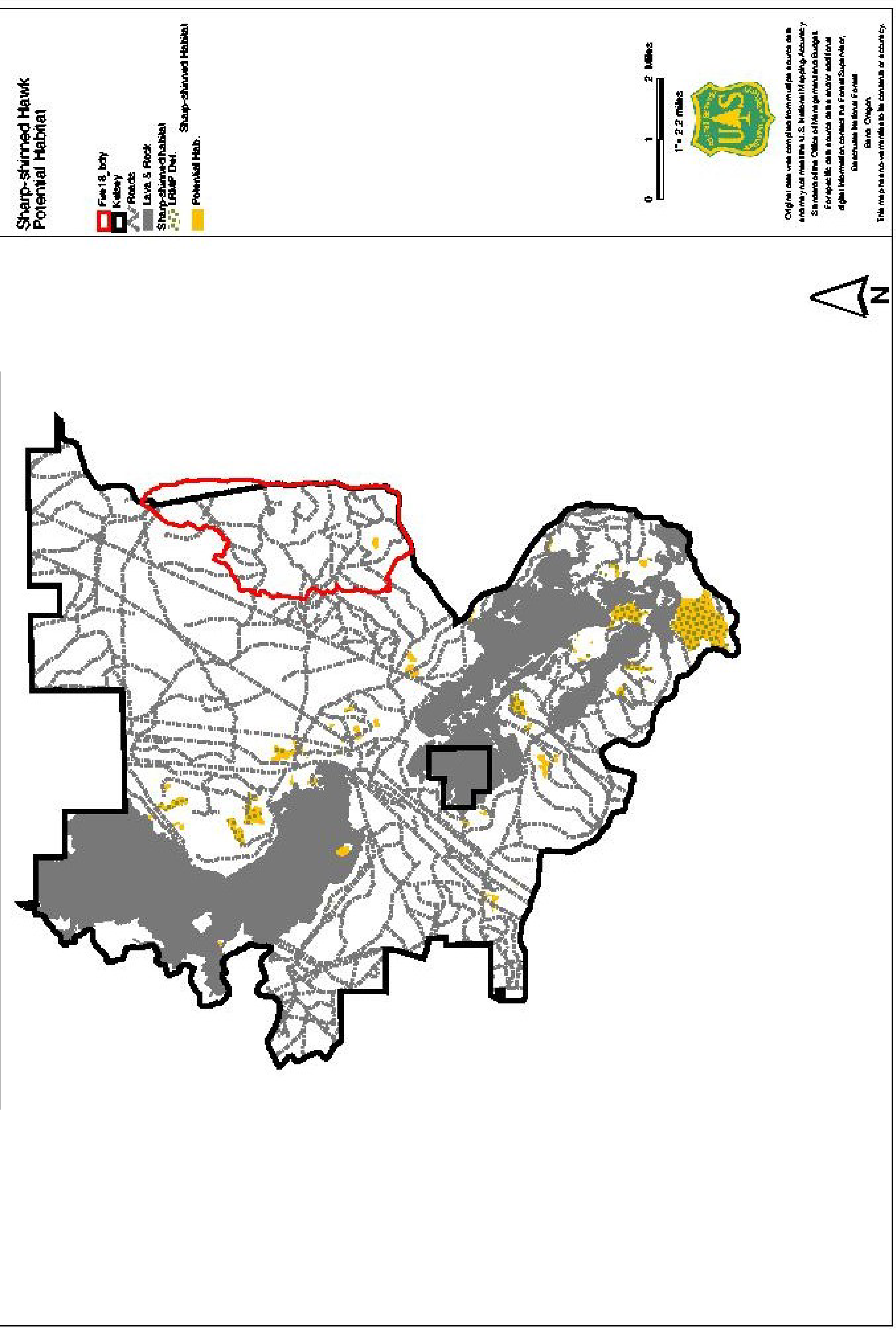


Figure 28: Cooper's Hawk Habitat Within The Kelsey Project Area, Including Habitat Lost In The 18 Fire

Figure 29: Sharp-Shinned Hawk Habitat Within The Kelsey Project Area, Including Habitat Lost In The 18 Fire



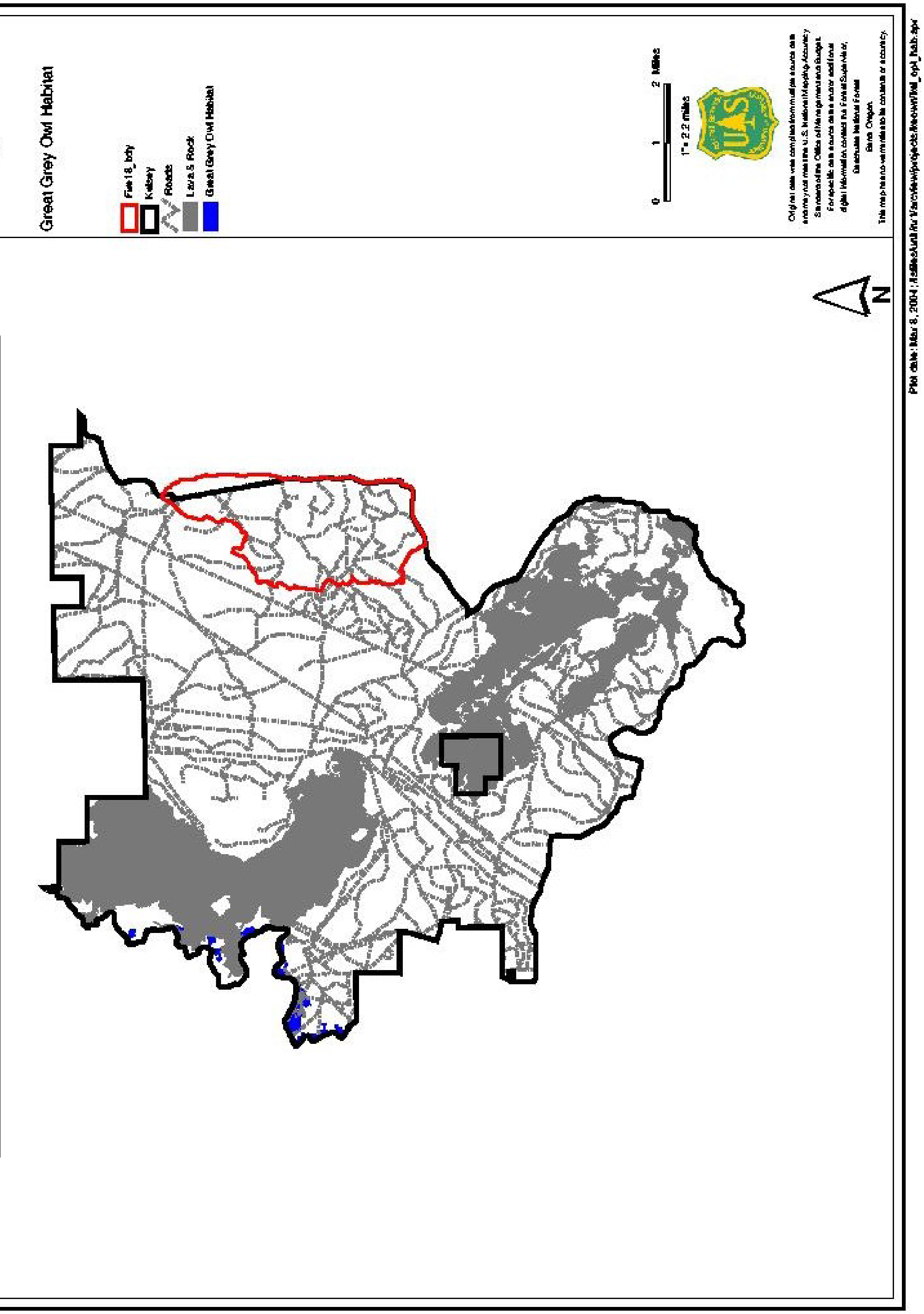


Figure 30: Great Gray Owl Habitat Within The Kelsey Project Area

Cumulative Effects: Due to the generalist nature of this species, no cumulative effects to this species would be anticipated. There would be negligible change in available nesting and foraging habitat.

Forest Plan Consistency

WL-2: "Active nest sites will be protected by maintaining the forest character of an area at least 300 feet in radius around the nest…."
WL-3: "Active nest sites should be protected from disturbing activities within ¼ mile …March 1 – August 31…"

The alternatives comply with current direction for this species. Potential habitat was analyzed for effects, and mitigation measures are proposed to protect any active nests from disturbance.

Golden Eagle

The golden eagle occurs in grass-shrub, shrub-sapling, and young woodland growth stages of forested areas, or in forest with open lands nearby for hunting. It essentially needs a favorable nest site, usually a large tree or cliff, a dependable food supply, mainly of medium to large mammals and birds, and broad expanses of open country for foraging. It favors hilly or mountain country, where take off and soaring are facilitated by updrafts; deeply cut canyons rising to open sparsely treed mountain slopes and crags represent ideal habitat.

There are no known golden eagle nest sites or home ranges in the project area. Although the project area contains potential foraging habitat, even though it is low quality foraging habitat, it does not contain favorable nest sites for this species.

Alternative 1 (No Action)

Direct and Indirect Effects: This alternative would have few effects on potential golden eagle activity within the project area. Golden eagle foraging may actually improve in the case of a large wildfire burning through the project area. A large fire would open up more foraging area and expose more prey.

Cumulative Effects: Foraging habitat may improve if another fire occurs on the landscape due to not treating the high risk stands. This may be additive to the incidental increase in potential dead carcass scavenging opportunities as a result of widening Highway 97 and creation of new interchanges.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: In general, foraging habitat is not proposed for treatment. Some of the larger, open areas proposed for fuels treatments could be used for hunting by golden eagles. The proposed fuels treatments would not affect the overall prey base for golden eagles in these areas. The species taken by eagles may change due to changes in small mammal habitat, but prey for eagles would still be available.

Cumulative Effects: Cumulative effects to golden eagles would be negligible. Golden eagles forage over a wide area; therefore fuels treatment areas within the Kelsey project area may be part of a larger foraging area or territory. The proposed treatments may result in a change in the small mammal community within the unit, but this would not likely affect the overall prey base. An eagle would still be able to hunt and capture prey in the area. Effect to potential foraging habitat from proposed fuels treatments may be additive with the activities associated with the Highway 97 and interchange projects, with a likely increase in road-killed deer. Golden eagles are known to scavenge on recently killed-carcasses (such as road-killed deer; Carey, 2003).

Forest Plan Consistency

WL-2: "Active nest sites will be protected by maintaining the forest character of an area at least 300 feet in radius around the nest…."
WL-3: "Active nest sites should be protected from disturbing activities within ¼ mile …February 1 –July 31…"

All alternatives comply with current direction for this species. Potential habitat was analyzed for effects, and mitigation measures are proposed to protect any active nests from disturbance.

Osprey

Potential habitat for osprey in the project area can be found along the Deschutes River. Osprey feed on fish within the river and will nest in the larger trees along the river. There has been nesting activity by osprey in the Benham Falls area.

Alternative 1 (No Action)

Direct and Indirect Effects: The No Action Alternative would have no effect on potential nesting or foraging habitat. Some of the stands along the river are considered to be high risk for beetle-induced mortality. Tree mortality would be unlikely to affect potential osprey nest trees because nesting often occurs in large snags near water.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Neither of the action alternatives would affect foraging habitat. No trees over 21 inches dbh will be harvested, therefore potential nesting habitat will not be affected. Mitigation, Nest-1, page 2-42, would protect an active nest from disturbance.

Cumulative Effects: Due to the lack of potential direct and indirect effects, there would be no cumulative effects as a result of this alternative.

Forest Plan Consistency

WL-2: "Active nest sites will be protected by maintaining the forest character of an area at least 300 feet in radius around the nest…."
WL-3: "Active nest sites should be protected from disturbing activities within ¼ mile …April 1 through August 31…"

All alternatives comply with current direction for this species. Potential habitat was analyzed for effects, and mitigation measures are proposed to protect any active nests from disturbance.

Great Blue Heron

Similar to the osprey, the great blue heron is associated with riparian and wetland habitat. The stands along the Deschutes River serve as potential habitat for this species. No known nests or rookeries are within or near the project area.

Alternative 1 (No Action)

Direct and Indirect Effects: The No Action alternative would have no effect on potential nesting or foraging habitat. Some of the stands along the river are considered high to beetle-induced mortality. Tree mortality would be unlikely to affect potential great blue heron nesting and foraging sites.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: One (1) unit is proposed with Alternative 2 (Proposed Action) and five (5) units are proposed with Alternative 3 near the Deschutes River (Alternative 2: Unit 87; Alternative 3: Units 87, 201 through 204). No treatments would occur within the first 100 feet of the River and unit boundaries would begin well into upland vegetation (riparian vegetation would not be treated). This would protect potential great blue heron habitat. No effects from the action alternatives are expected.

Cumulative Effects: Due to the lack of direct and indirect effects, there would be no cumulative effects.

Forest Plan Consistency

> WL-36: "Future nesting trees for existing rookeries will be provided. Emphasis will be placed on providing large, mature and over-mature ponderosa pine within the general vicinity of existing rookeries".

All alternatives comply with current direction for this species. There are no known rookeries. Potential habitat was analyzed for effects; because no large trees (greater than 21 inches dbh) would be cut and the riparian/river habitat would be buffered, there would be no effects to great blue herons. Habitat for any potentially new rookeries would be provided.

Bats

There are two caves located within the Kelsey project area, Lava River Cave and Bessie Butte Pit. Lava River Cave is hibernacula for small numbers (less than 5) of Townsend's big-eared bats. There are no records of bats in the Bessie Butte Pit. The Bessie Butte Pit cave is located within the 18 Fire burned and salvaged area; there are no proposed Kelsey units near this cave. There are other caves in the adjacent planning areas. Most of these caves are known hibernacula (winter hibernating) for some bat species.

> ***Small-footed myotis:*** Roosting, nursing, and hibernating habitat occurs on the Deschutes National Forest. Hibernacula and maternity habitat consists mainly of lava tubes and small caves, while roosting habitat consists of rock crevices, caves, cliff faces and buildings.
>
> ***Long-eared myotis:*** Occurrence of this species is documented on the Deschutes NF. They are known to roost in caves, under tree bark, in snags, and under bridges. Despite its occurrence in a wide variety of habitats, it has been closely associated with old-growth forests or components of

old growth. Maternity habitat consists of fallen logs, snags, and buildings. Hibernating individuals have been found in caves, crevices, and building in western Oregon and Washington, but wintering ecology and distribution are largely unknown.

Long-legged myotis: Occurrence is documented on the Deschutes NF, and is most closely associated with forested habitat, most notably old growth stands. Day and night roost habitat mainly consists of large diameter snags and rock crevices (Ormsbee 1995). Foraging occurs in mature open stands and early seral stage stands (Erickson and West 1995). Trees and large snags provide the most important habitat for nursery colonies. These bats have been documented to hibernate in caves on the Deschutes NF.

Yuma myotis: Occurrence of this species is documented on the Deschutes NF, highly associated with water and riparian habitat. Night roost habitat includes bridges, buildings, trees and rim rock. Nursery colonies have been found in buildings, under bridges, in caves and mines. This species is not known to hibernate on the Deschutes NF.

Western big-eared bat (MIS species): Occurrence is documented on the Deschutes NF. This species of bat depends on caves for hibernation, raising young, and day and night roosting. Foraging occurs in open savanna to fully stocked conifer stands. Prey species are strongly associated with bitterbrush, ceanothus, and other shrub species. Most foraging is suspected to occur within five miles of day roosts. Past studies have shown that foraging along forest edges occurred most often, apparently related to availability of prey species (moths) and protective habitat for predation. They utilize open water to meet moisture requirements.

Large winter hibernating populations of the western big-eared bat occur in a few caves on the Bend-Fort Rock Ranger District. The population is estimated to be 600 individuals in central Oregon (Deschutes National Forest and immediately adjacent areas). There are approximately 2,500 in Oregon. As of 2003, population trends for central Oregon, based on winter counts in hibernacula, have indicated a decline of about 25 percent since 1986. The decline is likely related to disturbance of hibernating bats, disturbance to the maternity roosts, and effects of wildfires.

Some of the known hibernacula within caves adjacent to the project area are used by this species. Snags greater than 21 inches dbh are rare within the project area. Some small lava formations occur within the project area and bat usage of these areas due to their size would likely be incidental.

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no direct effects to bats that roost in caves or rock outcrops. There would be indirect effects to bats that roost in snags and trees. A detailed discussion of effects to this roost type can be found under “Dead Wood Habitat.” In summary of this discussion, this alternative would retain some roost snags and trees in the short-term, but long–term development of large snags and trees may be hindered. Most of the bat species’ prey habitat includes a shrub component. Shrubs would be retained in various seral stages within the planning area. Forested habitat may be at risk to uncharacteristic, high intensity wildfire or beetle-induced mortality.

For bats that roost in trees or dead wood, such as long-eared and long-legged myotis, retaining stands at high risk to wildfire and beetle-induced mortality could potentially result in fewer roost trees for these species. Past wildfires (such as 18 Fire and Skeleton Fire) have demonstrated that portions of large tree habitat can be lost fairly quickly. In the event of a large wildfire in the project area, this alternative would contribute to an overall reduction in roosting habitat, and potentially a decrease in bat populations.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Neither action alternative would have any direct effects to caves or lava rock outcroppings. With mitigation, no direct or indirect effects to roosting habitat for bats that use this type of roost are expected. Wildlife mitigation 5, page 2-43 would avoid direct and indirect disturbance to roosting bats within known caves due to smoke from the underburning prescription.

Effects to tree, snag, and forest roosting habitat are similar to those detailed in the Dead Wood, pages 3-104 through 3-111 and LOS analysis, beginning on page 3-93. The effects to bat species using these habitats for roosting would be a short-term reduction in roosting habitat with long-term habitat stabilization. Trees greater than 21 inches dbh would not be cut. Snags would not be cut unless for safety reasons. This will minimize short-term impacts (long-eared and long-legged myotis).

Foraging habitat could be impacted from fuels treatments in shrub habitat. A detailed discussion of the effects to shrub habitat begins on page 3-83. For the various bat species, alteration of shrub habitat could influence prey availability. A variety of shrub structure is desired to attract a variety of insect species on which bats prey. A large amount of early shrub structure would be maintained following fuels treatments (mowing and underburning). Alternative 3 would maintain a larger amount than Alternative 2. Early seral shrubs may not produce as many flowers or leaves that moths and other insects would feed on as mid-seral shrubs. The overall diversity of shrub structure would be reduced in those units that would be treated. The effect on bat species may be a reduction in available prey or foraging opportunities near roost habitat. Retention patches within proposed units will help off-set this effect, but there will be a dominance of early shrub structure.

Cumulative Effects: There would be no cumulative effects to cave or rock roosting habitat and the bat species that use them. Cumulative effects to forest roosting habitat as a result of either action alternative would be similar to those discussed for LOS and Dead Wood Habitat. Because of current direction to retain all trees greater than 21 inches dbh and the action alternatives propose largely uneven-age harvest and thinning prescriptions, with no planned cutting of snags, cumulative effects to this roost type of roost habitat and indirectly bat populations will be negligible.

There would be cumulative effects to foraging habitat for those species that forage for insects over shrubs (such as western big-eared bats and small-footed myotis). Cumulatively, the maintenance of early shrub habitat may decrease the diversity of prey species for bats. Over the landscape, the areas with the best foraging opportunities for bats will be away from the urban-interface, where larger areas of more mature shrubs will be found. Current shrub treatments and the 18 Fire, within the adjacent Fuzzy planning area, have created additional early shrub structure. A lack of shrub habitat diversity (such as shrub seral stages) may alter foraging patterns by western big-eared bats and small-footed myotis, or reduce bat prey species diversity, which then can reduce bat populations or species diversity.

Forest Plan Consistency

Refer to discussions in LOS (Page 3-102) and dead wood (Page 3-111) habitat for specific direction wording.

WL-64: "[Big-eared bats] will be protected by…3) maintaining the character of forest vegetation at the entrance of important caves; and 4) enhancement of habitat conditions."
WL-65: "At caves already known to be important to [big-eared bats], monitoring will occur…"

WL-70: "Because most lava tube caves have air movement that could be significantly influenced…existing forest vegetation will be maintained at these openings."

Compliance with bat habitat direction has been met through other habitat analyses (see dead wood and LOS discussion) and mitigation to potential habitat (cave mitigation).

Landbirds

Neotropical migratory birds (NTMB) have become species of concern recently, due to the downward trend of these landbirds in the West. The decline of these populations is a result of many complex issues, but factors believed to be responsible include; habitat loss, fragmentation, and alteration of historic vegetation communities. Other probable causes for the decline include predation from feral species, nest parasitism by other birds, and use of pesticides associated with agriculture areas.

The Deschutes NF is currently following guidelines from the "Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington" (Altman 2000). This conservation strategy addresses key habitat types as well as biological objectives and conservation strategies for these habitat types found in the east-slope of the Cascade Mountains, and the focal species that are associated with these habitats. The conservation strategy lists priority habitats (Table 74): 1) Ponderosa pine; 2) Mixed Conifer (Late Successional); 3) Oak-Pine Woodland; and 4) Unique Habitats. There is no Oak-Pine Woodland habitat within the project area or on the Bend-Fort Rock district. Unique habitats include lodgepole pine, whitebark pine, meadows, aspen, and subalpine fir. Only lodgepole pine and aspen occur in the planning area.

Table 74: Priority Habitat Features And Associated Focal Species For Conservation In Selected Habitats In The East-Slope Cascades Landbird Conservation Planning Region

Habitat	Habitat Feature/ Conservation Focus	Focal Species by Subprovince Central Oregon/Klamath Basin
Ponderosa Pine	Large patches of old forest with large snags	White-headed woodpecker
	Large trees	Pygmy nuthatch
	Open understory with regeneration pines	Chipping sparrow
	Patches of old burned forest	Lewis' woodpecker
Mixed Conifer (Late Successional)	Large trees	Brown creeper
	Large snags	Williamson's sapsucker
	Interspersion grassy openings and dense thickets	Flammulated owl
	Multi-layered/ dense canopy	Hermit thrush
	Edges and openings created by wildfire	Olive-sided flycatcher
Lodgepole Pine	Old growth	Black-backed woodpecker

Effects to habitat for some of the focal species have been discussed under other headings: black-backed woodpecker, white-headed woodpecker, and pygmy nuthatch, brown creeper, Williamson's sapsucker, hermit thrush, and flammulated owl (pages 3- 93 through 97, 104, 112 through 115, and 135 through 141).

Landbirds: Ponderosa Pine and Mixed Conifer (Late-successional)

The desired condition for landbirds in ponderosa pine forest is a large tree, single layered canopy with an open, park-like understory dominated by herbaceous cover with scattered shrub cover and pine regeneration. Landbird conservation in ponderosa pine forest emphasizes maintaining healthy ecosystems through representative focal species for four habitat conditions. These include large patches of old forest with large snags and trees, an open understory with regenerating pines, and patches of burned old forest. In mixed conifer forest it involves large trees and snags with multi-layered dense canopy and interspersion of grassy openings.

Conservation strategies for management of these habitats include: 1) use of either or both prescribed burning and thinning to reduce fuel loads and accelerate development of late-seral conditions; 2) retain all large trees, especially ponderosa pine greater than 20 inches dbh; 3) initiate snag creation and recruitment where necessary; 4) retain all existing snags and broken-topped trees in units; implement road closures (obliteration); and 5) minimize invasion of exotic and invasive plants and soil erosion.

Existing Condition

Ponderosa pine forest within the East-Slope Cascades Landbird Conservation planning unit occurs extensively at low elevations in all the subprovinces except Columbia Foothills where it is a minor component. Timber harvest, particularly at lower elevations, has resulted in the loss of older mixed conifer forests and large diameter trees and snags. There is a high risk of loss of remaining mixed conifer overstory from stand-replacing fires due to high fuel loads in densely stocked understories (Altman, 2000).

Alternative 1 (No Action)

Direct and Indirect Effects: This alternative does not address the conservation strategies recommended by Altman, 2000. There is the potential effect of further loss of these habitats by retaining the existing condition of high-risk stands. In the event of a wildfire or beetle outbreak, it would take decades for late seral habitat to develop. Three (3) species that may benefit from this scenario are the chipping sparrow, olive-sided flycatcher, and Lewis' woodpecker because of open (Lewis' woodpecker) and/or younger aged-stands (chipping sparrow and olive-sided flycatcher).

The existing condition of ponderosa pine and mixed conifer habitats in the Kelsey project area are similar to the conditions of these habitats in the adjacent planning areas. Currently the existing condition provides little high quality habitat for the focal species within this type. Maintaining the current level of risk to either or a combination of beetle-induced mortality and wildfire in these stands would contribute to an overall reduction of habitat for some of the focal species.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Both action alternatives address the management strategies for these habitat types (prescribed burning and thinning). No snags are proposed for harvest, and no trees over 21 inches dbh would be harvested. There are 49.7 miles of roads proposed for closure or decommissioning with mitigation measures to prevent the spread of invasive weeds. Alternative 2 treats fewer acres (9,330) than Alternative 3 (10,505). Alternative 2 also proposes more treatment acres with one of the objectives being to accelerate LOS development. More acres with less intensive thinning are proposed under Alternative 3, retaining more trees per acre treated.

In the short-term there would be changes in habitat for the focal species of this type. Habitat for chipping sparrows and olive-sided flycatchers would increase due to the 6 to 12 acre created openings and the thinning of overstory trees. Long-term, habitat for pygmy nuthatches and white-headed woodpeckers would increase as tree growth responds to the thinning and tree crowns close in, increasing the canopy closure Habitat for flammulated owls may increase in quality (short-term openings and long-term, thickets and larger structure may develop). There is currently no habitat for Lewis' woodpecker (outside the 18 Fire) and there would be no effects to this focal species.

As stands respond to treatment and risk is reduced, ponderosa pine habitat would become more stable. Fuels densities would become lower, possibly allowing for the historic fire regime to occur. Habitat for all of the focal species would be expected to improve in quality.

Cumulative Effects: Improving the stability and quality of ponderosa pine habitat, and developing more late-seral ponderosa pine habitat in the project area, and adjacent planning areas, would provide better distribution of the focal species. It is estimated that through management objectives to improve the resiliency of the stand and increase tree growth (such as development of LOS) there would be a 26 percent increase in this type of habitat (4 to 5 percent from the proposed actions in Kelsey). Increased amounts of quality habitat in the project area will provide more resiliency of the focal species populations in the event of a large wildfire or insect outbreak. Quality ponderosa pine habitat will more likely be found away from communities and developments (Sunriver, Bend, Tract-C lands), and the infrastructure that supports them (Highway 97 projects and interchanges).

Landbirds – Old Growth Lodgepole Pine

Conservation strategies for this habitat include leaving portions unsalvaged in burned and beetle-killed areas; and exempting areas from commercial timber management in order to retain LOS characteristics as long as possible (Altman, 2000).

Conservation issues related to this habitat type include its reduction by timber harvest, insect outbreaks, fire suppression, and over-stocked stands (Altman, 2000). Many species that utilize this habitat need relatively large blocks of habitat to maintain populations, and salvage logging in decadent stands has removed nest and foraging trees.

Conservation strategies for this habitat include leaving portions unsalvaged in burned and beetle-killed areas; and exempting areas from commercial timber management in order to retain LOS characteristics as long as possible (Altman, 2000).

Existing Condition

Most lodgepole pine stands are found along the western boundary and in patches within the southern portion of the planning area. There is approximately 83 acres (0.2 percent of total project area) of LOS lodgepole pine (stage 6, 6L) and 1,945 total acres (6 percent of total project area) of mature and LOS lodgepole pine (stage 5-6, 6L) in the Kelsey project area. Some of these areas do contain large tree structure, but it may be ponderosa pines within the stand that are the large trees (Figure 26, page 3-106).

Alternative 1 (No Action)

Direct and Indirect Effects: This alternative would retain the stands. The maintenance of high risk of losing these stands in the event of a beetle-outbreak or wildfire would have similar effects as those described for ponderosa pine habitat. Initially, habitat would increase as a result of disturbance in these high-risk stands. In the long-term, it may take more than 40 years for new habitat to develop within the project area.

The large lodgepole pine-dominated stands as referred to in the Conservation Strategy are not as common in the Kelsey area as in adjacent planning areas to the south (Lava Cast). Maintaining the current level of risk to either or a combination of beetle-induced mortality and wildfire in these stands would contribute to an overall reduction of habitat for some of the focal species. Although there are risks to maintaining current habitat conditions, potential impacts would be minimal.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Alternative 2 treats slightly fewer lodgepole pine stands than Alternative 3 (75 acres of mature lodgepole pine stands) than Alternative 3 (86 acres of mature lodgepole pine stands). Proposed activities within lodgepole pine would likely reduce habitat. The focal species for this habitat, the black-backed woodpecker, also uses ponderosa pine habitats.

Cumulative Effects: Other species that heavily utilize lodgepole pine habitat, such as the three-toed woodpeckers, are not likely found in the project area, but may be found in adjacent planning areas, for example Lava Cast. As a short-term result of the proposed treatments, there would be fewer acres (4 percent) of older lodgepole pine habitat.

This would not likely significantly contribute to fragmentation of habitat because the proposed units are small and represent approximately two (2) percent of the mature lodgepole pine habitat and even less of the old-growth lodgepole pine habitat (83 acres in the project area) when considering the adjacent planning areas. Cumulative effects to lodgepole pine habitat would be minimal. As a result of the action alternatives there would be less than one (1) percent additional decrease in mature lodgepole pine habitat over the combined adjacent planning areas.

Forest Plan Consistency

On January 10, 2001, Executive Order (E.O. 13186) titled "Responsibilities of Federal Agencies to Protect Migratory Birds" was signed. This E.O. requires the "environmental analysis of Federal actions, required by NEPA or other established environmental review processes, evaluates the effects of actions and agency plans on migratory birds, with emphasis on species of concern." As previously stated, the Deschutes National Forest is currently following guidelines in the Conservation Strategy For Landbirds Of the East-Slope Of The Cascade Mountains In Oregon And Washington" (Altman 2000) in response to this Executive Order. Effects to key habitats and focal species have been analyzed. Conservation strategies have been addressed. Habitat provisions for many of the MIS species also provides habitat for various landbirds and meets the intent of the Conservation Strategy. There will be no intentional take of any migratory birds.

American Marten

Existing Condition

The American marten prefers large, somewhat dense stands of lodgepole pine, mixed conifer, and mountain hemlock. Abundant coarse woody material (CWM) in these stands is important to support a rodent prey base (Forest Plan WL-61). Mistletoe brooms have also been reported as providing habitat for marten (Bull et al. 1997). Potential habitat for marten within the project area can mainly be found in the late seral, mixed conifer stands in the southern portion of the planning area, and along the Deschutes River, totaling approximately 1,145 acres.

Alternative 1 (No Action)

Direct and Indirect Effects: Effects to marten as a result of this alternative can be extrapolated from the effects to late seral (LOS) and coarse woody material habitat. Based on earlier discussion, there is currently little LOS habitat. This alternative would take the longest (greater than 70 years) to develop large structure LOS habitat because current growth would continue to slow, relying on and contributing to increased risk of either or both beetle-induced mortality and wildfire to reduce stand density. This alternative would likely take the longest to develop better quality marten habitat. Potential marten habitat may increase if dwarf mistletoe spreads to other stands.

The CWM component of marten habitat may increase under this alternative. Retaining dense stands of relatively small diameter trees (8 to 12 inches dbh) would retain the high risk of tree mortality. This would increase CWM levels and favor marten habitat. The development of large CWM structure used for denning would continue to be slow and the level would remain low.

Retaining the existing condition of potential habitat within the Kelsey project area may initially provide more habitat for marten populations. In the long–term, retaining a high level of risk to these stands may ultimately decrease marten habitat on the landscape as a result from a large wildfire.

Because potential habitat for this species is currently limited within the project area, this alternative would have little effect on potential marten populations. Due to the degree of beetle-mortality and wildfire risk in the existing stands, marten populations may increase from the influx of coarse woody material as a result of either of these natural occurrences.

Maintaining potential habitat that has a high risk for either beetle-induced mortality and wildfire, or both, also increases the risk of losing the habitat quickly. This can contribute towards a decreasing trend in marten populations.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Overall, the action alternatives reduce the risk of loss of potential marten habitat to beetle-induced mortality and wildfire. In the short-term, the result will be a decrease in habitat due to the opening up of the canopy, loss of early recruitment of logs by improving the growth of the trees, and incidental loss of logs and snags due to fuels treatments. Proposed mitigation measures (Appendix F, Implementation Guidelines CWM 1-3) would reduce the potential loss of dead wood habitat. In the long-term, larger structure and more resilient stands would provide more stable habitat. Some proposed commercial thinning within stands that are currently potential habitat has the specific objective to develop LOS characteristics. There would be long-term gains in potential habitat, leading to a potential increasing trend in marten populations.

Alternative 3 proposes to treat more acres of potential marten habitat than Alternative 2 (units within lodgepole and mixed conifer associations: 439 acres and 227 acres respectively). Neither alternative proposes dwarf mistletoe treatments in potential marten habitat.

Cumulative Effects: The action alternatives would, in the long-term, contribute to more potential marten habitat on the landscape. This effect, however, is minimal due to the already low amount of potential habitat. Relative to Lava Cast (4,390 acres, 12 percent) south of the project area, mixed conifer (lodgepole and mixed conifer) in the project area is substantially less of the total area, 2,330 acres, five (5) to six (6) percent. Cumulatively, the action alternatives would impact three (3) to six (6) percent of the potential marten habitat in the combined Kelsey and Lava Cast project areas.

Reducing the risk to this potential habitat, as a result of commercial thinning, would contribute to more acres of potential habitat and the resiliency of the habitat to catastrophic wildfire. There would likely be a stable or increasing trend in marten populations as a result of the action alternatives. Alternative 3 treats the most acres, however Alternative 2 minimizes the short-term negative impacts while also providing the long-term benefits. There would likely be a stable to an increasing trend in marten populations as a result of the action alternatives.

Forest Plan Consistency

WL-61: "Pine marten prefer…dense lodgepole pine, mixed conifer, or mountain hemlock forest containing abundant dead woody debris as habitat for rodent prey."
WL-63: "In preferred forest types concentrations of down woody material…will be left at an average rate of approximately 1 per acre…Concentrations incorporating high tree stumps, logs, or snags are especially desirable…"

The effect analysis has addressed current direction and appropriate mitigation (Wildlife mitigations, Pages 2-43 and 2-44) to manage for snags, logs, and other coarse woody debris, such as high stumps, would be incorporated.

SPECIAL UNIQUE HABITATS

Lava Rock Outcroppings

Lava rock outcroppings and flows are scattered throughout the project area, providing unique habitat for a variety of wildlife species. Selected wildlife species known or suspected to utilize these habitats include the rock wren, American marten, Townsend's big-eared bat, pallid bat, western small-footed myotis, long-eared myotis, long-legged myotis, fringed myotis, and northern sagebrush lizard. Refer to Table 41, page 3-61 for species status and occurrence within the project area.

Water Developments (Wildlife Guzzlers)

Water is scarce within the Kelsey project area. With the exception of the Deschutes River along the western boundary of the project area, there are no streams, riparian habitat or wet meadows. One fenced, 600-gallon wildlife guzzler located within the planning area is designed to provide water to wildlife, primarily big game, but also to benefit birds and other wildlife. This guzzler was installed in 1964. Wildlife guzzlers have a catch apron for collecting precipitation, underground storage tanks, and a drinking basin. The guzzler and fence are currently in good operating condition.

Effects Common to Alternative 1 (No Action), Alternative 2 (Proposed Action), and Alternative 3

None of the alternatives would have direct, indirect, or cumulative effects to lava rock outcroppings, water developments, or caves. All unique habitats will be avoided through various mitigations.

COMPARISON OF ALTERNATIVES AND EVALUATION CRITERIA

Table 75 is a summary of the response to the evaluation criteria listed on pages 3-65.

Table 75: Summary of Response to Evaluation Criteria

Criteria	Alternative 1	Alternative 2	Alternative 3	Desired Condition/ Comments
Deer and Elk Habitat				
1. Hiding cover levels (% of planning area)	35	28	28	10
2. Thermal cover levels (% of MA-7 allocation in planning area)	24	17	16	30
3. Acres treated to promote cover	0	1,701	1,739	N/A
4. Shrub seral stage percent ratio over the MA-7 allocation in planning area (early:mid:late)	37:24:35	53:16:26	54:16:27	33:33:33
5. Open road density within planning area: MA-7 KEA (miles/square mile)	 4.3 6.0	 1.9* 1.3*	 1.9* 1.3*	In MA-7: 1.0-2.5 mile/square. mile In KEA: 0.5-1.5 mile/square mile * due to seasonal closure
LOS/OGMA and Connectivity				
1. Timeframe for LOS development	Greater than 40-70 years	Greater than 20 years	Greater than 20 years	
2. Acres treated with objective to promote LOS	0	1,331	1,317	
3. Acres LOS proposed for treatment	0	95	94	
4. Proposed units and acres within a corridor	0	4 units 369 acres	8 units 437 acres	
5. Miles of road proposed for physical closure that crosses a corridor	0	5.3	5.3	
Dead Wood Habitat				
1. Acres treated that decrease recruitment	0	4,749	5,324	Number of acres of commercial thinning
2. Current availability of snags > 10 inches dbh (total over planning area)	12.4 per acre	12.4 per acre	12.4 acre	
3. Estimated timeframe for the development of large snags and CWM	Greater than 40 years	Greater than 30 years	Greater than 30 years	
MIS Cavity-nesting Species				
1. Estimated timeframe for habitat development	40 years	Greater than 30 years	Greater than 30 years	
2. Level of risk of current and future habitat to beetle and wildfire mortality	High	Low	Low	

3. Acres of widely-spaced thinning (indirect effects to white-headed woodpecker habitat)	N/A	2642	1,393	Acres treated that would reduce beetle risk for 30 years
Selected MIS Raptors				
1. Acres and % acres of potential nesting habitat in the planning area degraded or eliminated Great Gray Owl N. Goshawk Cooper's Hawk Sharp-shinned Hawk	 80 (34%) 1,290 (22%)*	 1 (<1%) 249 (12%) 264 (10%) 123 (13%)	 26 (11%) 203 (10%) 224 (8%) 67 (7%)	No Action figures based on retained stands with high/imminent risk to beetles. *Goshawk, Cooper's and sharp-shinned hawk habitat combined
2. Estimated timeframe for suitable nesting habitat to develop	Greater than 20-40 years	30-40 years	30-40 years	
Bats				
1. Estimated timeframe for the development of large tree structure	Greater than 40 years	Greater than 30 years	Greater than 30 years	
2. Diversity of shrub habitat (ratio of shrub seral stages within the planning area)	37:24:35	53:16:26	54:16:27	
Landbirds ***(Criteria for black-backed and white-headed woodpecker, Williamson's sapsucker, pygmy nuthatch, and flammulated owl see Dead Wood Criteria; refer to LOS Criteria for brown creeper and hermit thrush)***				
1. Trend in availability of suitable habitat for olive-sided flycatchers and chipping sparrows	No Change	Initial Increase Then decreasing	Initial increase Then decreasing	Decerase due to improved stand health and tree growth and closing of canopy after initially created openings
Marten				
1. Estimated timeframe to develop CWM and LOS	Greater than 70 years	Greater than 30-40 years	Greater than 30-40 years	
2. Acres of potential habitat within the planning area treated	0	227	439	

SOILS

BACKGROUND

The long-term sustainability of forest ecosystems depends on the productivity and hydrologic functioning of soils. Ground-disturbing management activities directly affect soil properties, which may adversely change the natural capability of soils and their potential responses to use and management. A detrimental soil condition often occurs where heavy equipment or logs displace soil surface layers or reduce soil porosity through compaction. Indirect effects from these impacts include increased runoff and accelerated soil erosion. Detrimental disturbances reduce the soils ability to supply nutrients, moisture, and air that support soil microorganisms and the growth of vegetation. The biological productivity of soils relates to the amount of surface organic matter and coarse woody debris retained or removed from affected sites.

The Regional supplement to the Forest Service Manual (FSM 2520, R-6 Supplement No. 2500-98-1) provides policy for planning and implementing management practices which maintain or improve soil and water quality. This Regional guidance is consistent with Forest Plan interpretations for standards and guidelines SL-3 and SL-4 that limit the extent of detrimental soil conditions in previously managed areas (Final Forest Plan Interpretation, 1996).

PROJECT DESCRIPTION

Mechanical harvest would likely be accomplished using modern, track-mounted machines equipped with a felling head (harvester shear), and felled trees would be whole-tree yarded to designated skid-trail networks and transported to landings using grapple skidders. Mechanical harvesters would only be allowed to make a limited number of equipment passes on any site-specific area. Skidders would be restricted to designated skid trails at all times. Main skid trails would be spaced approximately 100 feet apart on average.

Most of the slash generated from harvest activities would be machine piled and burned at the log landings. There would be no machine piling of slash in random locations of activity areas. Either prescribed underburning or hand treatments of activity-created fuels or both would occur in certain activity areas. Removing the whole tree from the unit to the log landing (whole tree yarding), underburning, hand piling, and mechanical mowing would accomplish fuels reduction. Much of the unusable stem wood and tops would likely be machine piled and burned on log landings. There would be no machine piling of logging slash in random locations of activity areas. Dead trees (snags) and down woody material would be retained in a mosaic of varying densities across the landscape.

Temporary road would be constructed to allow access to one activity area, but these roads would be obliterated upon completion of harvest activities. Roads management inside the planning area would close and decommission roads identified because they are no longer needed for long-term access. Soil restoration treatments (subsoiling) would also be applied to primary skid trails and log landings to reduce cumulative levels of detrimentally compacted soil within the proposed activity areas.

INDICATORS

The extent of detrimental soil conditions within individual activity areas proposed for mechanical treatments.

The amount of coarse woody debris (CWD) and surface organic matter that would be retained to provide ground cover protection and a long-term source of nutrients on treated sites.

The probable success in project design and implementation of management requirements and mitigation measures that would be applied to minimize adverse impacts to soil productivity

MANAGEMENT DIRECTION

The Forest Plan specifies that management activities are prescribed to promote maintenance or enhancement of soil productivity by leaving a minimum of 80 percent of an activity area, in a condition of acceptable productivity potential following land management activities (Forest Plan page 4-70, SL-1 and SL-3). This is accomplished by following Forest-wide standards and guidelines to ensure that soils are managed to provide sustained yields of managed vegetation without impairment of the productivity of the land. Standard and Guideline (SL-4) directs the use of rehabilitation measures when the cumulative impacts of management activities are expected to cause damage exceeding soil quality standards and guidelines on more than 20 percent of an activity area. Standard and Guideline (SL-5) limits the use of mechanical equipment in sensitive soil areas. Operations will be restricted to existing logging facilities (such as skid trails, landings) and roads, whenever feasible. Standard and Guideline (SL-6) provides ground cover objectives to minimize accelerated erosion rates on disturbed sites with unprotected soils.

Forest Plan Management Areas MA-7, MA-8, and MA-9 do not contain specific standards and guidelines for the soil resource in this area. No actions are proposed in MA-9 (Scenic Views). Forest-wide standards and guidelines apply to the proposed management activities in MA-7 and MA-8.

The Pacific Northwest Region developed soil quality standards and guidelines that limit detrimental soil disturbances associated with management activities (FSM 2520, R-6 Supplement No. 2500-98-1). This Regional guidance supplements Forest Plan standards and guidelines, which are designed to protect or maintain soil productivity. Detrimental soil impacts are those that meet the criteria described in the Soil Quality Standards listed below.

Detrimental Compaction: in volcanic ash/pumice soils is an increase in soil bulk density of 20 percent, or more, over the undisturbed level.

Detrimental Puddling: when the depth of ruts or imprints is six inches or more.

Detrimental Displacement: the removal of more than 50 percent of the A horizon from an area greater than 100 square feet, which is at least 5 feet in width.

Detrimental Surface Erosion: requires visual evidence of surface loss either or a combination of in areas greater than 100 square feet, rills or gullies and water quality degradation from sediment or nutrient enrichment.

The Regional supplement to the Forest Service Manual (FSM 2520, R-6 Supplement No. 2500-98-1) provides policy for planning and implementing management practices which maintain or improve soil quality. An emphasis is placed on protection over restoration. The following excerpt is taken from FSM 2520.3:

“When initiating new activities”:

Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area. (This includes the permanent transportation system).

> In activity areas where less than 20 percent detrimental soil impacts exist from prior activities, the cumulative amount of detrimentally disturbed soil must not exceed the 20 percent limit following project implementation and restoration.
>
> In activity areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move conditions toward a net improvement in soil quality”.

This Regional policy is consistent with the Forest Plan interpretation of Forest-wide standards and guidelines SL-3 and Sl-4, which is filed in the Deschutes National Forest Supervisor’s Office (Final Interpretations, Document 96-01, Soil Productivity, 1996).

TARGET LANDSCAPE CONDITION

The primary goal for managing the soil resource is to maintain or enhance soil conditions at acceptable levels without impairment of the productivity of the land. The extent of detrimental soil disturbances is minimized through the application of management requirements and mitigation measures designed to minimize, avoid or eliminate potentially significant impacts, or rectifying impacts in site-specific areas by restoring the affected environment. The land effectively takes in and distributes water, and erosion rates are controlled to near-natural levels. The biological productivity of soils is ensured by management prescriptions that retain adequate supplies of surface organic matter and coarse woody debris without compromising fuel management objectives and the risk of soil damage from high intensity, stand replacement wildfire.

SCOPE OF THE ANALYSIS

The soil resource may be directly, indirectly, and cumulatively affected within each of the activity areas proposed within the project area. An activity area is defined as “the total area of ground impacted activity, and is a feasible unit for sampling and evaluating” (FSM 2520 and Forest Plan, page 4-71). For this project proposal, activity area boundaries are considered to be the smallest identified area where the potential effects of different management practices would occur. The discussion of soil effects and soil quality standards will be focused on the units proposed for silvicultural treatments. The activity areas range from approximately one (1) to 405 acres in size.

Quantitative analyses and professional judgment were used to evaluate the proposed activities by comparing existing conditions to the anticipated conditions, which would result from implementing the action alternatives. The temporal scope of the analysis is defined as short-term effects being changes to soil properties that would generally revert to pre-existing conditions within 5 years or less, and long-term effects as those that would substantially remain for 5 years or longer. This analysis also considered the effectiveness and probable success of implementing the management requirements, mitigation measures, and Best Management Practices (BMPs), which are designed to avoid, minimize or reduce potentially adverse impacts to soil productivity.

EXISTING CONDITION

Landscape Characteristics

Approximately 75 percent of the planning area is comprised of gently sloping plains and uneven lava flows that lie below and surround cinder cones and younger lava flows. Twenty five percent of the project area consists of lava flows that have naturally low soil quality. Dominant landforms have average slope gradients that range from 0 to 15 percent with occasional, short steep pitches up to 30 percent associated with the rough edges of lava flows. Bessie, Luna, and Klawhop are cinder cones with butte escarpments and smooth convex slopes that range from 30 to 70 percent.

Mean annual precipitation varies across the landscape due to changes in elevation, but it generally ranges from about 10 to 20 inches. Precipitation patterns are primarily influenced by Pacific Ocean fronts that move inland from the west during the wet season months of November through March. Approximately two-thirds of the total precipitation occurs during the late fall and winter. Much of the winter precipitation falling above 4,000 feet accumulates as snowpack that melts during the spring and early summer months. Brief thundershowers usually provide light summer rainfall from late June through mid-October.

The project area includes portions of the Arnold, Coyote Springs, Benham Falls, Kelsey Butte, Lava Cast Forest, Lava Butte and the Little Deschutes subwatersheds. Most of the water yielded from these lands is delivered to streams as deep seepage and subsurface flows. There are no intermittent, or ephemeral stream channels within the majority of the project area. The Deschutes River forms a portion of the western boundary of the planning area.

The project area contains 29 landtype mapping units (Table 76) based on similarities in landforms, geology, and climatic conditions that influence defined patterns of soil and vegetation (Soil Resource Inventory, Larsen, 1976). The biophysical characteristics of these landtype units can be interpreted to identify hazards, suitabilities, and productivity potentials for natural resource planning and management.

The dominant landtypes within the project area exhibit high water infiltration rates and are classified as well to excessively drained. Surface soils are pumiceous loamy sands and sands. Permeability is very rapid in surface soils and moderate to rapid in the buried soils. Some of theses soils have a water table that can be encountered within two to five feet from the surface. Underlined bedrock in the planning area is mostly basalts and andesites that have a high to moderate capacity to store water and a low to moderate rate of water transmission unless storage capacity is exceeded. Table 76 displays the Soil Resource Inventory mapping (SRI) units that occur in the Kelsey project area and their key interpretation.

Table 76: Mapping Units and Interpretations

Mapping Unit	Percent Slope	Natural Stability	Erosion Potential	Compaction Potential	Displacement Potential	Sedimentation Yield Potential
01*	0-30	Very Stable	N/A	N/A	N/A	N/A
09*	25-70	Stable	Low	Moderate	High	Variable
11*	0-30	Very Stable	Low	Low	Low	N/A
14*	25-80	Stable	Moderate	Low	High	Low to Moderate
15*	0-10	Very Stable	Low	Low to Moderate	Low to Moderate	Low
43	0-5	Very Stable	Low to Moderate	High	Low to Moderate	Low
63	0-10	Very Stable	Low	Low to Moderate	Low	Low
64	0-30	Very Stable	Low to Moderate	Low	Moderate	Low
65	0-30	Very Stable	Low to Moderate	Low	Moderate	Low
66	0-30	Very Stable	Low to Moderate	Low	Moderate	Low to Moderate
68*	30-60	Very Stable To Stable	Moderate	Low	High	Low to Moderate
6A	0-30	Very Stable	Low	Moderate to Low	Low to Moderate	Low
6B	0-30	Very Stable	Low	Low	Moderate	Low
6Gfrost*	0-30	Very Stable	Low	Moderate	Moderate to Low	Low

Table 76: Mapping Units and Interpretations						
Mapping Unit	**Percent Slope**	**Natural Stability**	**Erosion Potential**	**Compaction Potential**	**Displacement Potential**	**Sedimentation Yield Potential**
6J	0-20	Very Stable	Low	Low	Low to Moderate	Low
70	0-30	Very Stable	Low	Low to Moderate	Low to Moderate	Low
72	0-20	Very Stable	Low	Low to Moderate	Low to Moderate	Low
74	0-30	Very Stable	Low	Low	Low	Low
76	0-30	Very Stable	Low	Low	Low	Low
80*	25-70	Stable	Moderate	Low	Low	Low to Moderate
81*	25-70	Stable	Moderate	Low	Low	Low to Moderate
LD	0-30	Very Stable	Low	Low	Low	Low
LE	0-30	Very Stable	Low to Moderate	Low	Moderate	Low
LG*	0-80	Stable	Low to Moderate	Moderate to Low	Low to Moderate	Low to Moderate
LK*	0-60	Very Stable	Low to Moderate	Low	Moderate to High	Low to Moderate
LU	0-20	Very Stable	Low	Low to Moderate	Low to Moderate	Low
LX	0-30	Very Stable	Low to Moderate	Low	Low to Moderate	Low
WE	0-5	Very Stable	Low to Moderate	Low to Moderate	Low to Moderate	Low
XD	0-30	Very Stable	Low	Low to Moderate	Low to Moderate	Low

* Sensitive Soils (Total = 15,050 acres): 1,9,11,14,LG = Rough, uneven lava flows (12,345 acres); 15,6G = Depressions, flats (1,040 acres); 68,80,81,LK = Cinder cones (1,665 acres).

The more productive soils (ash deposits) are commonly found on north and east aspects, and toe slopes, swales and depressions. Dominant soils are moderately deep (20 to 40 inches) to deep with loamy-sand textures that readily drain excess moisture over much of the project area. The underlying residual soils and bedrock materials have a moderate capacity to store water. The deep soils (40 inches or more in depth) associated with these landscape positions commonly reflect areas of dense vegetation. The less productive soils (cindery soil materials) are commonly found on south and west aspects and on basalt ridges and side-slopes of buttes and cinder cones. Approximately 15 percent of the project area is comprised of landtypes that contain shallow soils (less than 20 inches) and areas of exposed bedrock that generally produce surface runoff only during high intensity storms.

The sandy textures of these ash-influenced soils have high infiltration and percolation rates that account for low amounts of overland flow and natural erosion on undisturbed sites with adequate ground cover protection. Surface erosion by water is generally not a concern because dominant landtypes have gentle slopes and low-to-moderate erosion hazard ratings. The moderately deep and deep soils on the buttes in the project area have a moderate erosion hazard. Exposed soils on the steep slopes (greater than 30 percent) of these landforms are much more susceptible to accelerated erosion during high-intensity rainfall events.

Soils derived from Mazama ash tend to be non-cohesive (loose) and they have very little structural development due to the young geologic age of the volcanic parent materials. Dominant soils have naturally low bulk densities and low compaction potential. However, mechanical disturbances can reduce soil porosity to levels that limit vegetative growth, especially where there is a lack of woody debris and surface organic matter to help cushion the weight distribution of ground-based equipment. Due to the absence of rock fragments on the surface and within soil profiles, these soils are well suited for tillage treatments (subsoiling) that loosen compacted soil layers and improve the soils ability to supply nutrients, moisture, and air that support vegetative growth and biotic habitat for soil organisms. The sandy-textured surface layers are also easily displaced by equipment operations, especially during dry moisture conditions. The maneuvering of equipment is most likely to cause soil displacement damage on the steeper landforms.

Land Suitability and Inherent Soil Productivity

The suitable lands database for the Forest Plan identifies areas of land which are considered to be suitable for timber production using criteria affecting reforestation potential (FSH 2409.13). This data was developed to designate a broad-scale timber base area for forest-wide planning purposes. Project level planning requires that lands proposed for harvest have their suitability verified based on the criteria outlined in the Forest Service Handbook (FSH 1909.12). Lands that do not meet these criteria are considered unsuitable or partially suitable for timber harvest due to regeneration difficulties or the potential for irreversible damage to resource values from management activities.

The productivity of forest soils can be measured as the Cubic Foot Site Class (Mean Annual Increment in cubic feet/year) for primary tree species growing on undisturbed or minimally disturbed sites. These volume indices provide valuable baseline information regarding soil productivity potential for each soil type in the Deschutes SRI (Soil Resource Inventory, Larsen, 1976). On the Deschutes National Forest, site classes range from Very Low (Site Class 7) to High (Site Class 4). Soil types having Site Class 7 are considered unsuited for forest production because the mean annual increment is generally less than 20 cubic feet per year.

Dominant landtypes within the Kelsey project area generally have moderate productivity ratings. All activity areas proposed for timber harvest and fuel reduction treatments meet the criteria for suitability that would allow them to be regenerated or resist irreversible resource damage.

Sensitive Soil Types

Criteria for identifying sensitive soils to management are listed in the Forest Plan (Appendix 14, Objective 5). These criteria include slopes over 30 percent, frost pockets, seasonal or year-long high water tables, extremely rocky areas, and soils that have high or severe erosion hazard ratings.

Sensitive soils within the Kelsey project area include: 1) soils on slopes greater than 30 percent, 2) soils associated with frost pockets in cold air drainages, and 3) soils that occur in localized areas of rocky lava flows. There are no potentially wet soils with high water tables or sensitive soils with high erosion hazard ratings.

Approximately 33 percent (15,046 ac) of the project area contains landtypes with localized areas of sensitive soils (Table 77). Only portions of these landtypes contain localized areas with sensitive soils. Figures 31 and 32, pages 3-158 and 164 show locations of sensitive soils on steep slopes (greater than 30 percent). Approximately 24 percent of total Kelsey planning area (11,120 acres) is lava flows, primarily within Newberry National Volcanic Monument.

Table 77: Landtype Acres Containing Localized Areas Of Sensitive Soils Within The Eighteen Fire Recovery Project Area (Soil Resource Inventory, Deschutes National Forest, 1976)

SRI Map Unit Symbol	Geomorphology (Representative landforms)	Type of Concern**	Landtype Acres
01,09,11,14, LG	Rough, uneven lava flows	3	12,343
15, 6G	Depressions or Flats	2	1,040
68, 80, 81, 81 LK	Cinder cones	1	1,663

****Management Concerns:** 1) On slopes greater than 30 percent, loose sandy soils are susceptible to soil displacement; 2) Very low productivity due to frost heaving, low fertility, and temperature extremes; 3) Sensitive soils with variable depths in pockets and cracks of rocky, uneven lava flows.

Erosional Processes

Erosion is a function of many soil and environmental factors that affect soil particle detachment and movement by runoff water. Severity of erosion also depends on many factors, including slope gradient, inherent soil erodibility, the amount of bare ground, and the intensity of precipitation events. All soils are susceptible to soil movement whenever rainfall intensities or snowmelt are great enough to cause overland flow. On undisturbed sites with gentle slopes, surface erosion occurs at naturally low rates because vegetation and organic litter layers protect soils. Accelerated erosion occurs at a rate greater than natural, usually associated with disturbances that reduce vegetative cover, displace organic surface layers, or reduce soil porosity through compaction. Steep slopes with sparse vegetation generally have greater amounts of surface runoff, increasing the erosion potential. Due to the lack of structural development, volcanic ash-influenced soils are easily eroded where water becomes channeled on disturbed sites such as road surfaces, skid trails, water-bar outlets, and road drainage structures.

Inherent erosion hazard (Table 76) is a relative rating for surface erosion based on the ability of the soil to take in water, resistance of the soil surface to the impact of rainfall and water movement, and the effect of topography or slope gradient. The rating for surface erosion potential assumes that the surface cover of vegetation or litter has been disturbed or destroyed and bare surface soils are exposed to the elements of erosion. The following ratings are intended for planning purposes to indicate relative potential erosion hazards:

Low: Soils are generally on gentle to moderate slopes with no appreciable hazard for erosion.

Moderate: Some loss of surface materials can be expected, but soils are sufficiently resistant to erosion to permit limited and temporary exposure of bare soil during development or use.

High: Considerable loss of surface materials can be expected. Unprotected soils will erode sufficiently to severely damage productivity.

There are no sensitive soils with high erosion hazards within the project area. Dominant soils consist of moderately deep and deep soils on gentle slopes with low hazards for water erosion. At the present time, adequate soil cover currently exists to control erosion on the dominant soils and landforms that have been affected by disturbance in the project area.

Forest Plan standard and guideline SL-6 (Forest Plan pages 4-70 and 4-71) provides ground cover objectives to minimize accelerated erosion rates on disturbed sites with unprotected soils (Table 78). Effective ground cover includes all living or dead herbaceous or woody materials and rock fragments greater than three-fourths of an inch in diameter in contact with the ground surface, including tree or shrub seedlings, grass, forbs, litter, and woody biomass. Effective ground cover is measured as a percent of natural conditions for representative soils and landtypes. In order to minimize soil erosion by water or wind, the following ground cover objectives should be met within the first two years after completion of ground-disturbing management activities.

Table 78: Minimum Ground Cover Objectives to Minimize Soil Erosion By Water and Wind

Surface Soil Erosion Potential (Deschutes Soil Resource Inventory)	Minimum Effective Ground Cover (Percent of Natural)	
	1st Year	2nd Year
Low	20 - 30	31 – 45
Moderate	31 – 45	46 – 60
High	46 – 60	61 – 75
Severe	61 - 75	76 – 90

Mass Movements (Landslide Hazards)

Mass movements, or landslides, occur when earthen materials become unstable and slide downslope in response to gravity. There are no natural or management-related landslides known to exist within the project area. The high permeability of the ash-influenced soil materials generally precludes the buildup of hydraulic pressures that could trigger landslides. There are no seeps or springs on steep slopes and dominant landtypes do not meet criteria for landslide prone terrain.

MANAGEMENT-RELATED DISTURBANCES

Timber Management

During the 1920s, logging left a scattered overstory of seed trees to provide natural regeneration. Over the past 70 to 80 years, it is expected that natural processes (such as root penetration, frost heave, rodent activity, freeze-thaw and wetting-drying cycles) have gradually restored soil porosity in compacted areas, while the establishment of native vegetation and accumulation of organic matter has improved areas of past soil displacement.

Based on more recent harvest history, various thinning treatments, intermediate harvest, and regeneration cut occurred within the project area between 1979 and 1992. Temporary roads, log landings, and primary skid trails were constructed and used to access individual harvest units of past timber sales. Research studies and local soil monitoring have shown that soil compaction and soil displacement account for the majority of detrimental soil conditions resulting from ground-based logging operations (USDA Soil Monitoring Reports, Deschutes National Forest, 1995-97 and 1999; Page-Dumroese, 1993; Geist, 1989; Powers, 1999).

Past use of ground-based logging equipment has disturbed soils in portions of approximately 15,550 acres within the project area. Research has shown that the detrimental effects of soil compaction generally require more than 3 to 5 equipment passes over the same piece of ground (McNabb, Froehlich, 1983). Where only 1 or 2 equipment passes occurred, soil compaction was shallow (2 to 4 inches) and the bulk density increases did not qualify as a detrimental soil condition. It is expected that soils in these areas have returned to undisturbed density levels in the short-term (less than 5 years) through natural processes, such as root penetration, frost heave, rodent activity, freeze-thaw and wetting/drying cycles.

Some long-term adverse effects to soil productivity still exist where either or both surface organic layers were displaced and multiple equipment passes caused deep compaction. The establishment of ground cover vegetation and accumulation of organic matter has been improving areas of past soil displacement. Decaying wood on the forest floor is critical for maintaining the soils ability to retain moisture and provide both short and long-term nutrient supplies for the growth of vegetation. Mycorrhizal fungi and soil organisms depend upon the continuing input of woody debris and fine organic matter. A balance between management practices and ensuring adequate amounts of coarse woody debris (CWD) is an important goal for maintaining long-term soil productivity. Using mycorrhizal fungi as a bio-indicator of productive forest soils, research studies were used to develop conservative recommendations for leaving sufficient CWD following management activities (Graham et al. 1994, Brown et al. 2003). A minimum of 5 to 10 tons per acre of coarse woody debris (greater than 3 inches in diameter) should be retained on dry, ponderosa pine sites to maintain soil productivity. The upper limit of this range seems appropriate in areas where most of the partially decomposed CWD and forest litter has been consumed by fire (Brown et al. 2003). A sufficient number of standing dead snags and live trees (if available) should also be retained for future recruitment of organic matter.

Conserving surface litter (organic materials such as leaves, twigs and branches less than 3 inches in diameter) is also important for protecting mineral soil from erosion, buffering the effects of soil compaction, and supplying nutrients that support the growth of vegetation and native populations of soil organisms. Surface litter also provides on-site moisture retention.

Roads

The planning area contains approximately 271 miles (approximately 488 acres) of open Forest system roads. Segments of these existing roads cross through portions of activity areas proposed for treatment. The amount of detrimentally disturbed soil committed to existing roads is included in the estimated percentages displayed in Table 79, page 3-154 and Table 80, page 3-158. Roads detrimentally disturb soil properties and convert the soil resource to a non-productive condition. Most of the precipitation that falls on compacted road surfaces is transmitted as surface runoff, and roads are primary sources of accelerated surface erosion. Road condition surveys would be conducted to identify where improvements are necessary to correct drainage problems on existing roads that may be used as haul routes for this project.

The roads analysis identified several segments of local system road, which are recommended for long-term closures and road decommissioning (obliteration) treatments. Some local system roads are currently closed to public use, but segments of these roads may be re-opened to provide necessary access. These roads would either be closed again or decommissioned following harvest activities. There is approximately 18,996 feet (5.2 acres) of user created roads, plus 221,900 feet (30 acres) of cross-country OHV trails.

Non-Motorized Recreation Activities

The extent of detrimental soil conditions associated with non-motorized recreation use is relatively minor in comparison to existing roads and past logging disturbances. The small amount of disturbed soil does not increase the percentage of detrimental soil conditions in this activity area. Developed recreation facilities do not increase the percentages of existing detrimental soil conditions within any of the proposed activity areas.

Impacts from dispersed recreation activities are usually found along existing roads and trails. Field observations indicate little or no evidence of dispersed campsites within the proposed activity areas. User-created trails typically occur where vegetation has been cleared on or adjacent to old skid trail networks of past harvest areas. Conservative estimates were used to account for soil disturbances from existing logging facilities, such as main skid trails and landings, and the extent of these impacts is likely included in the estimates of existing detrimental soil conditions (Table 79, page 3-154). Recreational use is expected to have a negligible effect on overall site productivity within the individual activity areas proposed for this project.

Livestock Grazing

The project area contains portions of the Bessie Grazing Allotment, which has been inactive since 1990. Livestock impacts to the soil resource are found mainly in localized areas of concentrated use, such as around water developments, salt licks, bedding areas, and major travel routes. The majority of detrimental soil conditions are confined to relatively small areas (about 1.0 acre) around water developments needed to manage livestock. Salt licks are commonly placed in the immediate vicinity of water sets and these sites are commonly used as bedding areas, especially where scattered trees exist to provide shade. Although there are three water sets within the project area, only one occurs within a proposed activity area. One acre of disturbed soil is estimated for this water set and it is included the estimated percentages of detrimental soil conditions.

There are no site-specific areas where livestock movement and grazing effects have caused unsatisfactory soil conditions within the individual activity areas proposed for this project. Current range records for representative analysis plots indicated that forage conditions were generally good and the vegetative trend was stable. The minor extent of incidental soil disturbances from grazing use in random locations of activity areas is not expected to increase the percentages of detrimental soil conditions.

ENVIRONMENTAL EFFECTS

Past management activities have affected the soil resource within the project area. The proposed harvest and associated activities may cause cumulative increases in detrimental conditions by increasing compaction and soil displacement, reducing effective ground cover, and increasing the potential for accelerated erosion. The following indicators will be used to compare the alternatives.

The proposed vegetation and fuel reduction treatments are related actions that would occur to achieve a purpose and need that is not associated with timber production. A qualitative assessment of soil effects was conducted by comparing existing conditions to the anticipated conditions that would result from implementing the action alternatives.

The potential for detrimental changes to soil physical properties was quantitatively analyzed by the extent (surface area) of temporary roads, log landings, and designated skid trail systems that would likely be used to facilitate yarding activities within each of the proposed activity areas. Professional judgment was used to evaluate changes in the amount and composition of coarse woody debris and surface organic matter that provides surface cover, habitat for soil biological activity, and a nutrient reservoir for maintaining soil productivity.

Soil condition assessments for similar soils and the same types of ground-based harvest systems, research references, and personal communications with timber sale administrators were used to predict the extent of detrimental soil disturbance anticipated from mechanized harvest and yarding activities. On the Deschutes National Forest, soil productivity monitoring has shown that detrimental soil conditions increase each time a stand is treated with mechanical equipment. Monitoring results following initial harvest entries have shown that 15 to 30 percent of the unit area can be detrimentally disturbed by ground-based harvest systems depending on harvest prescriptions, the spacing of skid trails, and soil conditions at the time of harvest (Soil Monitoring Report, 1995). Research studies and local soil monitoring have shown that soil compaction and soil displacement account for the majority of detrimental soil conditions resulting from ground-based logging operations (Deschutes N.F., Soil Monitoring Reports, 1996, 1997, and 1999; Page-Dumroese, 1993; Geist, 1989; Powers, 1999).

Estimates for predicted amounts of detrimental soil conditions following proposed commercial harvest account for the expected amount of volume removal, the type of logging equipment, the spacing of skid trails, and the number of log landings that would be needed to deck accumulated materials. Due to the gentle terrain and the type of machines that would likely be used for yarding operations, it is expected that skid trail networks would have an average spacing distance of approximately 100 feet between main trails. Individual skid trails would have an average disturbed width of 12 feet. On moderately flat ground with small timber, research found that skid trail spacing of 100 feet would account for approximately 11 percent of the unit area (Froehlich, 1981, Garland, 1983).

Research has shown that the first one or two equipment passes over an area compacts the upper few inches of the soil. Additional passes cause greater increases in bulk density and compact the soil to greater depths. The detrimental effects of soil compaction generally require more than 3 to 5 equipment passes over an area (McNabb, Froehlich, 1983). Frost heaving and freeze-thaw cycles can generally offset soil compaction near the soil surface. Other natural processes that help restore soil porosity in soil surface layers include root penetration, rodent activity, wetting and drying cycles, and the accumulation of organic matter. On gentle to moderately sloping terrain, the maneuvering of equipment generally does not remove soil surface layers in large enough areas (at least 5 feet in width) to qualify as detrimental displacement (FSM 2520, R-6 Supplement). Smaller areas of gouging or the mixing of soil and organic matter would not constitute detrimental soil displacement. Conservative estimates were used to account for predicted amounts of detrimental soil conditions associated with logging facilities, and the relatively minor extent of these incidental soil disturbances is likely included in these estimates.

Alternative 1 (No Action)

Sensitive Soils

Direct and Indirect Effects: Under Alternative 1 (No Action), the management activities proposed in this document would not take place. No additional land would be removed from production to build roads or logging facilities for commercial harvest operations. This alternative would defer opportunities for decommissioning roads, which are no longer needed for long-term access, that would reclaim and stabilize detrimentally compacted soil committed to Forest road system. The current extent of detrimental soil conditions would likely remain unchanged for an extended period of time.

Disturbed soils would continue to recover naturally from the effects of past management activities. At the present time, adequate soil cover currently exists to control erosion rates within tolerable limits.

The Bessie Grazing Allotment is currently inactive, but livestock could resume grazing in portions of the project area following the recovery of herbaceous vegetation. Livestock grazing within the proposed activity areas would be delayed until at least the fall of 2005.

Soil productivity would not change appreciably unless future high intensity, stand replacing wildfires cause intense soil heating resulting in detrimental changes to soil properties. The No Action Alternative would defer fuel reduction opportunities at this time. If a large amount of fuel is present during a future wildfire, soil temperatures can remain high for long duration and excessive soil heating would be expected to produce large changes in soil chemical, physical, and biological properties (DeBano, 1991).

Coarse Woody Debris (Cwd) And Surface Organic Matter

Direct and Indirect Effects: As previously described under the existing condition, the amount of coarse woody debris would gradually increase as diseased trees fall to the ground over time. Short-term increases in available nutrients would benefit ground-cover vegetation that would eventually provide new sources of surface organic matter.

In the long-term diseased trees would become heavy fuel loadings that increase the burn hazard to an unacceptable level. The larger diameter snags (greater than 17 inches) may stand for 10 to 20 years, depending on the rate of decay and local wind conditions. High-to-extreme fire hazard and potential for excessive soil heating exists when downed woody debris exceeds 30 to 40 tons per acre (Brown et al., 2003).

Cumulative Effects: Proposed Oregon Department of Transportation projects could potentially remove approximately 15 acres from the productive land base. These projects include new access to Lava River Cave, Lava Lands Visitor Center, the Sunriver interchange, and the widening of highway from north of the Cottonwood interchange to the proposed Sunriver interchange.

Alternative 2 (Proposed Action)

Detrimental Soil Disturbance

Direct and Indirect Effects: Under Alternative 2, there would be tree harvest on approximately 475 acres of sensitive soils. The development and use of log landings, and skid trail systems are the primary sources of physical disturbance that would result in adverse changes to soil productivity. The majority of soil impacts would occur on and adjacent to these heavy-use areas where multiple equipment passes typically cause detrimental soil compaction. Mitigation would be applied to avoid or minimize the extent of soil disturbance in random locations between main skid trails and away from log landings. Thinning slash and fallen dead trees would provide additional ground cover that would improve the soils ability to resist surface erosion.

The amount of disturbed area associated logging landings and skid trails would be limited to the minimum necessary to achieve management objectives. Since there is overlap with previously managed areas, opportunities to reuse existing skid trail networks and log landings would be utilized. The estimated total of approximately 340 acres of soil would be removed from production for designated skid trails and log landings within the proposed (unit) activity areas proposed for ground-based harvest. Table 79 displays existing and predicted amounts of detrimental soil conditions in acres and percentages for each of the activity areas proposed under Alternative 2. Under Alternatives 2 there would be approximately 71 acres of soil restoration treatments that would be applied to specific units.

Ground-disturbing activities would vary in their intensity of site disturbance. Alternative 3 activities would result in the greatest extent of physical soil impacts due to logging facilities. Soil restoration treatments would reclaim and stabilize detrimental soil conditions on many of these facilities. Alternative 3 would provide the greatest benefit in reducing heavy fuel loadings and decrease the hazard for future high-severity ground fires.

Reforestation would be accomplished on approximately 275 acres in activity areas by using hand tools to plant tree seedlings. Shallow excavations and scalping to prepare sites for planting would not disturb large enough areas to qualify as a detrimental soil condition (FSM 2520, R-6 Supplement). These trees would increase water infiltration into the soil as root systems develop, and they would also provide some additional cover to reduce raindrop impacts on exposed mineral soil.

Table 79: Alternative 2 (Proposed Action) Existing And Predicted Detrimental Soil Conditions For Each Activity Area						
DEIS Unit Number	Unit Acres	Proposed Treatment[34]	Existing Detrimental Soil Conditions	Estimated Detrimental Soil Disturbance After Treatment	Estimated Detrimental Soil Conditions Following Subsoiling	
					Percent	Acres
7	80	HTH, UB	0 %	13 %	13 %	0
8	46	HSL, WTY, MST	1 %	14 %	14 %	0
9	47	UB	1 %	1 %	1 %	0
10	15	UB	0 %	0 %	0 %	0
11	54	HTH, WTY	8 %	21 %	20 %	1
12	102	HTH, WTY, MST, UB	0 %	13 %	13 %	0
13	218	HTH, WTY, MST, UB	0 %	13 %	13 %	0
20	198	MST, UB	24 %	24 %	24 %	0
21	112	HSL, WTY, MST	26 %	33 %	24 %	8
22	172	HTH, WTY, MST	37 %	44 %	37%	12
23	96	HTH, WTY, MST, UB	4 %	17 %	17 %	0
24	13	MST, UB	3 %	3 %	3 %	0
25	85	MST, UB	1 %	14 %	14 %	0
26	102	HSL, WTY, MST, UB	4 %	17 %	17 %	0
27	47	HSL, WTY, MST,	2 %	15 %	15 %	0
29	9	MST	11 %	11 %	11 %	0
30	64	MST	0 %	0 %	0 %	0
31	1	MST	6 %	6 %	6 %	0
33	14	HCR	4 %	17 %	17 %	0
34	52	HSL, WTY, HP	0 %	13 %	13 %	0
35	19	HSL, WTY, MST, UB, HP	0 %	13 %	13 %	0
36	14	HSL, WTY, UB	25 %	32 %	25 %	1
37	36	HTH, WTY, UB	2 %	15 %	15 %	0
38	24	HSL, WTY, MST, UB	0 %	13 %	13 %	0
39	66	HTH, WTY, UB	30 %	37 %	30 %	5
40	22	MST	29 %	29 %	29 %	0
41	54	HTH, WTY, MST, UB	27 %	34 %	2 %	4
42	41	HTH,MST, UB	29%	36%	29%	3
45	155	HTH, MST, WTY, UB	13 %	20 %	20 %	0
46	22	MST	29 %	29 %	29 %	0
47	224	HTH, WTY	14 %	21 %	20 %	3
48	43	MST	2 %	2%	2 %	0
49	10	HTH, WTY, MST, HP, UB	4 %	17 %	17 %	0
50	108	HTH, WTY, MST, UB	2 %	15 %	15 %	0
52	1	HTH, WTY, MST, UB	29 %	36 %	20 %	1
53	3	MST, GPR	5 %	5%	5 %	0
54	4	HTH, WTY, MST, UB	29 %	36 %	29 %	1
55	5	MST	8 %	8 %	8 %	0
56	69	HTH, WTY, MST, UB	29 %	36 %	29 %	5
57	17	MST	32 %	32 %	32 %	0
58	41	HSA, WTY, MST	29 %	36 %	29 %	3
59	15	HSL, WTY, UB	29 %	36 %	29 %	1
60	35	HSL, WTY, MST, UB	4 %	13 %	13 %	0
61	45	HSL, WTY, MST, UB	16 %	23 %	20 %	2
62	11	MST	29 %	29 %	29 %	0
63	10	MST	29 %	29 %	29 %	0

[34] **Table Key: HP** = Hand Pile; **MP** = Machine Pile; **HCR** = Seed tree; **HTH** = Commercial Thin; **HPR** = Partial removal; **HSL** = Uneven-aged management; **HAS** = Sanitation cut; **HSV** = Salvage; **WTY**=Whole Tree Yard; **UB** = Underburn; **MST** = Mechanical Shrub Treatment.

Table 79: Alternative 2 (Proposed Action) Existing And Predicted Detrimental Soil Conditions For Each Activity Area						
DEIS Unit Number	Unit Acres	Proposed Treatment[34]	Existing Detrimental Soil Conditions	Estimated Detrimental Soil Disturbance After Treatment	Estimated Detrimental Soil Conditions Following Subsoiling	
					Percent	Acres
64	9	MST	7 %	7 %	7 %	0
65	11	HSL, WTY, MP	29 %	36 %	29 %	1
66	26	HSL, WTY, MST,UB	0 %	13 %	13 %	0
67	96	HTH, WTY, UB	19 %	26 %	19 %	6
68	46	HSL, WTY, MST, UB	0 %	13 %	13 %	0
69	22	HSL, WTY, MST, UB	0 %	13 %	13 %	0
70	21	HSL, WTY, MST, UB	0 %	13 %	13 %	0
71	36	HSL, WTY, MST, UB	0 %	13 %	13 %	0
73	11	HTH, WTY, MST, UB	2 %	15 %	15 %	0
74	12	HTH, WTY, MST, UB	1 %	14 %	14 %	0
75	3	HTH, WTY, MST, UB	0 %	13 %	13 %	0
77	46	MST, UB	3 %	3%	3 %	0
78	29	HTH, WTY, MST	4 %	17 %	17 %	0
79	124	MST, UB	15 %	22 %	20 %	3
80	26	HTH, WTY, MST	0 %	13 %	13 %	0
81	75	MST	1 %	1 %	1 %	0
82	87	MST, UB	10 %	10 %	10 %	0
83	53	MST, UB	0 %	0 %	0 %	0
84	27	MST, UB	0 %	0 %	0 %	0
85	10	MST	0 %	0 %	0 %	0
86	5	MST	0 %	0 %	0 %	0
87	11	HPR, WTY, HP, UB	13 %	20 %	20 %	0
88	79	HTH, WTY, MST, UB	13 %	20 %	20 %	0
89	19	HTH, WTY, MST, UB	10 %	17 %	17 %	0
90	53	MST, UB	0 %	0 %	0 %	0
94	17	HTH, WTY, MST	0 %	13 %	13 %	0
95	5	MST	0 %	0 %	0 %	0
96	94	HTH, WTY, MST, UB	3 %	16 %	16 %	0
97	9	HTH, WTY	29 %	36 %	36 %	1
98	8	HTH, WTY, MST, UB	29 %	36 %	22 %	1
99	5	HSA, WTY, MST, UB	29 %	36 %	29 %	1
100	4	HSL, WTY, MST, UB	26 %	33 %	26 %	1
101	11	MST, UB	19 %	19 %	19 %	0
102	126	HTH, WTY, MST, UB	1 %	14 %	14 %	0
104	119	MST, UB	0 %	0 %	0 %	0
105	170	HTH, WTY, MST, UB	0 %	13 %	13 %	0
106	223	MST	2 %	2 %	2 %	0
107	10	MST	1 %	1 %	1 %	0
108	32	MST	1 %	1 %	1 %	0
109	60	MST	0 %	0 %	0 %	0
110	98	MST	3 %	3 %	3 %	0
111	75	HTH, WTY, UB	0 %	13 %	13 %	0
112	25	HTH, WTY, MST, UB	0 %	13 %	13 %	0
113	61	HTH, WTY	0 %	13 %	13 %	0
114	47	MST	11 %	11 %	11 %	0
115	53	MST	2 %	2 %	2 %	0
116	28	MST	0 %	0 %	0 %	0
117	51	HTH, WTY, MST, UB	0 %	13 %	13 %	0
119	70	HTH, WTY	0 %	13 %	13 %	0
120	36	HTH, WTY	3 %	16 %	16 %	0
121	93	HSL, WTY	0 %	13 %	13 %	0
123	405	UB	8 %	8 %	8 %	0
124	35	HTH, WTY, MST, UB	0 %	13 %	13 %	0

Table 79: Alternative 2 (Proposed Action) Existing And Predicted Detrimental Soil Conditions For Each Activity Area						
DEIS Unit Number	Unit Acres	Proposed Treatment[34]	Existing Detrimental Soil Conditions	Estimated Detrimental Soil Disturbance After Treatment	Estimated Detrimental Soil Conditions Following Subsoiling	
					Percent	Acres
125	8	HSL, WTY	6 %	19 %	19 %	0
126	30	HSL, WTY, UB	3 %	16 %	16 %	0
129	54	HTH, MST	2 %	15 %	15 %	0
130	99	HTH, WTY, MST, UB	3 %	16 %	16 %	0
131	37	MST	29 %	29 %	29 %	0
132	94	MST	5 %	5 %	5 %	0
133	63	MST	16 %	16 %	16 %	0
134	231	MST	7 %	7 %	7 %	0
135	110	MST	2 %	2 %	2 %	0
136	213	MST	0 %	0 %	0 %	0
137	239	MST	14 %	14 %	14 %	0
138	113	MST	29 %	29%	29 %	0
139	224	MST	15 %	15 %	15 %	0
140	12	MST	11 %	11 %	11 %	0
141	339	MST	11 %	11 %	11 %	0
142	112	MST, UB	16 %	16 %	16 %	0
143	69	MST, UB	17 %	17 %	17 %	0
145	247	MST, UB	17 %	17 %	17 %	0
146	157	HTH,WTY, MST, UB	0 %	13 %	13 %	0
147	135	HTH,WTY, MST, UB	0 %	13 %	13 %	0
148	5	HTH,WTY, MST, UB	1 %	14 %	14 %	0
149	5	HTH,WTY, MST, UB	0 %	13 %	13 %	0
150	4	HTH,WTY, MST, UB	0 %	13 %	13 %	0
151	238	UB	27 %	27 %	27 %	0
152	89	HTH, WTY, MST, UB	1 %	14 %	14 %	0
153	44	UB	4 %	4 %	4 %	0
154	68	UB	0 %	0 %	0 %	0
155	38	UB	0 %	0 %	0 %	0
156	18	HTH, WTY, UB	0 %	13 %	13 %	0
157	21	UB	0 %	0 %	0 %	0
158	10	UB	0 %	0 %	0 %	0
251	37	MST	4 %	4 %	4 %	0
254	49	HSA, WTY, MST	2 %	15 %	15 %	0
256	33	HTH, WTY, MST, UB	1 %	14 %	14 %	0
257	58	NONE	0 %	0 %	0 %	0
258	46	HSL, WTY, MST	0 %	13 %	13 %	0
259	27	HSL, WTY, UB	0 %	13 %	13 %	0
260	54	NONE	10 %	10 %	10 %	0
261	44	HSL, WTY, MST	17 %	24 %	24 %	1
262	69	HSL, WTY, UB	18 %	25 %	20 %	4
263	58	HTH, WTY, MST, UB	10 %	17 %	17 %	0
264	55	HTH, WTY, MST, UB	17 %	24 %	20 %	2
265	90	HTH, WTY, MST, UB	4 %	17 %	17 %	0
266	58	NONE	0 %	0 %	0 %	0
267	69	HSL, WTY, UB	3 %	16 %	16 %	0
268	84	HSL, WTY, MST	1 %	14 %	14 %	0
269	62	HTH, WTY, MST, UB	1 %	14 %	14 %	0

Table Key: HP = Hand Pile; **MP** = Machine Pile; **HCR** = Seed tree; **HTH** = Commercial Thin; **HPR** = Partial removal; **HSL** = Uneven-aged management; **HAS** = Sanitation cut; **HSV** = Salvage; **WTY**=Whole Tree Yard; **UB** = Underburn; **MST** = Mechanical Shrub Treatment.

The following conclusions summarize the potential increases in detrimental soil conditions associated with logging facilities and approximately 6.5 miles of temporary roads that would be needed to facilitate yarding operations in each of the activity areas. A seasonal road closure would prevent inappropriate access off classified roads in the project area.

Under Alternative 2, it is estimated that existing roads and management facilities within the proposed activity areas currently impact 965 acres of soil. There would be an increase to the total acres of detrimental soils impacts in Alternative 2 of 340 acres. Soil compaction would account for the majority of these impacts and the total amount of detrimental soil conditions would be approximately 1,375 acres prior to soil restoration activities. Subsoiling treatments would be applied to rehabilitate approximately 77 acres of detrimentally compacted soil within portions of the activity areas.

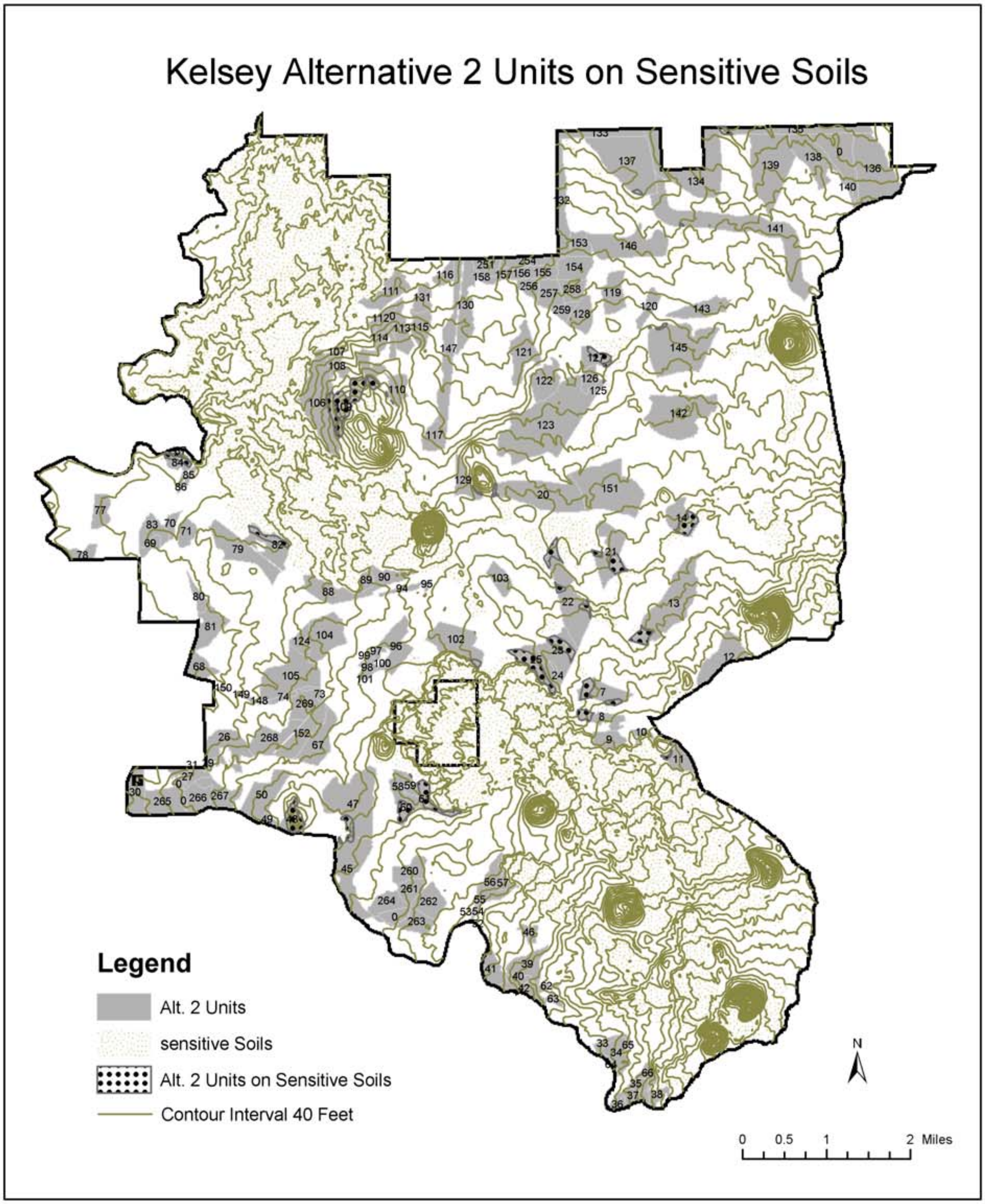
Based on these disturbed area estimates, the percentages of detrimental soil conditions following implementation of project and restoration activities would increase above existing conditions by approximately 10.0 to 13.6 percent in each of the proposed activity areas. None of these activity areas would exceed the Forest Plan standard for Region 6 or Forest Plan standards and guidelines. Therefore, the proposed actions comply with Forest Plan standards and guidelines SL-3 and SL-4, and Regional policy (FSM 2520, R-6 Supplement No. 2500-98-1) for maintaining soil productivity.

Sensitive Soils

Direct and Indirect Effects: Sensitive soils within the project area include: 1) soils on slopes greater than 30 percent, 2) soils associated with frost pockets in cold air drainages, and 3) soils that occur in localized areas of rocky lava flows. There are no potentially wet soils with high water tables or sensitive soils with high erosion hazard ratings that would require special mitigation. There are steep slopes in the following activities areas (units) 7, 8, 20, 21, 22, 23, 48, 84, 87, 106, 109, 110, 129, 135, 137 and 145. Figure 31, page 3-158 shows proposed activity areas in relation to sensitive soils locations of sensitive soils In order to avoid soil displacement damage, special requirements (Mitigations, Soils-5, page 2-50) will be applied to these units that have sensitive soils with steep slopes. Under Alternative 2, there would be commercial harvest on 475 acres of sensitive soils.

The potential for successful regeneration is limited by properties such as soil depth, soil fertility, and temperature extremes on low productivity sites such as frost pockets, cold air drainages, and localized areas of rocky lava flows. These sites may require replanting in order to achieve adequate stocking levels in a desired amount of time. Modified harvest prescriptions or other, less intensive treatments are management options that do not apply to reforestation objectives in areas affected by stand-replacement wildfires. The following activity (unit) areas have the potential to be frost packet that may require replanting activities: 13, 20, 21, 22, 25, 45, 47, 58, 60, 61, 82, and 102.

Figure 31: Sensitive Soils
Alternative 2 (Proposed Action)



Alternative 3

Detrimental Soil Disturbance

Direct and Indirect Effects: Under Alternative 3, there would be tree harvest on approximately 395 acres of sensitive soils. The development and use of log landings, and skid trail systems are the primary sources of physical disturbance that would result in adverse changes to soil productivity. The majority of soil impacts would occur on and adjacent to these heavy-use areas where multiple equipment passes typically cause detrimental soil compaction. Mitigation would be applied to avoid or minimize the extent of soil disturbance in random locations between main skid trails and away from log landings. Although the removal of trees would have no affect on evapotranspiration rates, logging slash and fallen dead trees would provide additional ground cover that would improve the soils ability to resist surface erosion.

The amount of disturbed area associated logging landings and skid trails would be limited to the minimum necessary to achieve management objectives. Since there is overlap with previously managed areas, opportunities to reuse existing skid trail networks and log landings would be utilized. As previously described under Important Interactions, an estimated total of approximately 525 acres of soil would be removed from production for designated skid trails and log landings within the proposed (unit) activity areas proposed for ground-based harvest. Table 80 displays existing and predicted amounts of detrimental soil conditions in acres and percentages for each of the activity areas proposed under Alternative 3.

Table 80: Alternative 3 Existing And Predicted Detrimental Soil Conditions For Each Activity Area

Ea Unit Number	Unit Acres	Proposed Treatment[35]	Existing Detrimental Soil Conditions	Estimated Detrimental Soil Disturbance After Treatment	Estimated Detrimental Soil Conditions After Subsoiling	
					Percent	Acres
9	47	RP/SPC	1 %	1 %	1 %	0
11	54	HTH, WTY	8%	21 %	20 %	1
20	198	MST, UB	24 %	24 %	24 %	0
21	112	HTH, WTY	26 %	33 %	33 %	8
22	172	HTH, WTY	37 %	44 %	37 %	12
23	96	HTH, WTY	4 %	17 %	17 %	0
24	13	MST, UB	3 %	3 %	3 %	0
26	102	HSL, GPR, WTY	4 %	17 %	17 %	0
29	9	MST	11 %	11 %	11 %	0
31	1	MST	6 %	6 %	6 %	0
33	14	HCR	4 %	17 %	17 %	0
37	36	HCC, HP	2 %	15 %	15 %	0
39	66	HTH, HP	30 %	37 %	30 %	5
41	54	HTH, WTY, MST, UB	27 %	34 %	27 %	4
42	41	HTH, MS, UB	29 %	36 %	29 %	3
45	155	HTH, MST, UB	13 %	20 %	20%	0
48	43	MST, UB	2 %	2 %	2 %	0
49	10	HTH, MST, UB	4 %	17 %	17 %	0
53	3	MST, GRP	5 %	5 %	5 %	0

[35] **Table Key: HP** = Hand Pile; **MP** = Machine Pile; **HCR** = Seed tree; **HTH** = Commercial Thin; **HPR** = Partial removal; **HSL** = Uneven-aged management; **HAS** = Sanitation cut; **HSV** = Salvage; **WTY**=Whole Tree Yard; **UB** = Underburn; **MST** = Mechanical Shrub Treatment.

Table 80: Alternative 3 Existing And Predicted Detrimental Soil Conditions For Each Activity Area

Ea Unit Number	Unit Acres	Proposed Treatment[35]	Existing Detrimental Soil Conditions	Estimated Detrimental Soil Disturbance After Treatment	Estimated Detrimental Soil Conditions After Subsoiling	
					Percent	Acres
55	5	MST, GPR, HP	8 %	8 %	8 %	0
57	17	MST, GPR, HP	32 %	32 %	32 %	0
61	45	HSL, HP	16 %	23 %	20 %	2
62	11	MST,	29 %	29 %	29 %	0
63	10	MST, HP	29 %	29 %	29 %	0
65	11	HSL, MP, HTY	29 %	36 %	29 %	1
73	11	HTH, WTY	2 %	15 %	15 %	0
74	12	HTH, MST, UB	1 %	14 %	14 %	0
75	61	HTH, MST, WTY	0 %	13 %	13 %	0
77	46	MST, UB	3 %	3 %	3 %	0
78	29	HTH, MST, HTY	4 %	17 %	17 %	0
81	75	MST	1 %	1 %	1 %	0
82	87	MST,	10 %	10 %	10 %	0
83	53	MST, UB	0 %	0 %	0 %	0
87	11	HPR, UB	13 %	20 %	20 %	0
88	79	HTH, MST, UB	13 %	20 %	20 %	0
89	19	HTH, MST, UB	10 %	17 %	17 %	0
90	52	MST, UB	0%	0%	0%	0
96	94	HTH, UB	3 %	16 %	16 %	0
97	9	HTH, WTY, HP	29%	36%	29%	1
98	8	HTH, MST, UB	29 %	36 %	29 %	1
99	5	HSA, MST, WTY, GPR, UB	29 %	36 %	29 %	1
100	4	HSL, MST, WTY, UB	26 %	33 %	26 %	1
102	126	HTH, WTY, UB	1 %	14 %	14 %	0
106	223	MST, HP	2 %	2 %	2 %	0
107	10	MST	1 %	1 %	1 %	0
108	114	MST	0 %	0 %	0 %	0
109	60	MST	0 %	0 %	0 %	0
110	98	MST	3 %	3 %	3 %	0
113	61	HTH	0 %	13 %	13 %	0
114	47	MST	11 %	11%	11%	0
115	53	MST	2 %	2 %	2 %	0
116	28	MST	0 %	0 %	0 %	0
119	70	HTH, WTY	0 %	13 %	13 %	0
120	36	HTH, WTY	3 %	16 %	16 %	0
121	93	HSL, HTY	0 %	13 %	13 %	0
123	405	UB	8 %	8 %	8 %	0
125	8	HSL ,WTY	6 %	19 %	19 %	0
126	30	HSL, WTY	3 %	16 %	16 %	0
129	54	HTH. WTY, HP	2 %	15 %	15 %	0
131	37	MST, HP	29 %	29 %	29 %	0
132	94	MST	5 %	5 %	5 %	0
133	63	MST	16 %	16 %	16 %	0
134	231	MST	7 %	7 %	7%	0
135	110	MST	2 %	2 %	2 %	0
136	213	MST	0 %	0 %	0 %	0
137	239	MST	14 %	14 %	14 %	0
138	113	MST, UB	29%	29%	29%	0
139	224	MST, UB	15%	15%	15%	0
141	339	MST	11 %	11 %	11 %	0
143	69	MST, UB	17 %	17 %	17 %	0
145	247	MST/ UB	17 %	17 %	17 %	0

Table 80: Alternative 3 Existing And Predicted Detrimental Soil Conditions For Each Activity Area

Ea Unit Number	Unit Acres	Proposed Treatment[35]	Existing Detrimental Soil Conditions	Estimated Detrimental Soil Disturbance After Treatment	Estimated Detrimental Soil Conditions After Subsoiling	
					Percent	Acres
148	5	HTH, WTY, MST, UB	1 %	14 %	14 %	0
149	5	HTH, HTY, MST, UB	0 %	13 %	13 %	0
150	4	HTH, HTY	0 %	13 %	13 %	0
152	89	HTH, WTY, MST, UB	1 %	14 %	14 %	0
153	44	UB	4 %	4 %	4 %	0
200	20	HTH, WTY, UB	1 %	14 %	14 %	0
201	20	HTH, WTY, UB	0 %	13 %	13 %	0
202	8	HTH, WTY	3 %	16 %	16 %	0
203	9	HTH, WTY, HP	4 %	17 %	17 %	0
204	12	HTH, WTY, HP	5 %	18 %	18 %	0
206	7	HTH, HTY,MST	0 %	13 %	13 %	0
207	75	MST, UB	0 %	0 %	0 %	0
208	110	MST, UB	2 %	2 %	2 %	0
209	44	HTH, WTY, MST, UB	1 %	14 %	14 %	0
210	34	HTH, WTY, MST, UB	3 %	16 %	16 %	0
211	71	HTH, WTY, MST	0%	13%	13%	0
213	40	HTH, WTY	0 %	13 %	13 %	0
218	32	HTH, WTY, MST	1 %	14 %	14 %	0
220	48	HTH, WTY, UB	0 %	13 %	13 %	0
221	16	MST, HP	1%	1 %	1 %	0
222	61	MST	1 %	1 %	1 %	0
223	164	MST	5 %	5 %	5 %	0
224	4	HTH, WTY, MST	8 %	21 %	20 %	1
225	10	HTH, WTY, MST	5 %	18 %	18 %	0
226	30	MST	3 %	3 %	3 %	0
227	24	HTH, WTY, MST	2 %	15 %	15 %	0
229	19	HTH, WTY	2 %	15 %	15 %	0
230	10	HTH, WTY	0 %	13 %	13 %	0
231	9	HTH, WTY	1 %	14 %	14 %	0
237	103	UB	0 %	0 %	0 %	0
238	57	UB	29 %	29 %	29 %	0
239	61	HTH, WTY, MST	1 %	14 %	14 %	0
240	15	HTH, WTY	2 %	15 %	15 %	0
241	52	HTH, WTY	17 %	24 %	20 %	2
242	62	HTH, WTY	29 %	36 %	29 %	4
243	19	HTH, WTY	2 %	15 %	15 %	0
244	61	HTH, WTY	13 %	20 %	20 %	0
245	99	UB	2 %	2 %	2 %	0
246	60	HTH, WTY	16 %	23 %	20 %	2
247	62	HSL, WTY	0 %	13 %	13 %	0
248	42	HTH, WTY	4 %	17 %	17 %	0
251	37	MST	4 %	4 %	4 %	0
252	34	UB	2 %	2 %	2 %	0
253	32	HTH, WTY, MST	2 %	15 %	15 %	0
254	49	HSA, GPR, WTY	2 %	15 %	15 %	0
255	99	UB	3%	3 %	3 %	0
256	33	HTH, WTY, MST, UB	1 %	14 %	14 %	0
257	58	NONE	0 %	0 %	0 %	0
258	46	HSL, WTY, MST	0 %	13 %	13 %	0
259	27	HSL, WTY, GRP, UB	0 %	13 %	13 %	0
260	54	NONE	15 %	15 %	15 %	0
261	44	HSL, WTY, MST	17 %	24 %	20 %	2
262	69	HSL, WTY, UB	18 %	25 %	20 %	4

Table 80: Alternative 3 Existing And Predicted Detrimental Soil Conditions For Each Activity Area						
Ea Unit Number	Unit Acres	Proposed Treatment[35]	Existing Detrimental Soil Conditions	Estimated Detrimental Soil Disturbance After Treatment	Estimated Detrimental Soil Conditions After Subsoiling	
					Percent	Acres
263	58	HTH, WTY, MST, UB	9 %	16 %	16 %	0
264	55	HTH, WTY, MST, UB	17 %	24 %	20 %	3
265	90	HTH, WTY, MST, UB	4 %	17 %	17 %	0
266	58	NONE	0 %	0 %	0 %	0
267	69	HSL, WTY, UB	3 %	16 %	16 %	0
268	84	HSL, WTY, MST	1 %	14 %	14 %	0
269	62	HTH, WTY, MST, UB	1 %	14 %	14 %	0
270	16	MST	4 %	4%	4 %	0
271	19	MST	1 %	1 %	1 %	0
272	3	HTH, WTY, MST, HP	3 %	16 %	16 %	0
273	2	HTH, WTY, MST	4 %	17 %	17 %	0
274	25	UB	0 %	0 %	0 %	0
275	20	UB	2 %	2 %	2 %	0
276	1	HTH, WTY, MST, HP,	1 %	14 %	14 %	0
277	98	HTH, WTY, MST, UB	1 %	14 %	14 %	0
278	4	HSA, WTY	5 %	18 %	18 %	0
307	80	HTH, WTY, MST	2 %	15 %	15 %	0
308	46	HTH, WTY, MST	1 %	14 %	14 %	0
312	102	HTH, WTY, MST, UB	1 %	14 %	14 %	0
313	267	HTH, WTY, MST, UB	1 %	14 %	14 %	0
325	85	UB	3 %	16 %	16 %	0
327	47	HTH, WTY, MST	4 %	17 %	17 %	0
335	19	HSL, WTY	0 %	13 %	13 %	0
338	24	HSL, WTY, UB	0 %	13 %	13 %	0
340	22	MST	4 %	4 %	4 %	0
346	22	MST	29 %	29 %	29 %	0
347	224	HTH, WTY	14 %	21 %	21 %	0
352	1	HTH, WTY, MST	42 %	49 %	20 %	1
354	4	HTH, WTY, MST	29 %	36 %	20 %	1
356	69	HTH, WTY, MST	29 %	36 %	29 %	7
360	35	HSL, WTY, MP	11%	24 %	20 %	1
366	4	HSL,WTY, MP	0 %	13 %	13 %	0
367	96	HTH, WTY, UB	29 %	36 %	29 %	7
368	46	HTH, WTY, MST	19 %	26 %	20 %	3
369	22	HSL, WTY, MST, UB	0 %	13 %	13 %	0
404	119	UB	1 %	1 %	1 %	0
405	170	HTH, WTY, MST, UB	1 %	14 %	14 %	0
411	75	HTH, WTY, UB	1 %	14 %	14 %	0
412	25	HTH, WTY, MST	0 %	13 %	13 %	0
424	35	HTH, WTY, MST, UB	0 %	13 %	13 %	0
430	99	HTH, WTY, MST, UB	4 %	17 %	17 %	0
442	112	HSL, WTY, MST, UB	19 %	26 %	20 %	7
446	157	HTH, WTY, MST, UB	1 %	14 %	14 %	0
447	135	HTH, WTY, MST, UB	0 %	13 %	13 %	0
451	238	MST	28 %	28 %	28 %	0

Table Key: HP = Hand Pile; **MP** = Machine Pile; **HCR** = Seed tree; **HTH** = Commercial Thin; **HPR** = Partial removal; **HSL** = Uneven-aged management; **HAS** = Sanitation cut; **HSV** = Salvage; **WTY**=Whole Tree Yard; **UB** = Underburn; **MST** = Mechanical Shrub Treatment.

Reforestation would be accomplished on 210 acres in activity areas by using hand tools to plant tree seedlings. Shallow excavations and scalping to prepare sites for planting would not disturb large enough areas to qualify as a detrimental soil condition (FSM 2520, R-6 Supplement). These trees would increase water infiltration into the soil as root systems develop, and they would also provide some additional cover to reduce raindrop impacts on exposed mineral soil.

The following conclusions summarize the potential increases in detrimental soil conditions associated with logging facilities and approximately 7.0 miles of temporary roads for commercial harvest that would be needed to facilitate yarding operations in each of the eight activity areas.

Under Alternative 3, existing roads and management facilities within the proposed activity areas currently impact an estimated total of approximately 911 acres of soil. There will be an increase to the total acres of detrimental soils impacts in Alternative 2 of 526 acres. Soil compaction would account for the majority of these impacts and the total amount of detrimental soil conditions would be approximately 1,514 acres prior to soil restoration activities. Subsoiling treatments would be applied to rehabilitate approximately 77 acres of detrimentally compacted soil within portions of the activity areas (Table 80, page 3-158).

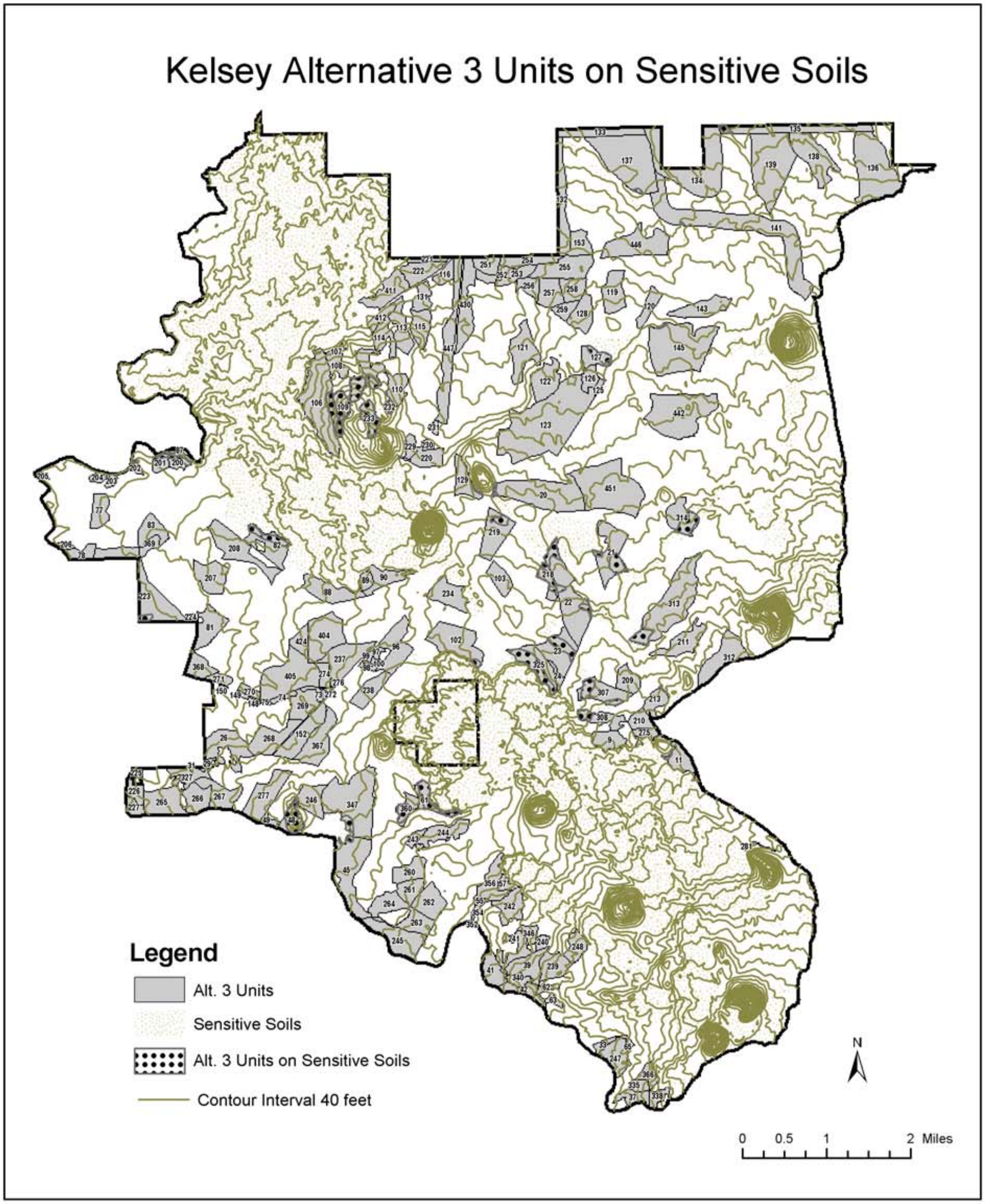
Based on these disturbed area estimates, the percentages of detrimental soil conditions following implementation of project and restoration activities would increase above existing conditions by approximately 8.7 to 13.7 percent in each of the proposed activity areas. None of these activity areas would exceed the Forest Plan standard the Region 6 or Forest Plan standards and guidelines. The proposed actions comply with Forest Plan standards and guidelines SL-3 and SL-4, and Regional policy (FSM 2520, R-6 Supplement No. 2500-98-1) for maintaining soil productivity.

Sensitive Soils

Direct and Indirect Effects: Sensitive soils within the project area include: 1) soils on slopes greater than 30 percent, 2) soils associated with frost pockets in cold air drainages, and 3) soils that occur in localized areas of rocky lava flows. There are no potentially wet soils with high water tables or sensitive soils with high erosion hazard ratings that would require special mitigation. There are steep soils in the following activities areas (units) 11, 20, 21, 22, 23, 48, 84, 87, 129, 200, 201, 213, 218, 229, 307, and 308. To avoid soil displacement damage, special requirements will be applied to these units that have sensitive soils with steep slopes.

The potential for successful regeneration is limited by properties such as soil depth, soil fertility, and temperature extremes on low productivity sites such as frost pockets, cold air drainages, and localized areas of rocky lava flows. These sites may require replanting in order to achieve adequate stocking levels in a desired amount of time. Modified harvest prescriptions or other, less intensive treatments are management options that do not apply to reforestation objectives in areas affected by stand-replacement wildfires. The following activity (unit) areas have the potential to be frost packet that may require replanting activities: 20, 21, 22, 45, 61, 102, 218, 313, 347, and 360.

**Figure 32: Sensitive Soils
Alternative 3**



Direct and Indirect Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Coarse Woody Debris (CWD) And Surface Organic Matter

Direct and indirect effects: The indicator for CWD and surface organic matter was evaluated qualitatively based on the probable success of implementing appropriate design elements and best management practices (BMPs) that address adequate retention of woody debris and organic matter to meet soil productivity and wildlife habitat objectives (see wildlife section). For dry, ponderosa pine sites to maintain soil productivity, a minimum amount of 5 to 10 tons per acre of CWD (greater than 3 inches in diameter) is recommended to ensure desirable biological benefits for maintaining soil productivity without creating an unacceptable fire hazard for a potential high-severity reburn (brown et al., 2003). Under alternatives 2 and 3, harvest operations would be expected to accelerate the accumulation of woody debris. Existing sources of woody debris would be retained on-site and protected from disturbance to the extent possible. Enough fallen trees and other organic materials would likely be available after harvest activities to meet this recommended guideline in the short-term.

Commercial harvest and whole-tree yarding can affect soil productivity through the removal of nutrients in the form of tree boles, limbs and branches. Although these forest management practices remove potential sources of future CWD, ground-based harvest activities also recruit CWD to the forest floor through breakage of limbs and tops and toppling of some trees during felling and skidding operations. Many of the smaller-diameter dead trees (less than 10 inches) and logging slash created from unusable stem wood would accelerate the accumulation of woody debris where these materials may be currently deficient. This would expedite decomposition processes and input of organic materials into the soil surface. These materials would also provide additional soil cover that improves the soils ability to resist surface erosion. The removal of tree boles would have little or no effect on nutrient cycling processes during the recovery period. Most of the tree's short-term nutrient supply is stored in the leaves (needles), branches, and roots. Available nutrients stored in fine organic matter and soil surface layers will benefit the recovery of ground cover vegetation that will eventually provide new sources of surface organic matter.

Coarse woody debris (greater than 3 inches in diameter) is needed for biological activity and long-term nutrient cycling. Small woody material and surface litter (such as leaves, twigs, and branches less than 3 inches in diameter) are needed for erosion control and short-term nutrient cycling. On undisturbed sites, woody materials (less than 10 inches in diameter) are expected to fall to the ground within 3 to 5 years. The larger residual trees that remain following harvest would become future sources of CWD. This would provide only localized benefits within this large activity area. Over the next 10 to 20 years, the amount of CWD after harvest is predicted to average an acceptable range of 15 to 20 tons per acre within each of the proposed activity areas.

Experience suggests that less intensive future wildfires would result in areas where some of the hazardous fuels are removed through management treatments as opposed to not treating n areas where heavy fuels were allowed to accumulate with no treatment. All other conditions being equal, the lower the fuel loading, the lower the fire intensity and burn severity. Alternative 2 would result in a lower risk for future wildfires than Alternative 1. Alternative 3 would result in a lower risk for future wildfires than either Alternative 1 (No Action) or Alternative 2 (Proposed Action).

Ground-disturbing management activities vary in their intensity of site disturbance. Implementation of Alternative 3 would result in the greatest extent of physical soil impacts due to logging facilities, but soil restoration treatments would be applied to reclaim and stabilize detrimental soil conditions on many of these facilities. It should be noted that Alternative 3 provide the greatest positive opportunity to reduce heavy fuel loadings before they accumulate on the forest floor and increase the hazard for high-severity ground fires in the future.

Project design criteria, including operational guidelines for equipment use, would minimize the extent of detrimentally disturbed soil from harvest activities between main skid trails and away from log landings. The primary factor that would limit soil compaction is the limited amount of equipment traffic off designated logging facilities.

A winged subsoiler would be used to loosen and stabilize detrimentally compacted soil on certain management facilities to reduce the effects of detrimentally disturbed soils associated with implementation of the proposed activities. Additional treatment options for improving soil quality on disturbed sites include redistributing topsoil in areas of soil displacement damage, pulling available slash and woody materials over the treated surface, and planting shrubs and tree seedlings to establish ground cover protection. This is mandatory mitigation that is required on activity areas to comply with Regional policy (FSM 2520, R-6 Supplement) and Forest Plan standards and guidelines SL-3 and SL-4 that limit the extent of detrimental soil conditions to 20 percent of an activity area. In areas where less than 20 percent detrimental soil conditions exist from prior activities the cumulative detrimental effect of the current activity following the project implementation and restoration must not exceed 20 percent. In units that exceed 20 percent detrimental soil compaction prior to activitiy implementation, subsoiling would occur to, at a minimum, reduce compaction of the soils to the condition that existed prior to the activity (Refer to Table 79, page 3-154 and Table 80, page 3-158 for specific units and acres).

The winged subsoiling equipment used on the Deschutes National Forest has been shown to lift and shatter compacted soil layers in greater than 90 percent of the compacted zone with one equipment pass (Craigg, 2000). Subsoiling treatments have been implemented with good success due to the absence of rock fragments on the surface and within soil profiles. Although rock fragments can limit subsoiling opportunities on some landtypes, hydraulic tripping mechanisms on this specialized equipment help reduce the amount of subsurface rock that could potentially be brought to the surface by other tillage implements. Most of the surface organic matter remains in place because the equipment is designed to allow adequate clearance between the tool bar and the ground, thereby allowing smaller slash materials to pass through without building up. Any mixing of soil and organic matter does not cause detrimental soil displacement because these materials are not removed off site. Although the biological significance of subsoiling is less certain, these restoration treatments likely improve subsurface habitat by restoring the soils ability to supply nutrients, moisture, and air that support soil microorganisms. Since the winged subsoiler produces nearly complete loosening of compacted soil layers without causing substantial displacement, subsoiled areas are expected to reach full recovery within the short-term (less than 5 years) through natural recovery processes.

Ponderosa pine seedlings would be planted using hand tools on approximately 279 acres (Alternative 2) and 212 acres (Alternative 3). Shallow excavations and scalping to prepare sites for hand planting would not disturb large enough areas to qualify as a detrimental soil condition.

Roads and Skid Trails

Direct and Indirect Effects: Mechanical harvesters would only be allowed to make a limited number of equipment passes on any site-specific area between skid trails or away from log landings. Existing skid trails and landings would be reutilized to the extent possible within the commercial harvest areas, but it is expected that the creation of additional skid trails and log landings would likely cause a 7 percent increase in detrimental soil conditions. Skidding equipment would be restricted to designated skid trails at all times. The majority of soil impacts would be confined to known locations in heavy use areas that can be reclaimed when logging facilities are no longer needed for future management.

Using information from similar harvest activities in similar terrain, it would be expected that the creation of additional skid trails and log landings would likely increase detrimental soil conditions approximately seven (7) percent. Under Alternative 2, estimates of existing and predicted amounts of detrimental soil conditions associated in each unit from harvest logging facilities are included in the percentages displayed for each of the proposed activity areas in Table 79, page 3-154. Under Alternative 3, estimates of existing and predicted amounts of detrimental soil conditions associated in each unit from harvest logging facilities are included in the percentages displayed for each of the proposed activity areas in Table 80, page 3-158.

Temporary roads would be decommissioned and rehabilitated with completion of unit activities. Approximately 22 miles of road re-construction would occur. Some currently closed roads would be opened to provide necessary access, but these roads would be re-closed following harvest activities. An additional 42.0 miles of local system road, which are currently open, would be closed following project activities. Road decommissioning (obliteration) treatments would be applied to approximately 7.7 miles of Forest roads and would be removed from the transportation system.

Road decommissioning treatments would include subsoiling to alleviate compacted road surfaces on approximately seven miles of local system road. These soil restoration treatments would result in a net improvement in soil quality in the project area. Decommissioning would occur on approximately 7.0 miles of road segments to improve soil quality.

Road maintenance activities would reduce accelerated erosion rates, where improvements are necessary, to correct drainage problems on specific segments of existing road. Surface erosion can usually be controlled by implementing appropriate Best Management Practices (BMPs) that reduce the potential for indirect effects to soils in areas adjacent to roadways. Road maintenance activities would not be necessary on roads closed for access restriction because self-maintaining drainage structures would be installed, where appropriate, to protect the road surface from erosion. There are no major soil-related concerns associated with the combined effects of these future activities.

As previously described, extensive areas of the project area have been covered by loose, non-cohesive ash deposits that consist of sandy textured soils with little or no structural development. Although equipment traffic can decrease soil porosity on these soil materials, compacted sites can be mitigated by tillage with a winged subsoiler (Powers, 1999). Dominant soils within the proposed activity areas are well suited for tillage treatments due to their naturally low bulk densities and the absence of rock fragments within soil profiles. Since the winged subsoiler produces nearly complete loosening of compacted soil layers without causing substantial displacement, subsoiled areas are expected to reach full recovery within the short-term (less than 5 years) through natural recovery processes.

Mitigation, including operational guidelines for equipment use, would minimize the extent of detrimentally disturbed soil from harvest activities between main skid trails and away from log landings. The primary factor that would limit soil compaction is the limited amount of equipment traffic off designated logging facilities. The effects of only two (2) passes by harvester machines on any site-specific area are not expected to qualify as a detrimental soil condition. Conservative estimates were used to account for predicted amounts of detrimental soil conditions associated with logging facilities, and the relatively minor extent of these incidental soil disturbances is likely included in these estimates.

Fuels Treatments

Prescribed burning would occur during moist cold weather conditions and would not substantially affect soils. Burn plans would be followed, including fuel moistures that would limit detrimental effects to soils. Mechanical mowing would be accomplished using a mowing machine that would pass over the ground one time and would not cause soils to compact. Tight turns would not be permitted that would cause soil displacement.

There would be no machine piling of logging slash in random locations of activity areas. Whole tree yarding would remove potential sources of woody debris to off-site landings and skid roads, areas that already have detrimental conditions. This would not cause additional soil impacts because burning would occur on disturbed soils. Shallow excavations and scalping to prepare sites for hand planting would not disturb large enough areas to qualify as a detrimental soil condition.

Cumulative Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Cumulative Effects: Activity areas that have current detrimental levels that would cause the proposed activities to incur detrimental levels exceeding 20 percent need to be accounted for as a cumulative effect (past and proposed equal or greater than 20 percent). Restoration subsoiling would return these levels to 20 percent.

No additional ground-disturbing management activities from other projects are currently scheduled within the project activity area boundaries. The 18 fire burned approximately 3,500 acres that were originally included in the Kelsey vegetation management planning area. These affected acres were removed from the Kelsey vegetation management project and included in the 18 Fire salvage EIS project. There is no overlap of proposed activity areas with these two projects. The extent of detrimental soil conditions beyond the predicted levels displayed for each of the proposed project areas would not increase. Accelerated erosion is not expected to have any long-term adverse effects to soil productivity during the recovery period.

The effects of recreation use and livestock grazing would be similar as those described for existing condition of the soil resource. Future soil disturbances would be confined mainly to small concentration areas that have a relatively minor effect on overall site productivity. Future impacts from dispersed camping and incidental use by hikers and mountain bikers are expected to have a negligible effect on site productivity within the activity areas. Livestock could resume grazing in portions of the project area following the recovery of herbaceous vegetation. Livestock grazing within the proposed activity areas would be delayed until at least the fall of 2005. Appropriate stocking levels, rotation of grazing use, and periodic rest would ensure adequate ground cover that effectively minimizes erosion and adverse effects to the soil resource. There are no major soil-related concerns associated with the combined effects of these future activities. The proposed ODOT access projects would increase road density and remove approximately 15 acres from the productive land base.

Forest Plan Consistency

Under Alternative 2 and 3, the amount of disturbed soil associated with logging facilities and temporary roads would be limited to the minimum necessary to achieve management objectives. As discussed under direct and indirect effects, the Mitigation Measures, page 250 and Best Management Practices (DEIS, Imlementation Guidelines, Appendix F, BMPs), are designed to avoid or minimize potentially adverse impacts to the soil resource. Compliance with Forest Plan standard and guideline SL-5 is addressed by mitigating areas with sensitive soils on steep slopes (greater than 30 percent) from activity areas. All reasonable Best Management Practices for Timber Management and Road Systems would be applied to protect the soil surface and control erosion on and adjacent to roads and logging facilities that would be used during project implementation. These conservation practices are to be implemented during and following project activities to meet the stated objectives for protecting and maintaining soil productivity.

Soil restoration treatments would be applied to rectify impacts by reducing the amount of detrimentally compacted soil dedicated to specific management areas of the proposed activity areas. Restoration treatments, such as subsoiling, are designed to promote maintenance or enhancement of soil quality. These conservation practices comply with Forest Plan interpretations of Forest-wide standards and guidelines SL-3 and SL-4 (Final Interpretations, Document 96-01, Soil Productivity, 1996), and Regional policy (FSM 2520, R-6 Supplement No. 2500-98-1) for planning and implementing management activities.

Under Alternative 2, the percentages of detrimental soil conditions would increase above existing conditions by approximately 10.0 to 13.7 percent in all eight-activity areas. None of the activity areas would exceed the Forest Plan standard of 20 percent following implementation of project and restoration treatments. It is expected that enough fallen trees and other organic materials would be available after harvest activities to meet recommended guidelines for CWD retention in the short-term. Therefore, the proposed actions comply with Regional and Forest Plan standards and guidelines for maintaining soil productivity within all proposed activity areas

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Under Alternative 3, the percentages of detrimental soil conditions would increase above existing conditions by approximately 8.7 to 13.7 percent in all activity areas. None of the activity areas would exceed the Forest Plan standard of 20 percent following implementation of project and restoration treatments. It is expected that enough fallen trees and other organic materials would be available after harvest activities to meet recommended guidelines for CWD retention in the short-term. The proposed actions comply with Regional and Forest Plan standards and guidelines for maintaining soil productivity within all proposed activity areas.

The overall effects of the action alternatives combined with all past, present, and reasonably foreseeable management activities would be within allowable limits set by Forest Plan standards and guidelines for protecting and maintaining soil productivity. The action alternatives would improve soil productivity in specific areas where soil restoration treatments (subsoiling) are implemented.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS

The action alternatives are expected to create impacts that could cause irreversible damage to soil productivity. There is low risk for mechanical disturbances to cause soil mass failures (landslides) due to the inherent stability of dominant landtypes and the lack of seasonally wet soils on steep slopes. Careful planning and the application of Best Management Practices and project design elements would be used to prevent irreversible losses of the soil resource.

The development and use of temporary roads and logging facilities is considered an irretrievable loss of soil productivity until their functions have been served and disturbed sites are returned back to a productive capacity. The action alternatives include soil restoration activities (subsoiling) on portions of activitiy areas estimated to exceed the 20 percent standard folowing implementation of the fuels and commercial harvest activities, including subsoiling temporary roads and facilities. Subsoiling would improve the hydrologic function and productivity on detrimentally disturbed soils.

SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND THE MAINTENANCE OF LONG-TERM PRODUCTIVITY

Project design, Forest Plan management requirements and mitigation measures built into the action alternatives ensure that long-term productiviy will not be impaired by the application of short-term management practices. The action alternatives would maintain long-term productivitiy by improving soil productivity in specific, detrimentally impacted areas where soil restoration treatments (subsoiling) are implemented. Included are soils committed to log landings and skid trails, other areas associated with commercial harvest activities that may be later identified, and roads recommended to be decommissioned.

FISHERIES

SUMMARY OF FINDINGS OF BIOLOGICAL EVALUATION

A biological evaluation (BE) was prepared to document and review the findings of the Kelsey Vegetation Management project for potential effects on species that are:

1. Listed or proposed for listing by the USDI Fish and Wildlife Service as Threatened or Endangered; or
2. Designated by the Pacific Northwest Regional Forester as Sensitive; or
3. Required consultation with the National Marine Fisheries Service under the Magnuson-Stevens Fishery Conservation Act. It was prepared in compliance with the requirements of Forest Service Manual (FSM) 2630.3, FSM 2672.4, and the Endangered Species Act of 1973, as amended (Subpart B; 402.12, Section 7 Consultation).

The BE describes the existing condition and addresses the potential effects of commercial harvest and other vegetation activities within the project area on threatened, endangered, and sensitive fish species. This determination, required by the Interagency Cooperation Regulations (Federal Register, January 4, 1978), ensures compliance with the Endangered Species Act (ESA). Changes to the R-6 Regional Forester's Sensitive Species List were instituted on November 28, 2000. Invertebrate species were not included and will not be covered under this section.

The BE determined that Alternative 2 (Proposed Action) and Alternative 3 would provide beneficial effects to redband trout through the improvement of stand conditions within the Riparian Habitat Conservation Area (RHCA) of the Deschutes River.

A Water Quality Restoration Plan (WQRP) is in draft form for the Upper Deschutes River. The WQRP has not been completed.

MANAGEMENT DIRECTION

The project area lies within the management area of the Inland Native Fish Strategy (INFISH), which amended the Deschutes National Forest Land and Resource Management Plan in 1995. Included is the Pilot Butte watershed, which includes two subwatersheds (Benham Falls and Coyote Spring). The area that is within these subwatersheds were identified in the Interior Columbia Basin Ecosystem Management Project (ICBEMP, USDA 2000) area as being important for native Columbia River redband trout *(Oncorhynchus mykiss gairdneri)* viability. Redband trout are included on the Regional Foresters Sensitive Species List (R6). Although ICBEMP was never adopted as management direction it did identify that these subwatersheds should receive restoration priority over other subwatersheds including watershed restoration, noxious weed treatments, prescribed fire, thinning, and road restoration.

Management direction within INFISH requires Riparian Habitat Conservation Areas (RHCAs) to be delineated for watersheds. They are portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. The standard widths for RHCAs from INFISH will be adopted for the project area. The Deschutes River is the major water body within the project area, and is designated under Category 1 – Fish-bearing Stream. The RHCA will consist of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100 year floodplain, or to the outer edges of the riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet, including both sides of the stream channel), whichever is greatest.

For the Kelsey Project area, the RHCA will have a width of 300 feet upslope from the edge of the river. There are over 400 acres within the RHCA along the east riverbank within the planning area. The proposed treatments would occur within less than 3 percent of the RHCA. The riparian zone width is variable, mostly narrow (5 to 10 feet). There are areas of sedge and willows that extend over 50 feet wide from rivers edge in some areas. The vegetation community quickly transforms into drier upland types consisting of lodgepole or ponderosa pine and bitterbrush. In other areas, loose rock/large boulder slopes separate the river from the uplands.

Management of RHCAs is intended to achieve Riparian Management Objectives (RMOs), described by habitat features indicating “good” watershed health and inland native fish habitat. Habitat features applicable to this project (forested system) are pool frequency, water temperature, large woody debris, and width/depth ratio (RMO compliance, page A-4 of the Record of Decision for the Inland Native Fish Strategy Environmental Assessment, 1995). Standards and Guidelines from INFISH that are incorporated by reference applying to the Kelsey Project are: TM-1, FM-1, FM-4, WR-1, and RA-4.

Standard and guideline TM-1 from INFISH prohibits timber harvest within RHCAs, with exceptions. An exception is to apply silvicultural practices to acquire desired vegetation characteristics, where needed, to attain the RMOs, and not retard attainment of RMOs or adversely effect inland native fish. Fire and fuels treatments are allowed if they are designed to contribute to the attainment of RMOs (Standard and Guidelines FM-1, FM-4). Active management is intended for ICBEMP A2 sub watersheds, but is to pose a low risk for sediment delivery and low risk of adversely affecting the hydrologic regime and riparian areas. The NNVM Comprehensive Management Plan includes standards and guidelines for protection, restoration, and enhancement of riparian vegetation and water quality (M-10, M-31, M-49).

The Oregon Department of Environmental Quality lists the Deschutes River within the project area as a water quality impaired river (303(d) list). The parameters for which it is listed are dissolved oxygen all year, turbidity during spring and summer, chlorophyll from June 1 to September 30, high water temperatures from September 1 to June 30 (excludes July and August, the hottest summer months), and sedimentation throughout the year. Management direction regarding 303(d) listed rivers is that any project activity should not further degrade the parameters for which it is listed (Forest Service and Bureau of Land Management Protocol for addressing Clean Water Act Section 303(d) Waters).

EXISTING CONDITION

Deschutes River

This is the only perennial water body included in the project area. The east bank of the river, from river mile 174.5 to 185.7, is included as a portion of the western boundary of the project area. There are other ephemeral stream channels that do not have a surface connection to perennial water.

The flow of the River is regulated at Wickiup Dam. The flow regime was historically very stable, with an average flow of about 1190 cubic feet per second (cfs) and an annual range from approximately 1000 - 1600 cfs measured at Benham Falls gauging station at river mile 181.6. Large flood events were uncommon. The river now experiences a large swing in flow, storing and releasing water for irrigation needs. Flow is reduced in the winter to as low as 20 cfs below Wickiup Dam during low precipitation years. It is then elevated during the summer, with releases at as high as 1800

– 2000 cfs. The range of flows, as measured at Benham Falls, is approximately 700 cfs to 2500 cfs. The additional discharge provided by Fall River, Spring River, and the Little Deschutes tempers the adverse effects of the modified flow regime on the Deschutes River within the project area. The altered flow regime has led to increased riverbank erosion, widening of the channel, and reduced water quality and fish habitat (UDWSR EIS). These effects are most evident in the river upstream of the confluence with Fall River.

Fish Species

There are no known threatened, endangered, proposed, or candidate fish species within the project area. Fisheries are to be treated as Outstandingly Remarkable Value (ORV) in Segment 4 because of redband trout (UDWSR EIS). The Federal Wild and Scenic River and State Scenic Waterway Acts established an overriding goal to protect and enhance the ORVs for which the river was designated. Refer to the Upper Deschutes Wild and Scenic River Final Environmental Impact Statement (UDWSR EIS, 1996).

Other game species in the river include the native mountain whitefish *(Prosopium williamsoni)*, and rainbow trout *(Oncorhyncus mykiss)*. Redband trout, sub-species of rainbow, were native to the river, but have since interbred with various hatchery stocks of rainbow trout. The non-game native sculpin *(Cottus spp.)* also inhabits the river below Wickiup Reservoir. The genetic make-up of the rainbow in the project area was recently evaluated. Samples collected downriver of Benham Falls revealed 7.2 percent hatchery rainbow genetic contribution, i.e., on average, the fish were 92.8 percent pure redband (Phelps, et al, 1996). The river supports natural reproduction of all the above listed species. The Oregon Department of Fish and Wildlife (ODFW) also stocks legal-sized rainbow trout in the summer months, and fish enter the river from the unscreened outlet at Wickiup Dam. Species within Wickiup Reservoir that could potentially enter the river via the outlet are kokanee salmon *(Oncorhyncus nerka kennerlyi)*, brown trout, rainbow trout, mountain whitefish, largemouth bass *(Micropterus salmoides)*, eastern brook trout *(Salvelinus fontinalis)*, three-spined stickleback *(Gasterosteus aculeatus)*, tui chub *(Gila bicolor)*, brown bullhead *(Ictalurus nebulosus)*, and coho salmon *(Oncorhyncus kisutch)*.

Fish Habitat

The altered flow regime below Wickiup Dam has affected fish habitat. Analysis of aerial photographs and channel morphology data indicates the channel is becoming wider and shallower, reducing maximum and average depths. The effects to fish habitat within the project area are lower than those observed in upriver reaches, primarily because of the flow contribution from the tributary streams. The channel width has increased approximately 20 percent since the inception of Wickiup Dam (UDWSR EIS). Aggradation in pools has reduced their effectiveness as fish habitat. River bottom substrates have high volumes of sand and silt. These fine sediments plug the interspaces of substrate gravels, reducing the survival rates of developing fish embryos buried within, and limiting habitat for aquatic invertebrates (Meehan, 1991).

Log drives during the 1930s damaged riverbanks and reduced instream large wood that fish depend on for cover from predators and as velocity breaks from stream currents for resting. The endpoint for the river log drives was near the Benham Falls footbridge. There is excellent fish hiding cover at this site due to the large accumulation of instream wood. A project implemented in 2003 within the project area (Kelsey Fish Habitat Improvement) added large wood to the river. Recent projects upriver of the project area have also re-introduced large wood. Due to limitations of equipment, large wood introductions are limited primarily to trees less than 20 inches diameter at breast height. Historically, abundant large ponderosa pines up to 4 feet diameter at breast height were likely found within the channel. (Refer to the UDWSR FEIS and the ODFW (Oregon Department of Fish and Wildlife) Upper Deschutes River Sub-basin Plan for more detailed description of fisheries and water resources).

Timber management activities (harvesting, skidding, landings, road building) have been shown to have hydrological effects in some watersheds. The pathways by which water moves to stream channels is affected by timber management by its influences on snow accumulation and melt rates, evapotranspiration and soil water, and soil structure that affect infiltration and water transmission rates (Meehan, 1991). This in turn can lead to changes in the timing, duration, and volume of peak flows in a stream, which influences changes in bank erosion and channel forming processes within the stream. Timber mangement has also been shown in some watersheds to modify stream processes by mass movements of sediment, bank destabilization from vegetation removal, and loss of instream large wood from direct removal or debris torrents. Changes in water quality (suspended sediment, temperature, dissolved oxygen, nutrients) have also been shown to be affected by timber management activities in some watersheds (Meehan, 1991). Hydrologic and stream morphology changes ultimately influence fish habitat. Fuel treatment activities, such as mowing and underburning of brush, generally have minor hydrologic effects to a watershed.

ESSENTIAL FISH HABITAT

One species of fish listed on the Regional Foresters Sensitive Species List may occur within the project area. There are no known threatened, endangered, proposed, or candidate fish species within the project area. The proposed project area was evaluated to determine which species might occur based on the presence of required habitats and known locations.

Chinook Salmon *(Oncorhyncus tshawytscha)*

Although the Upper Deschutes 4th field watershed (17070301) is mapped by the National Marine Fisheries Service as Essential Fish Habitat for chinook salmon, there are no present or historical records of chinook populations above Big Falls on the Deschutes River, which is over 50 miles downriver from the project area.

Bull Trout *(Salvelinus confluentus)*

Bull trout once occupied the Deschutes River upstream of Bend, but have not been documented since 1954 (ODFW 1996). The nearest current population is at Lake Billy Chinook, over 50 miles downriver. Although the Kelsey Project area is located a substantial distance upriver from bull trout populations, the proposed activities under all action alternatives were evaluated for consistency with the Project Design Criteria of the 2003-2006 Programmatic Biological Assessment (Joint Aquatic and Terrestrial Programmatic Biological Assessment).

Redband Trout *(Oncorhyncus mykiss gairdneri)*

Status

U.S. Fish and Wildlife (not listed); U.S. Forest Service Region 6 (sensitive species); State of Oregon (sensitive species).

Habitat

The redband trout has habitat requirements similar to other salmonids. There are both fluvial and adfluvial populations. Optimal water temperatures are 54 to 64 degrees Fahrenheit, but they have been known to survive temporary exposure up to 85 degrees. In the stream environment, they seek cover provided by large woody material, undercut banks, boulders, depth, and turbulence. They can be found in desert stream environs as well as those with forested canopies. They require clean gravels for spawning, preferably in the 0.25 inch to 2.0 inch range. Habitat for redbands exists within the project area.

The redband is considered an inland version of the rainbow trout. Recently, genetic analysis has been completed on redbands at several locations in the Deschutes River upstream of Bend. The genetic purity seems to have been significantly altered at some locations from interbreeding with hatchery rainbow. Genetic analysis on the redband population near Benham Falls revealed that 92.8 percent of the genetic make-up was redband. Hatchery rainbow have been routinely stocked in the Upper Deschutes Basin for decades. Historically, the redbands inhabited the entire Upper Deschutes River system.

RIPARIAN MANAGEMENT GOALS AND OBJECTIVES (RMOs)

Riparian Management Objectives (RMOs) have been established by INFISH to provide the criteria against which attainment or progress toward attainment of the riparian goals is measured. Interim RMOs provide direction for managers to conduct resource management activities across the landscape. It would be expected that objectives would be achieved over time. RMOs may be refined to better reflect conditions that are attainable in a specific watershed or stream reach based on local geology, topography, climate, and potential vegetation. This may only be done through watershed analysis or by amendment. No watershed analysis has been completed for the area containing the planning area.

The Riparian Management Objectives (RMOs) are listed in Tables 81 and 82, page 3-176. According to INFISH, not all of the described features may occur within a specific stream segment of a stream within a watershed, but all generally should occur at the watershed scale for stream systems of moderate size. The RMOs applicable to a forested system include pool frequency, width to depth ratio, water temperature, and large woody debris.

Under existing conditions pool frequency, width to depth ratio, and water temperature objectives are not being met and would be difficult to attain. Even under historic conditions prior to flow regulation from Wickiup Dam, pool frequency and width to depth ratio objectives were most likely not met. The inability of to meet the RMOs on a naturally very stable system, like the Deschutes River, indicates the need to modify the RMOs to reflect local geomorphology and hydrology. Large woody debris objectives are being met.

The average bankfull width of the Deschutes River in the project area is 138 feet. According to INFISH, Table 78, there should be 12 to 14 pools per mile. Under existing conditions there are approximately 2.5 pools per mile (Walker, 1991, Deschutes River Stream Survey). This value likely approximates the historic frequency. Spring-fed systems often have low pool frequencies, and are dominated by glide habitats.

The existing width to depth ratio for the project area is 21.6:1, far exceeding the less than 10:1 ratio objective listed in INFISH. This ratio has likely increased since flow regulation began more than 50 years ago at Wickiup Dam. Width has increased 20 percent during this time (USDA 1996). The ratio was likely not under 10:1 prior to regulation. Spring-fed systems often have naturally high width to depth ratios.

The Final 2002 ODEQ 303(d) list added the parameter of high water temperatures for the period of September 1 through June 30 for the river reach that includes the project area. As slope next to the river decreases (less steep), the width of the area that trees provide shading to decreases (USFS, BLM 2004). The amount of shade provided by trees next to the stream will decrease as channel width increases. The Deschutes River averages nearly 140 feet wide, within the project area, limiting potential shading from riparian vegetation. The period of greatest solar radiation occurs between 10:00 am and 2:00 pm (USFS,BLM 2004). Trees located in the primary shade zone nearest the stream are the only trees providing shade during this critical 4 hour period. Trees in the secondary shading zone (beyond the primary zone) can provide some shading when the sun is lower in its arc. The amount of shading in the secondary zone depends on stand density. Within this zone, there is no added benefit to shade from over stocked stands because one tree can cancel any shade benefit from another tree (USFS, BLM 2004). For slopes less than 30 percent and tree heights of 120 feet, the primary shade distance is 50 feet from the stream edge, decreasing to about 35 feet for slopes less than 10 percent (USFS, BLM 2004). The water temperature standard is being met in the reach above the project area, river mile 189.4 to 222.2 (ODEQ 2002).

The large woody debris feature is met. The 1991 stream survey documented 112 pieces per mile in the project area. The protocol for identifying large wood has changed since the time of the survey. Many of the trees identified, as large woody debris, would not meet the revised protocol. Since the time of the stream survey, additional large woody debris has been added to the river by natural windfalls, and the Kelsey Fish Habitat Project. The frequency of debris over 20 inches diameter at breast height is likely less than historical because of the log drives. Most of the large woody debris in the project area is limited to two accumulations near the Benham Falls Day Use area prior to the implementation of the Kelsey Fish Habitat Project.

Table 81: Interim Riparian Management Objectives (RMOs)

Habitat Feature	Interim Objectives
Pool Frequency	Varies by channel width (See Table below)
Water Temperatures	No measurable increase in maximum water temperature (7-day moving average of daily maximum temperature measured as the average of the maximum daily temperature of the warmest consecutive 7-day period.) Maximum water temperatures below 59° F within adult holding habitat and below 48° F within spawning and rearing habitats.
Large Woody Debris (Forested systems)	East of Cascade Crest in Oregon, Washington, Idaho, Nevada, and western Montana: >20 pieces/mile; >12” diameter; >35’ length.
Bank Stability (Non-forested systems)	>80 per cent stable.
Lower Bank Angle (Non-forested systems)	>75 per cent of banks with <90° angle (i.e., undercut).
Width/Depth Ratio	<10, mean wetted width divided by mean depth

Table 82: Interim Objectives For Pool Frequency

Wetted width (feet)	10	20	25	50	75	100	125	150	200
Pools per mile	96	56	47	26	23	18	14	12	9

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: This alternative may impact individuals (redband trout) or habitat as a result of no vegetative treatments. Effects to fish habitat or fish populations, including redband trout, would be from other activities not associated with this proposed project or from natural causes. Fine sediments from road 640 and associated dispersed campsites would continue to enter the Deschutes River, potentially impacting fish habitat. There would not be a loss of population viability nor a significant trend toward federal listing.

No management activities would occur within riparian habitat other than custodial activities such as fire suppression and road maintenance. The long-term risk of a high intensity and large-scale wildfire that could occur within riparian habitat would continue. The results of a wildfire could cause adverse effects to fish habitat and populations, including redband trout. Forest health within riparian habitat would decline with increases in insect populations above endemic levels. Adverse effects to redband habitat and populations would occur from such factors as potential increased sediment delivery (decreasing egg/embryo success within spawning areas), loss of tree shade and increased water temperatures, and loss of future instream large wood recruitment. Instream large woody material that provides hiding cover for fish, reduces velocities to provide microhabitats, and provides habitat and a food source for aquatic macroinveretebrates would continue to be less than desired for redband trout habitat.

Effects within the RHCA: 1) the reduction in shade could lead to increased water temperatures; 2) the reduction in large wood inputs would reduce fish habitat in the long-term; 3) the loss of riparian vegetation could lead to bank instability and decreased sediment filtering capacity; and 4) an increase in fine sediments could have adverse effects to fish and fish habitat. Fine sediments accumulated in riverbed substrates can limit survival of developing fish embryos and limit the production of aquatic macroinvertebrates, which provide forage for fish (Bjornn and Reiser, 1991, in Meehan, 1991). Suspended sediment can be abrasive to fish gills and decrease foraging ability. Sediment inputs after a fire could be both episodic and chronic. A weather storm that resulted in heavy precipitation soon after a fire could introduce measurable overland flow of sediments. Chronic, or long-term small inputs of sediment could continue for several years until vegetation groundcover is re-established and would likely be immeasurable due to limitations of equipment and techniques of sampling. Overland flow of sediments as a result of a fire, either chronic or episodic, would be minor compared to the movement of sediments through the system from accelerated upriver bank erosion and from natural sources.

There would be a short-term benefit to fish habitat of increased large wood recruitment to the river in the event of a fire adjacent to the river. Instream large wood provides hiding cover for fish, reduces stream velocities to provide microhabitats, and provides habitat and a food source for aquatic macroinveretebrates.

Dispersed sites and roads would continue to increase in abundance and area impacted, possibly leading to degraded riparian conditions and increased potential for sediment delivery to the river. Nutrient and bacteria inputs to watercourses as a result of dispersed camping practices would increase, but the changes would be difficult to attribute to activities along the river because of variables influencing water quality upriver in the watershed, primarily Wickiup Reservoir. Reservoirs and lakes are dynamic, and concentrations of ions and nutrients vary annually and seasonally.

Overall, the No Action Alternative does not protect and enhance the fisheries Outstandingly Remarkable Value identified in the Wild and Scenic River Plan. Due to the adverse indirect effects, the Biological Evaluation concluded that this alternative May Effect Individuals and Habitat (MEIH) of redband trout, but would not lead a loss of population viability or create a significant trend toward federal listing.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: The four (4) activity units (78, 84, 85, and 87), totalling 11 acres, that are proposed within the RHCA would require mechanized equipment. Prescriptions for units 84 and 85 would be mechanical shrub treatment or prescribed fire only. There is no riparian vegetation within these units with the exception of Unit 87, that has interspersed willows and other shrubs.

Slopes within these units are flat to very gentle – from 0 to 2 percent. The terrain between the unit boundaries and the river is also generally very gentle but is characterized by a basaltic boulder scree with slopes greater than 30 percent adjacent to Unit 84. Less than 1 acre of Unit 84 lies within the RHCA. Soils are highly permeable and well to excessively drained (Landtype 63 – Deschutes Soil Resource Inventory) within all units with the exception of Unit 87, which has poorly to somewhat poorly drained soils (Landtype 43 – Deschutes Soil Resource Inventory), providing habitat for scattered willows and other shrubs. Thinning and fuels reduction would occur within Unit 87. Removal of logs would occur over snow or frozen ground, to have lowest soil and vegetative impacts as possible, and would likely utilize non-conventional methodology, such as horse or all terrain vehicle ATV logging. There are no ephemeral channels, nor any sign of surface run-off or gullying within the units.

There would be none to neglible adverse effects to shade on the Deschutes River from this alternative because of the minimum of 100 foot buffer from riparian vegetation, except Unit 87 (1 acre), no management activity within the primary shading zone, and minimal management activity within the secondary shading zone. Some long-term benefits to shade may be achieved by increased tree height in the secondary shading zone. Since shade would be maintained, there would be no effects to the 303(d) parameter of high water temperatures in the Deschutes River.

In the long term, insect infestations or uncharacteristic, high intensity wildfire within the RHCA could cause adverse effects to fish and their habitat (same effects as listed under No Action). The potential for insect and disease damage and fire risk is decreased slightly over that of the No Action Alternative. Eleven (11) acres would be treated within the RHCA, and treatments within 1 mile of the river would total 260 acres. Silvicultural activities would reduce competition for ponderosa pine, resulting in healthier, larger, and taller site-potential trees. Large ponderosa pines are desired to provide shade, riverbank stability, and future instream large wood.

A total of 68 acres within the Upper Deschutes Wild and Scenic River Corridor are proposed for vegetation and fuels treatment. This alternative protects and enhances the fisheries Outstandingly Remarkable Value in the short term, but there is potential for it not to protect and enhance fisheries in the long-term, under the scenario of catastrophic fire or insect and disease epidemics as discussed above.

Alternative 3

Direct and Indirect Effects: Twenty two (22) acres are proposed for treatment within the RHCA, accounting for seven (7) percent of the RHCA, and an increase of 11 acres over Alternative 2. These additional acres are similar in terrain, slope, and soils to those units proposed under Alternative 2. Eight (8) units are proposed, each requiring the use of mechanized equipment. Slopes are flat to very gentle, ranging from 0 to 5 percent. The terrain between the unit boundaries and the river is also generally gentle (less than 10 percent), with the exception of units 200 (Unit 84, Alternative 2), 201, and 202 that have boulder screes up to 150 feet wide between the the unit boundaries and the river. Unit 87 would be dentical to the description of effects under Alternative 2. There are no ephemeral channels, nor any sign of surface run-off or gullying within the 8 units.

There would be a small reduction from Alternative 2 in the potential for a large-scale fire or decrease in forest health that could impact fish and their habitat, including redband trout. There are also more acres proposed for vegetation treatment and fuels reduction within 1 mile of the Deschutes River under this alternative, approximately 370 acres, an increase over Alternative 2 of 110 acres. This would further reduce the potential for large fires and insect and disease outbreaks. The long-term benefits to the conditions of the RHCA is greater under this alternative than Alternatives 1 and 2. This alternative promotes the growth of larger, healthier, and taller trees within the RHCA more than Alternatives 1 and 2. Large, tall trees within the RHCA provide shade, riverbank stability, and future large wood recruitment to the river, both of which would benefit fish and fish habitat.

There are 102 acres proposed for vegetation and fuels treatment within the Upper Deschutes Wild and Scenic River Corridor. This alternative would take more action to protect and enhance the fisheries Outstandingly Remarkable Value in the short and long-term. This alternative would have the most benefit to the fisheries Outstandingly Remarkable Value in the long-term.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Vegetative treatments would not reduce the total effective shade on the Deschutes River, although 11 acres and 22 acres would be treated within RHCAs under Alternatives 2 and 3 respectively (Table 83). These activities would occur outside of the primary shading zone. There would be no measurable increases in water temperatures in the Deschutes River.

Table 83: Riparian Habitat Conservation Area (RHCA) Summary

Alternative	Acres Proposed For Treatment In RHCA	Percent Total RHCA Acres Proposed For Treatment Within Project Area
1 (No Action)	0	0
2 (Proposed Action)	11	3
3	22	7

Units in these alternatives are less than 30 percent slope between the river and the unit boundary or are located 100 feet or more from the river, therefore the primary shading zone is 50 feet. The proposed vegetation treatments under this alternative that are within the RHCAs occur outside of the primary shading zone, and are far enough from the river that they are likely outside even the secondary shading zone.

Overland flows of sediment are not commonly evident in the RHCA of the Deschutes River under present conditions. The potential for overland flow of sediments into the Deschutes River as a result of vegetation management activities are none to neglible. The prescribed mitigation measures (100 foot setback from riparian vegetation and seasonal and equipment specifications), flat to gentle slopes within the units and generally between the units and the river, and permeable soils would result in none to neglible overland flow of sediments.

Approximately 0.6 miles of system road within the RHCA would be closed or obliterated. During the obliteration of roads, two dispersed campsites would be rehabilitated and relocated. Mitigation Measures, Hydrology, page 2-51, would reduce the potential for overland flow of sediments. Any overland flow of sediments as a result of management activities implemented under these alternatives would be immeasurable in the river due to limitations of equipment and techniques, and would be minor compared to the volumes of sediments delivered from accelerated erosion of banks upriver of the project area. Due to the lack of overland flow of sediments anticipated under this alternative, the 303(d) parameters of turbidity and sedimentation would not be adversely affected. Rehabilitating roads and dispersed campsites would benefit fish and their habitat by improving riparian and upland vegetation conditions and reducing overland flow of sediments in the long term (greater than 10 years). these alternatives would benefit water resources and fisheries, although fewer acres proposed for treatment than Alternative 3. The differences between alternatives would likely be minimal and immeasurable in the river environment.

Primary productivity within the Deschutes River, measured by Chlorphyll a concentrations (303(d) parameter), would not increase as a result of these alternatives. Nutrient inputs to the river would not increase because of the lack of overland flow of sediments, nor would shade be decreased to cause increased primary productivity. There would be no measurable changes in dissolved oxygen (303(d) parameter) concentrations as a result of these alternatives, as water temperatures and nutrient inputs would be maintained at present levels.

Management activities in these alternatives are not expected to result in any hydrologic changes to the timing, duration, or frequency of peak flow of the Deschutes River, which is a regulated system (See Hydrology Section). Since there would be no effects to water quality parameters of temperature, sedimentation, turbidity, nutrients, and dissolved oxygen, there would be no adverse effects to fish populations and fish habitat, including redband trout. These alternatives would not result in further degradation of the parameters for which it is listed on the ODEQ 303(d) list.

Vegetation and fuels treatments would provide short and long-term benefits for redband trout and associated habitat. The 303(d) parameters for which the river is listed would not be further degraded as provided in the following discussion.

There would be no effects to Essential Fish Habitat. The proposed activities are consistent with the Programmatic Biological Assessment with the exceptions of Criteria C.1 and Criteria E.1. Ground-based machines would operate within the RHCA of the Deschutes River under the action alternatives (Criteria C.1). The Equivalent Harvest Area (EHA) would be increased in watersheds already greater than 25 percent EHA (Criteria E.1). Critical bull trout habitat is no longer proposed. There would be no effect to bull trout or their habitat from any alternative.

The BE determined that the action alternatives would have beneficial effects to redband trout because of the improvement in stand conditions within the RHCA of the Deschutes River.

Cumulative Effects: There would be little potential for proposed activites to add to the adverse effects already occurring upriver. Management actions proposed would also reduce the potential for adverse effects downriver of the project area. The proposed actions may not be substantial enough to improve and protect fish habitat in the long-term. Reasonably foreseeable actions include more instream large wood restoration and riverbank stabilization using bio-engineering techniques, and more road and dispersed campsite closures to occur upriver of the Kelsey Project area. The Kelsey Fish Habitat Restoration Project added approximately 150 trees to the Deschutes River within the project area on the east bank during the spring of 2003. A similar project is being developed for the west bank of the Deschutes River within the Kelsey Project area.

Other foreseeable future actions would not likely have an adverse or beneficial cumulative effect to the Fisheries Resource in the Kelsey planning area. All other known future projects on the Bend-Fort

Rock Ranger District are located away from the Deschutes River and, with the exception of the Paulina planning area and Paulina Creek, have only ephemeral streams.

Analysis of the potential effects that has been completed for the proposed action for the East Tumbull Project has show that there would be no direct, indirect, or cumulative adverse effects to the fisheries resource

RIPARIAN MANAGEMENT OBJECTIVE (RMO) COMPLIANCE

RMOs, as established by INFISH, have been established to provide the criteria against which attainment or progress toward attainment of the riparian goals is measured. Interim RMOs provide the target for management activities across the landscape. Objectives would be achieved over time rather than expecting to be met instantaneously.

Alternative 1 (No Action), Alternative 2 (Proposed Action), and Alternative 3 are not expected to have any measurable effects to the pool frequency and width to depth ratios, as these are largely influenced by the regulated flow regime. None of the alternatives are anticipated to have a measurable effect on the water temperature, unless catastrophic conditions such as wildfire or insect and disease epidemics were to occur, with potential for water temperature to increase. Alternative 2 (Proposed Action) and Alternative 3 are proposed to promote healthier stands with larger and taller trees, which would: (1) improve shading to potentially reduce water temperatures, and (2) increase instream large wood recruitment. Maintaining and enhancing the RMOs for the Deschutes River requires entering the RHCA with active management.

HYDROLOGY

INTRODUCTION

Over 100 years of watershed research have shown that timber harvest, or vegetation removal, reduces net evapotranspiration and can increase streamflow (Bosch and Hewlett, 1982). The basic nature of processes to timber harvest, whether worldwide, regional, or local is conceptually similar. Timber harvest reduces the transpirational draft of water, thus reducing soil water depletion. In addition, canopy interception and subsequent vapor loss of precipitation can also be significantly reduced, thus delivering a greater percentage of precipitation to the forest floor (Troendle and Olson, 1993). Changes in evapotranspiration rates, peak flow volume, and peak flow duration, which may result from management activities, can potentially alter stream channel stability and sediment transport capability. Stable stream channels are capable of transporting sediment supplied from the contributing watershed. Over time, stable channels maintain their beds and banks, and do not experience net erosion or deposition. Shifts in either or both evapotranspiration rates and detectable water yield increases may have the potential to make stream channels less stable. Management activities such as conifer removal, road construction, prescribed fire or wildfire, may also result in a reduction in the inherent productivity of a site (result of soil displacement, erosion, compaction, nutrient cycle alterations, etc.). Wemple et al (1996) further discussed how roads can act as extensions to streams and disrupt the timing, magnitude, and frequency of flows.

This project would occur within the Pilot Butte and Newberry 5th-field Watersheds. The Pilot Butte Watershed is located on the eastern slope of the Cascade Mountain Range, spans approximately 147,000 acres, and encompasses the city of Bend. The Newberry Watershed is also located on the eastern slope of the Cascade Mountain Range, spans approximately 70,900 acres and encompasses Paulina and East Lakes.

The proposed project area covers approximately 46,050 acres and includes part of nine 6th-field subwatersheds (Table 84) and the 18 Fire area. Excluding the 18 Fire burn area, the planning area is 42,530 acres. The subwatersheds, ownership, and project boundary are displayed in Figure 33, page 3-184. The Benham Falls and Coyote Springs Subwatersheds are designated as A2, which is critical for maintaining quality red band trout habitat. A2 subwatersheds should receive restoration priority over other subwatersheds (ICBEMP, unsigned), including watershed restoration, noxious weed treatments, prescribed fire, thinning, and road restoration.

There are no perennial or intermittent streams, however the Deschutes River is a portion of the western boundary of the project area. Existing swales, areas where water could concentrate, within the project area are predominately runoff channels that flow only during high precipitation events and not on an annual event, such as ephemeral channels. These swales rarely exhibit a defined channel and rarely join perennial flow, primarily because of high soil infiltration rates, low water tables, and relatively low annual precipitation.

Table 84: Watershed And Subwatershed Acreage Within The Kelsey Planning Area

5th Field Watershed	6th Field Subwatershed	Total Acres*	Planning Area Acres*
Pilot Butte	Arnold	30,698	9,301
	Bend	27,813	412
	Coyote Springs	15,486	1,740
	Benham Falls	13,059	6,406
	Kelsey Butte	9,954	459

Table 84: Watershed And Subwatershed Acreage Within The Kelsey Planning Area			
5th Field Watershed	6th Field Subwatershed	Total Acres*	Planning Area Acres*
	Lava Cast Forest	13,338	10,771
	Lava Butte	18,569	15,893
	Lockit Butte	13,381	1,151
Newberry	Lower Little Deschutes	25,944	50

*****Acres are approximate.

The hydrology of the Wild and Scenic Deschutes River is a combination of spring-fed base flow, augmented by spring runoff from melted snow, and has been modified by the presence of Wickiup Dam. Wickiup Dam regulates the flow of the Deschutes River. Generally, summer flows are greater than normal due to irrigation demand, while winter flows are less than normal. The Deschutes River is designated Wild and Scenic (through segment 4) for the following outstandingly remarkable values; geologic, fishery, vegetation, wildlife, cultural, scenic, and recreation. It is designated significant for its hydrologic component.

Past impacts have occurred from road construction, timber harvest, recreational activities, and wildfire. Roads and trails currently provide access to much of the area, and urban development is present along the north, south, and west boundary of the project.

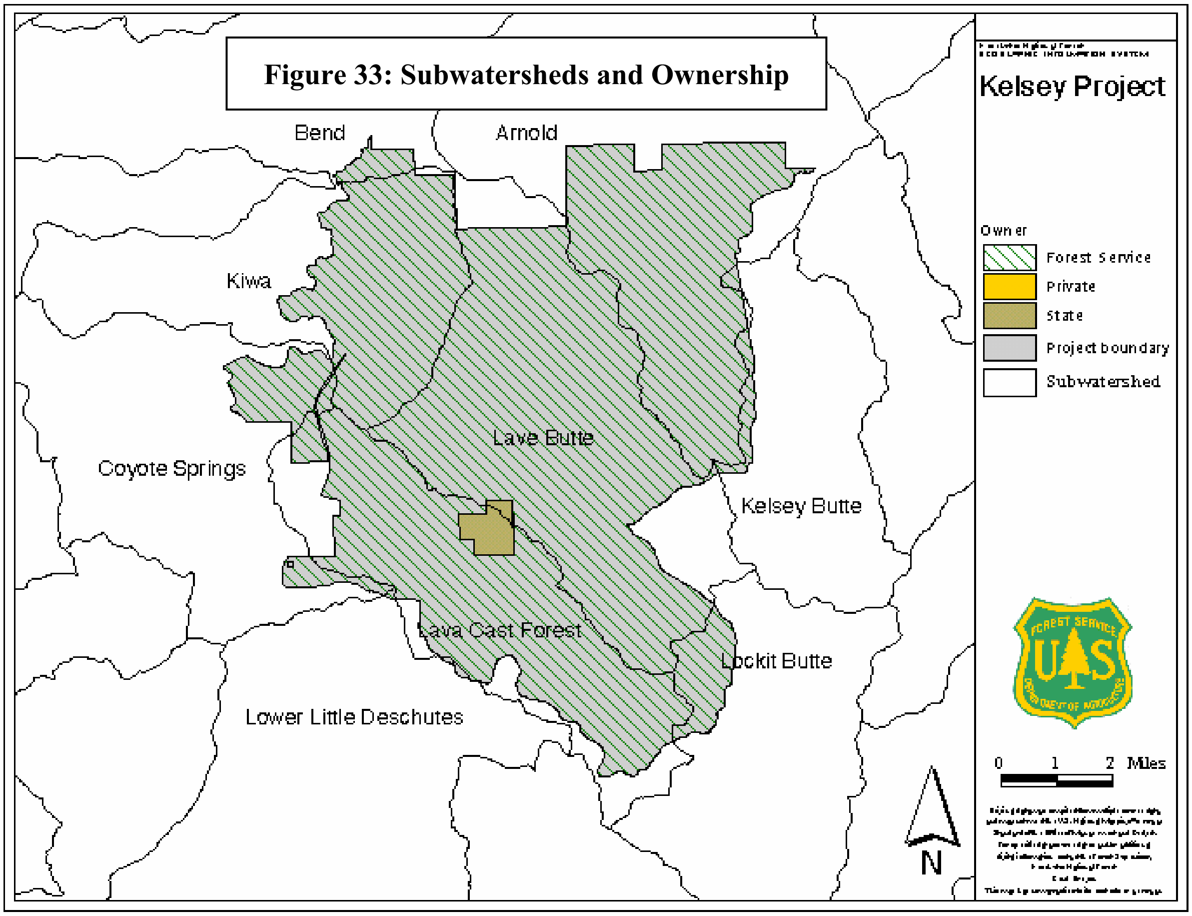
Riparian conditions along the Deschutes River vary from good to poor depending upon the degree of conifer encroachment, recreational use (dispersed and developed), and road density. Some riparian areas have a high degree of conifer encroachment and compaction, while others are functioning well. The predominate source of hydrologic disturbance is from the compaction of soils along the Deschutes River due to user-created roads and recreational areas. A complete description of existing condition can be found in the Environmental Impact Statement for the Upper Deschutes Wild and Scenic River (USDA 1996).

In July 2003, the 18 Fire burned approximately 3,810 acres, of which 3,520 acres were within the Kelsey Project area. Most of the burn area (63 percent) was classified as high intensity stand replacement fire, with 95 percent to 99 percent tree mortality. Approximately 37 percent was low to moderate intensity. The loss of canopy cover from tree mortality and subsequent effects on evapotranspiration, peak flows, sediment, stream shade and channel conditions are not substantial in this case for the following reasons:

- There is no live flowing water within or around the burn area. The nearest perennial water (the Deschutes River) is approximately 11 to 12 miles from the burn area.
- Soils are very porous and overland flow rarely occurs in areas that are not compacted (see Soils Report). Where overland flow does occur, it generally occurs for short segments on steeper slopes that have nonexistent or a small amount of vegetative cover.
- Slopes are generally less than 10 percent, with the exception of the Bessie Butte area.
- Water tables are deep and annual precipitation is relatively low.

Desired future watershed conditions to come out of the Kelsey Vegetation Project include the following;

- Manage watershed health and integrity so as prevent future listing as 303(d) streams.
- Incorporate management activities that may aid in removing streams from the 303(d) list.
- Improve riparian health and function.



BENEFICIAL USES

Beneficial uses are documented according to criteria in the Oregon Department of Environmental Quality, (ODEQ, 1998a). A beneficial use is a resource or activity that would be directly affected by a change in water quality or quantity.

The beneficial uses of the Deschutes River are public and private domestic water supply, industrial water supply, irrigation, livestock watering, anadromous fish passage, salmonid fish rearing and spawning, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, and aesthetic quality (Wild and Scenic). Beneficial uses are designated for entire basins, including the Deschutes Basin (approximately 6.9 million acres).

Water quality for beneficial uses is maintained and protected through the implementation of the Deschutes National Forest Plan (1990) Standards and Guidelines including Best Management Practices (BMPs), INFISH (1995), the Upper Deschutes Wild and Scenic River and State Scenic Waterway Management Plan (1996), and the Newberry National Volcanic Monument Comprehensive Management Plan (1994). All proposed management activities will meet the required Standards and Guidelines and selected BMPs in both the short and long term.

THE CLEAN WATER ACT AND SECTIONS 319 AND 303(D)

The objective of the Clean Water Act (CWA) of 1972 is to restore and maintain the chemical, physical, and biological integrity of all waters. Under Section 319 of the 1987 CWA Amendments, states are required to determine those waters that will not meet the goals of the CWA, determine those non-point source activities that are contributing pollution, and develop a process on how to reduce such pollution to the “maximum extent practicable”. Section 303(d) of the CWA requires that a list be developed of all impaired or threatened waters within each state. The Oregon Department of Environmental Quality (ODEQ) is responsible for compiling the 303(d) list, assessing data, and submitting the 303(d) list to the Environmental Protection Agency (EPA) for federal approval. Management direction regarding 303(d) listed waters is that any project activity should not further degrade the parameters for which it is listed (Forest Service and Bureau of Land Management Protocol for addressing Clean Water Act Section 303(d) Waters).

The proposed project area borders the Deschutes River, included on the 303(d) list. The segment of the River that borders the Kelsey Vegetation Project Area is listed for dissolved oxygen, chlorophyll A (June 1 through September 30), temperature (September 1 through June 30), sedimentation, and turbidity (spring/summer). ODEQ data for dissolved oxygen from water years 1985 through 1995, for the months of October through July, have shown that 39 percent of the samples did not meet the spawning dissolved oxygen standard (11 Milligrams per liter, or 95 percent saturation). U.S. Forest Service data from the spring and summer of 1995 shows that turbidity is increased as much as 30 fold when irrigation water is released in early spring and remains to twice background until late July. An Upper Deschutes River Instream Flow Assessment in 1994 revealed that low flows significantly affect the brown trout spawning habitat in the river (only 24 percent is useable) and high flows limit suitability for trout. The same assessment also revealed that there was a lack of large woody debris in the channel, which limits the cover and protection from the velocity of high flows for trout. Also, the spawning gravels contained a high percent of fines (sedimentation) that limit embryo survival rates for trout. The presence of Wickiup Dam, located approximately 40 miles upstream of the project area, and the modification of natural flow provides some explanation for these 303(d) listings.

RIPARIAN HABITAT CONSERVATION AREAS (RHCAS)

Riparian Habitat Conservation Areas are portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines. RHCAs include riparian corridors, wetlands, intermittent streams, and other areas that help maintain the integrity of aquatic ecosystems by (1) influencing the delivery of coarse sediment, organic matter, and woody debris to streams, (2) providing root strength for channel stability, (3) shading the stream, (4) protecting water quality, and (5) providing a network of uninterrupted habitats to serve as connectors for migrating species.

Interim RHCA widths apply where watershed analysis has not been completed. Site-specific widths may be increased where necessary to achieve riparian management goals and objectives, or decreased where interim widths are not needed to attain management goals and objectives, or avoid adverse effects.

The entire planning area lies east of Northwest Spotted Owl designated habitat, following standards and guidelines and interim widths for RHCAs. RHCA standard widths are applied based on the category of stream as defined by INFISH (1995), pages E-5 and E-6. Interim widths are as follows:

Category 1 areas (fish-bearing streams) will consist of a riparian area that incorporates the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site potential trees, or 300 feet slope distance (600 feet, including both sides of the stream channel), whichever is greatest.

Category 2 areas (perennial non-fish-bearing streams) will consist of a riparian area that incorporates the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year flood plain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet, including both sides of the stream channel), whichever is greatest.

Category 3 areas (ponds, lakes, reservoirs, and wetlands greater than 1 acre) will have a riparian area that consists of the body of water or wetland and the area to the outer edges of the riparian vegetation, or to the extent of the seasonally saturated soil, or to the extent of moderately and highly unstable areas, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance from the edge of the maximum pool elevation of constructed ponds and reservoirs or from the edge of the wetland, pond or lake, whichever is greatest.

Category 4 areas (seasonally flowing or intermittent streams, wetlands less than one acre, landslides, and landslide-prone areas) will consist of a riparian area that includes the extent of landslides and landslide-prone areas, or the intermittent stream channel and the area to the top of the inner gorge, or the intermittent stream channel or wetland and the area to the outer edges of the riparian vegetation, or one half site potential tree, or 50 feet slope distance whichever is greatest. For Priority Watersheds the area from the edges of the stream channel, wetland, landslide, or landslide-prone area to a distance equal to the height of one sit-potential tree, or 100 feet slope distance, whichever is greatest.

In non-forested rangeland ecosystems, the interim RHCA width for permanently flowing streams is the extent of the 100-year floodplain.

RHCA widths may be adjusted during site-specific project analysis where rationale for appropriate widths is presented in the decision making process. For this project, the RHCA width for the Deschutes River is 300 feet.

RIPARIAN MANAGEMENT GOALS AND OBJECTIVES

Riparian Management Objectives (RMOs), as established by INFISH (1995), have been established to provide the criteria for which attainment or progress toward attainment of the riparian goals is measured. The objectives for the attainment of Riparian Management Goals, as established by INFISH (1995), are discussed on DEIS page 3-175, Fisheries.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: This alternative would not protect or enhance watershed health, without the reduction in risk from high stand density. Management activities would continue as are presently occurring. This alternative would not reduce the risk of large uncharacteristic, high intensity wildfire and insect infestation in unthinned, high-density stands of upland vegetation. All or most riparian and upland vegetation could be substantially reduced with any large-scale natural stand-replacing event. This could contribute large amounts of sediment to the Deschutes River, increase water yields, remove shading vegetation, and damage riparian function. Increased water yields and sediment delivery from wildfire could cause channel and stream bank erosion. Specific roads within the Deschutes RHCA would continue to distribute sediment to the river. Increased stream temperature and sediment could adversely affect aquatic species.

Sediment delivery to the Deschutes River from dispersed recreation on problematic roads would continue. Management activities would not be designed to restore these areas or protect the Wild and Scenic outstandingly remarkable values. Without active restoration work, including closing and decommissioning roads and rehabilitating compacted sites, watershed recovery to a condition that is more "natural" may take many decades, and outstandingly remarkable values could decline.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: Alternative 2 (Proposed Action) would treat approximately 9,330 acres by thinning, fuels treatments, or thinning and fuels treatments. Proposed activities would reduce the risk of water quality degradation to the Deschutes River resulting from 1) high-intensity, stand replacement wildfire and 2) widespread tree mortality resulting from insect infestations and disease vectors.

Within the RHCA, a total of 11 acres would be treated with thinning and fuels reduction, which would be restricted to non-conventional methodology, such as horse or ATV logging. No treatment would occur within 100 feet of riparian vegetation. All RHCA units currently have high stand densities and are at high risk to widespread mountain pine beetle mortality or to uncharacteristic, stand replacing wildfire. Treatments within the RHCAs would reduce the risk for watershed degradation from wildfire, and tree mortality from insect vectors and mistletoe.

Approximately 6.5 miles of temporary roads would be needed for Alternative 2 activities. Temporary roads needed for treatments would be closed and rehabilitated.

Cumulative Effects: The Equivalent Clearcut Area (ECA) value for this alternative is approximately 26 percent, an increase from the existing ECA value of 23 percent. This 26 percent reflects the proposed treatments within the East Tumbull planning area because both projects are in the Pilot Butte 5th field watershed. There would be no expected measurable adverse effects to streams (at the watershed and site specific scale) from the implementation of activities proposed in this alternative. This alternative would do less to protect RHCAs from natural disturbances than Alternative 3 although the outstandingly remarkable values of the Wild and Scenic River would be protected and enhanced. This alternative would maintain compliance with the Clean Water Act. Existing adverse effects from Wickiup Dam would continue to exist, including modified flow, increased sedimentation of substrates, increased turbidity, and decreased dissolved oxygen.

Alternative 3

Direct and Indirect Effects: Alternative 3 would treat approximately 10,505 acres, approximately 11 percent more activity acres than Alternative 2 (9,330 acres). Proposed activities would reduce the risk of water quality degradation to the Deschutes River resulting from 1) high-intensity, stand replacement wildfire and 2) widespread tree mortality resulting from insect infestations and disease vectors.

Due to more treatment acres, the potential for overland flow and sediment delivery is greater than in Alternative 2. Gentle slopes, highly permeable soils, and mitigations would protect hydrologic resources from adverse effects. Alternative 3 would treat eight (8) units (78, 87, 200 to 204, and 206) and approximately 22 acres within the RHCA.

Approximately 7.0 miles of temporary roads would be needed for Alternative 3 activities. Temporary roads needed for treatments would be closed and rehabilitated.

Cumulative Effects: The ECA value for this alternative is approximately 26 percent, an increase from the existing ECA value of 23 percent. This 26 percent reflects the proposed treatments within the East Tumbull planning area because both projects are in the Pilot Butte 5th field watershed. There would be no expected measurable adverse effects to streams (at the watershed and site specific scale) from the implementation of activities proposed in this alternative. This alternative would do more to protect RHCAs from natural disturbances than Alternative 2 and the outstandingly remarkable values of the Wild and Scenic River would be protected and enhanced. This alternative would maintain compliance with the Clean Water Act. Existing adverse effects from Wickiup Dam would continue to exist, including modified flow, increased sedimentation of substrates, increased turbidity, and decreased dissolved oxygen.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Treatment activities would enhance, promote, or protect all Riparian Management Goals and Objectives (Tables 81 and 82, page 176; and Table 85). Thinning would reduce competition of surrounding trees, resulting in healthier and larger trees that are desired to provide shade, riverbank stability, and future instream large wood. A 100-foot buffer from riparian vegetation would ensure compliance with the Clean Water Act.

Direct and indirect beneficial effects would include increased tree growth (more shading), decreased water temperatures, increased dissolved oxygen in the water, improved riparian function and health, and decreased sediment delivery to the Deschutes River.

Table 85: Riparian Management Goals and Objectives

Goals	Objectives
1	Stream channel integrity, channel processes, and the sediment regime (including the elements c timing, volume, and character of sediment input and transport) under which the riparian an aquatic ecosystems developed
2	Instream flows to support healthy riparian and aquatic habitats, the stability and effective functio of stream channels, and the ability to route flood discharges
3	Natural timing and variability of the water table elevation in meadows and wetlands
4	Diversity and productivity of native and desired non-native plant communities in riparian zones
5	Riparian vegetation, to: Provide an amount and distribution of large woody debris characteristic of natural aquatic an riparian ecosystems; Provide adequate summer and winter thermal regulation within the riparian and aquatic zones Help achieve rates of surface erosion, bank erosion, and channel migration characteristic c those under which the communities developed.
6	Riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved wit the specific geo-climatic region
7	Habitat to support populations of well-distributed native and desired non-native plant, vertebrat and invertebrate populations that contribute to the viability of riparian-dependent communities

Thinning and fuels reduction would occur within Unit 87 (Benham Falls Day Use Area within the RHCA), but would be restricted to non-conventional methodology, such as horse or all terrain vehicle (**ATV**) logging to reduce soil impacts that would occur with conventional logging methods. All

RHCA treatments would have a winter logging restriction, in addition to other mitigation measures, to minimize potential short-term impacts.

Potential effects from compaction, overland flow, and sediment transport would be mitigated by decompacting all thinning units that exceed 20 percent detrimental soil impacts and by maintaining a 100-foot buffer from riparian vegetation. These mitigations, in combination with high soil infiltration rates and low slopes would eliminate potential sediment delivery to the Deschutes River. The 100-foot minimum riparian setback would mitigate and maintain river shade and not contribute to changes in stream temperature.

Inactivating and decommissioning roads would also directly reduce the potential for water quality degradation. Forty-two (42) miles of system road closure and 7.7 miles or system road decommissioning would occur with both alternatives. Two (2) dispersed campsites would be rehabilitated within RHCAs, associated with a partial closure (300 feet) of Forest Road 9702640, reducing existing compaction and sediment delivery to the Deschutes River.

In the short-term (less than 10 years) Alternative 3 provides more potential for overland flow and sediment delivery into the Deschutes River than in Alternative 2, as a potential result from treating more acres with potential compaction. Gentle slopes, highly permeable soils, and mitigations **(**page 31**)** in both action alternatives would not likely involve adverse effects to watershed health from sedimentation, as determined from monitoring in adjacent watersheds. There would be no measurable adverse effects to bank stability, width/depth ratio, or stream temperature within the RHCA. All proposed management activities with mitigation measures would meet the required Standards and Guidelines and selected Best Management Practices (BMPs) in both the short-term (less than 10 years) and long-term (greater than 10 years). Both action alternatives would benefit watershed health.

Cumulative Effects: To assess the effects of past management activities, it is necessary to evaluate the cumulative watershed effects. Cumulative watershed effects (CWE) include any changes that involve watershed processes and are influenced by multiple land use activities (Reid, 1993).

Proposed activities, in conjunction with past activities, may have an effect on watershed condition and integrity. The Equivalent Clearcut Area (ECA) methodology was used to determine where cumulative watershed effects might occur. Using ECA calculations in conjunction with field observations can provide important documentation of existing hydrological health of the subwatersheds.

The ECA methodology is defined as a watershed index of snowmelt and evapotranspiration rates relative to baseline condition where tree stands are considered fully canopied. ECA was designed as a planning tool to aid the Forest Service in assessing the cumulative effects of land management activities (Bettinger et al., 1998).

The influential factor in computing ECA is the amount of area altered by land management activities or factors, such as wildfires or timber harvest. The amount of area that can be described as a clearcut is defined in terms of the density of residual vegetation. Each particular land use area is assigned a "clearcut equivalent factor" (CEF), which is multiplied by the area disturbed to arrive at an ECA value (Bettinger et al., 1998). For example, clearcuts and roads are generally given a CEF value of 1.0, and partial cuts are given a CEF from 0.0 to 1.0, depending on the density of residual vegetation. The more open the unit is, the more it emulates the snowmelt and evapotranspiration rates of a similar stand that is clearcut.

A recovery rate factor, derived from local recovery rates, is included to achieve the final ECA determination. Recovery rates range from 27 to 120 years, depending on site-specific factors such as soil productivity and climate regime. A recovery rate based on a 50-year recovery period was used on this project. This is within the range of reported recovery rates in literature and through personal communication with Troendle in 1999. The 50-year recovery rate was used after consultation with specialists on the Deschutes National Forest.

Research by Troendle and Olson (1993), Troendle and King (1985, 1987), and Troendle (1983) found that there is no one specific threshold as to how much a watershed can be clearcut before a change in peak flow can be documented. ECA thresholds, in relation to changes in peak flow, have been documented as low as 25 percent and as high as 40 percent. However, this threshold is highly dependant upon the physical characteristics of the watershed. Upon field visits to the Kelsey area, there is no sign of stream degradation. The Bend subwatershed has a high ECA value primarily due to the city of Bend.

Before using the ECA methodology, its context of use was discussed with the Marc Wilcox (Forest Hydrologist), Duane Monte – deceased (Soil Scientist), and Dr. C. A. Troendle (Research Scientist, Research Hydrologist, USFS, Rocky Mountain Research Station). Marc Wilcox spent 15 years working on the Coon Creek Pilot Water Yield Increase Project. The purpose of this project was to implement research findings from the Frasier Experimental Station on an operational timber sale on a National Forest. Duane Monte has worked as a soil scientist, project leader, and restoration specialist on numerous Forests that have used similar techniques. Dr. Troendle is the project leader for ecosystem management at the Rocky Mountain Research Station. He is considered the foremost expert in the Forest Service on vegetative manipulations and water yield impacts. The methodology was also discussed with the Regional Hydrologist, Bruce McCammon, who agreed using ECA is appropriate only as a means to compare alternatives. However, stream channel condition and field observation should be used to determine actual health of the system (Personal Communication with McCammon, 1999).

Table 86 displays the results of the CWE analysis, as a function of the existing ECA value by subwatershed. Fifty 50 acres (0.1 percent) of the Lower Little Deschutes Subwatershed are in the project area and were not analyzed. Effects would not be measurable from treatment(s) that would occur within this 50-acre area. No vegetation treatments are proposed within the Bend and Lockit Butte Subwatersheds. The Bend and Lava Cast Forest Subwatersheds have the highest ECA values. In locations with relatively high ECA values and low soil porosity and infiltration rates, an increase in overland flow, and possibly a change in the timing, duration, and frequency of peak flow, might be expected. Soils are generally porous with high infiltration rates in the planning area (see soils report). Overland flow is rare and generally concentrated to steeper, unvegetated ground. Consequently, there would be no expected measurable adverse effects on a watershed or subwatershed scale.

Table 86: Percent Equivalent Clearcut Area (ECA) by Subwatershed and Alternative

Subwatershed	Alternative 1 (No Action) Existing Condition	Alternative 2 (Proposed Action)	Alternative 3
Bend	35.0	35.0	35.0
Coyote Springs	24.5	25.0	26.1
Benham Falls	6.7	7.8	7.8
Kelsey Butte	27.6	28.0	28.4
Lava Cast Forest	31.3	39.3	40.5
Lava Butte	17.6	25.9	26.6
Lockit Butte	16.1	16.1	16.1
Arnold	19.7	21.2	21.6
Watershed Average	**22.3**	**24.8**	**25.4**

All known past impacts, including harvests and wildfires have been evaluated. Specific roads, trails, harvest units, and plantations within each watershed are on file and available for review in the Watershed Project File located at the Deschutes National Forest Supervisor's Office located in Bend, Oregon.

Several past, present, and reasonably foreseeable actions have occurred, with few having potential to affect hydrology of the planning area. All past projects that affect hydrology were accessed in the ECA analysis. Recent projects pertaining to hydrology within the planning area include the Wickiup Dam Restoration project, Kelsey Fish Habitat Enhancement project, East Tumbull project, and 18 Fire Salvage (approximately 3,520 acres within the planning Area). Existing adverse effects from Wickiup Dam would continue to exist, which include modified flow, increased sedimentation of substrates, increased turbidity, and decreased dissolved oxygen. The other projects have been determined to have no existing or expected adverse effects to hydrology and water quality. Other restoration projects have been implemented to improve fish habitat and water quality. Large wood placement, bank stabilization projects, and road and campsite closures have improved water quality in many areas.

Future road closures or decommissioning, including user created roads, would likely improve the RHCA and protect the Deschutes River from increased sedimentation. Present use of dispersed recreation sites, day and overnight use, would continue to degrade adjacent stream banks within the riparian area. Road closures/decommissioning could reduce use of dispersed sites. Future closure or rehabilitation of dispersed recreation sites would decrease access through the RHCA, improving streambank integrity.

Continued motorized recreation use could affect hydrological processes. Existing sediment inputs to the river exist from dispersed recreation sites (compacted) along the river. Motorized recreation within the Wild and Scenic River corridor would continue to maintain or create compacted and soil displacement conditions, particularly on rutted roads, allowing standing water rather than percolation into the adjacent, less compacted soils.

Other projects such as the Fuzzy EA, Highway 97 modifications and rerouting to Lava River Caves and Benham Falls, Lava Cast Vegetation Management Project, and Opine Projects have been considered and determined to have no existing hydrologic effects.

RIPARIAN MANAGEMENT OBJECTIVE COMPLIANCE

Riparian Management Objectives (RMOs), as established by INFISH (1995), have been established to provide the criteria against which attainment or progress toward attainment of the riparian goals is measured. Interim RMOs provide the target toward which resource management activities can be conducted across the landscape. It is not expected that the objectives would be met instantaneously, but rather would be achieved over time. This section will discuss how each alternative either meets, or does not meet the intent of the RMOs. Consult the Fisheries Biologist's specialist report for additional information on RMO compliance.

Pool Frequency: Wickiup Dam directly controls pool frequency of the Deschutes River. With manipulation of the natural flow regime, pool frequency cannot be expected to be "natural". Jurisdiction of the dam in not Forest Service, and is out of the scope of this project.

Water Temperature: All vegetation treatments have either been designed to promote stream shade and cooler water temperatures or to avoid those areas that influence shade and temperatures. All thinning within RHCAs would promote stand health (tree growth) and improve stream shading over time. There would be no expected measurable adverse effects to stream temperature. Stream temperature is also influenced by the presence of Wickiup Dam.

Bank Stability: All treatments within the RHCAs would have no measurable adverse effects to bank stability. Bank stability would benefit from activities outlined in this project, such as dispersed site closures).

Lower Bank Angle: This applies predominately to non-forested systems and is inside the 200-foot riparian buffer.

Width/Depth Ratio: The presence of Wickiup Dam directly controls the width/depth ratio of the Deschutes River. All treatments within the Kelsey project would have no measurable adverse effects to the width/depth ratio of the Deschutes River.

COMPLIANCE WITH THE CLEAN WATER ACT AND 303(D) LISTED STREAMS

All alternatives are consistent with the Clean water Act.

The conditions that reduce the likelihood that proposed activities are capable of exacerbating watershed conditions and affecting water quality include:

Proposed activities are in soils that are well drained (i.e. pumiceous).

Mitigations and Best Management Practices will be employed (Pages 2-14 through 2-18).

All planned activities have been determined to meet Riparian Management Objectives.

Effect on 303(d) Parameters

Within the RHCA, a total of 11 acres (Alternative 2) and 22 acres (Alternative 3) would be treated with thinning and fuels reduction, which would be restricted to non-conventional methodology, such as horse or ATV logging. No mechanized treatment would occur within 100 feet of the waters edge. All RHCA units currently have high stand densities and are at high risk to widespread mountain pine beetle mortality or to uncharacteristic, stand replacing wildfire. Treatments within the RHCAs would reduce the risk for watershed degradation from wildfire, and tree mortality from insect vectors and mistletoe.

Approximately 6.5 miles of temporary roads would be needed for Alternative 2 activities. Temporary roads needed for treatments would be closed and rehabilitated.

Because of the lack of overland flow of sediments anticipated under this alternative, the 303(d) parameters of turbidity and sedimentation would not be adversely affected. Rehabilitating roads and dispersed campsites would benefit fish and their habitat by improving riparian and upland vegetation conditions and reducing overland flow of sediments in the long term (greater than 10 years). This alternative would benefit water resources and fisheries, with fewer acres proposed for treatment than Alternative 3. The differences would likely be minimal and immeasurable in the river environment.

Primary productivity within the Deschutes River, measured by Chlorphyll a concentrations (303(d) parameter), would not increase as a result of this alternative. Nutrient inputs to the river would not increase because of the lack of overland flow of sediments, nor would shade be decreased to cause increased primary productivity. There would be no measurable changes in dissolved oxygen (303(d) parameter) concentrations as a result of this alternative, as water temperatures and nutrient inputs would be maintained at present levels.

Management activities in this alternative are not expected to result in any hydrologic changes to the timing, duration, or frequency of peak flow of the Deschutes River, which is a regulated system (See Hydrology Section). Since there would be no effects to water quality parameters of temperature, sedimentation, turbidity, nutrients, and dissolved oxygen, there would be no adverse effects to fish populations and fish habitat, including redband trout. This alternative would not result in further degradation of the parameters for which it is listed on the ODEQ 303(d) list. This alternative is consistent with ICBEMP and NNVM objectives and standards and guidelines.

Vegetation and fuels treatments would provide short- and long-term benefits for redband trout and associated habitat. The 303(d) parameters for which the river is listed would not be further degraded as provided in the following discussion. These alternatives are consistent with ICBEMP science and NNVM objectives and standards and guidelines.

ROADS AND TRANSPORTATION

EXISTING CONDITION

The Kelsey Roads Analysis was concluded in March 2002. All Forest system roads were analyzed by specialists and ranked according to the need of each road and the affect of each road to each resource. The review provided recommendations for road status, including maintenance at the current status, change to different maintenance level, closing, or decommissioning. Road status recommendations have been incorporated by reference into this document for implementation (Project Record, Appendix S, Roads Analysis).

There are approximately 258 miles of open Forest Service roads and 13 miles of state, county, or other roads within the planning area, totaling 271 open road miles. Many of these roads were initially used to provide access to commercial harvest activity areas. Following the end of harvest during the 1930s through 1950s, old railroad beds and other defined access routes continued to provide access for follow-up forest management activities and other forest uses. These other uses have included both motorized and non-motorized recreation, forest products gathering, and special uses such as utility access. There are also 16 miles of closed roads. Some road closure devices show signs of being ineffective.

Most roads within the planning area, outside of NNVM, are currently open to year around use by both motorized and non-motorized use. Present uses include, but are not limited to, access by utilities, horseback riding, sightseeing, biking, cross country skiing, hunting, off-highway vehicle (OHV) use such as ATVs, motorcycles, 4-wheel drive, snowmobiles, special use access, and Forest Service administrative use. Many of the activities take place in critical winter mule deer and key elk habitat. Because roads are not maintained during the winter, winter use is primarily limited to snowmobiles and skiing. NNVM is closed to all off-road motorized use except utility maintenance and winter use of snowmobiles.

These roads are separated into three categories: primary, secondary, and others (Table 87). An administrative closure to off-highway vehicle use is in effect from the southern urban growth boundary south to the 400 and 900 roads and east to the Pacific Gas and Electric (PG&E) power lines.

- Primary roads: The public is encouraged to use primary roads for access into and through the Forest. These roads are the highest maintenance level and provide the most comfort for drivers. These total approximately 36 road miles.
- Secondary roads: These routes make a direct single connection to areas outside the reach of the primary system and used by vehicles from high-clearance to passenger cars. Some of these routes may resemble primary routes and function similarly, but do not meet primary road criteria. These roads total approximately 32 road miles.
- Other Roads: All other roads, that have minimal risk to safety or environment, are of the lowest maintenance level and provide access for recreation and land management activities. These roads total approximately 202 road miles and include closed roads.

Table 87: Road Classifications and Miles

Classification	Length (miles)
Primary	36.4
Secondary	32.2
Other	202.4
Total	271.0

Most primary and secondary roads are in good condition. Roads classified as other typically receive limited maintenance during specific project use. Portions of primary, secondary and other roads would be expected to require maintenance or reconstruction work to prepare them for project use. Closed roads (inactivated) remain part of the transportation system, with motorized use eliminated for one or more years. These roads are stabilized and placed in an inactive status, remaining on the Forest Transportation Inventory and available for future project use.

There are also numerous unclassified, user-created roads throughout the planning area that are not included in the totals listed above. Unclassified roads have evolved over time for non-planned uses. They are typically short length roads to old landing locations, remnants of roads that were used for mining and logging dating to the early 1900s, or roads developed by 4-wheel drive vehicles. Some of these roads are grown in with vegetation and not drivable by full sized vehicles.

The Forest Plan provides desired road density direction for the various Management Areas. Densities are to be used as thresholds for evaluation and not to serve as the basis for assessing Forest Plan conformance. The NNVM Management Plan does not provide for a specific road density. The desired road densities are described in the Forest Plan. The recommended road densities result from the Kelsey Roads Analysis. Road density includes the open road system, maintenance level roads 2 through 5, and state and county roads. Table 88 provides a comparison between present, desired, and recommended road density for each Management Area.

Table 88: Present, Desired, And Recommended Open Road Densities By Management Area

Management Area	Present Open Road Density (Miles/Square Mile)	Desired* Open Road Density (Miles/Square Mile)	Recommended** Open Road Density (Miles/Square Mile
Deer Habitat (MA-7)	**4.3**	**1.0 to 2.5**	**3.6**
Deer Habitat – Inside 18 Fire	*3.9*	-----	*2.7*
Deer Habitat – Outside 18 Fire	*4.4*	-----	*3.8*
Deer Habitat – Seasonal Closure	-----	-----	*1.3*
General Forest (MA-8)	**3.4**	**2.5**	**2.7**
General Forest – Inside 18 Fire	*7.0*	-----	*5.3*
General Forest – Outside 18 Fire	*3.3*	-----	*2.6*
Scenic Views (MA-9)	**6.0**	**2.5**	**4.8**
Old Growth (MA-15)	**1.9**	**2.5**	**2.0**
Wild and Scenic (MA-17)	**3.7**	**Lowest density to meet Long-term needs**	**2.0**
Ryan Ranch – Key Elk Area (KEA)	**6.0 (Inside Kelsey)**	**0.5 to 1.5**	**4.1**
All Ryan Ranch KEA	*4.6*	-----	*3.8*
Kelsey KEA Seasonal Closure	-----	-----	*1.3*
All Ryan Ranch with Closures (Present and Proposed)	-----	-----	*1.2*
NNVM	**0.8**	**Lowest density to meet Long-term needs**	**0.7**
Overall Planning Area Road Density	**3.8**	**Refer to Above Densities**	**3.1**

* Desired road density is derived from the Forest Plan. Open road density describes density of open, system roads.
** Recommended road density is the road density that would remain following proposed closure and decommissioning.
*** Density in parentheses is the density of the planning area, including the 18 Fire following proposed road closure.

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no road construction or reconstruction for present management use. There would be no road closure or decommissioning activities of roads that have been determined as not needed for management through the district roads analysis (Project Record, Appendix T, Roads Analysis). Normal maintenance activities that include road blading, shaping, and drainage activities and hazard tree removal would continue. Forest access would continue to be provided for both federal management activities and historical use of public activities.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Open road miles would be decreased through road closures within all Management Areas. Approximately 42.0 miles of road would be closed and 7.7 miles of road would be decommissioned. There would be no new permanent road construction in either action. The most economical and effective method for road inactivation that meets management objectives would be used for closure of temporary roads. Road reconstruction and maintenance activities would occur under both action alternatives. These activities would include, cutting hazard trees adjacent to identified roads and haul routes. Road reconstruction activities, described in Chapter 2 - Comparison of Alternatives, would restore proper drainage to the road template, and improve intersection alignment and road surface conditions where identified as deficient in segments of those roads. Access to proposed Unit 111 would require access on county roads through Deschutes River Woods.

Vegetation management and post-sale activities would result in an overall decrease of the total miles of the open transportation system, and would increase the total miles of road in closed or seasonally closed status. Approximately 22.0 miles of roads would be reconstructed prior to thinning activities. Roads that are proposed for closure, Table 10, page 2-28 and decommissioning, Table 11, page 2-29, would be closed or decommissioned following completion of vegetation treatments.

The closure and decommissioning of roads would reduce access for Forest management activities and historical public uses. Access for camping and hunting sites would be limited to non-motorized in those areas where public motorized access has been discontinued. Use of areas with historical camping sites, that are no longer accessible, would likely shift to other areas that are similar in terrain, vegetation, and previous accessibility.

Cumulative Effects: The Forest Roads Analysis initially began with a Forest Analysis of the primary access routes through the Forest. These included roads such as Highway 97, County Road 40, and Forest Roads 1800, 1810, 1820, and 9710 that run through or provide access to various parts of the Deschutes National Forest. Following this initial analysis, the remaining Forest system roads were analyzed, including those within the 18 Fire boundary. The roads within the 18 Fire were reanalyzed because of the changed resource condition and needs. The result was a change in the recommendations from the original analysis. Overall, the 18 Fire roads re-analysis recommended the closure and decommissioning of 9.9 miles of the 21.4 miles of road that existed within the fire area. This was an increase of approximately 3.5 miles from the original roads analysis for the Kelsey planning area.

Future considerations within the planning area include an Off Highway Vehicle (OHV) trail system and staging/play area. Some of the roads being proposed for closure under this EA would be considered for use as part of the planned trail system.

The Oregon Department of Transportation (ODOT) has installed a median barrier at highway centerline on Highway 97 within a portion of the planning area. Direct access to some roads in the Kelsey planning area is limited where the barrier has been installed. This may cause travel times to increase and adversely affect wildfire suppression access and success. Future access to Lava River Cave, Lava Lands Visitor Center, and Benham Falls on the Deschutes River is likely to change. Access to Lava River Cave would be from the Cottonwood Interchange and would use old Highway 97 north with a short section of newly constructed road to the present parking area. Access to Lava Lands Visitor Center is presently undecided.

The Highway 97 Weigh and Safety Station has been completed. Forest road access (1801) to Highway 97 in this area has been closed at Highway 97.

The proposed ODOT interchange at Highway 97, to be located at the present junction with County Road 40 to Sunriver, would not change long-term road access within the planning area. The Cottonwood Interchange would be upgraded. Highway 97 would be widened to four (4) lanes from the Sunriver Interchange to the end of the present four (4)-lane highway, just south of the entrance to Lava Lands Visitor Center. These ODOT projects along Highway 97 will alter traffic patterns within the Highway 97 travel corridor and Kelsey planning area, as previously described, however they are being analyzed in ODOT documents and not in this Kelsey Vegetation Management Project.

Forest Plan Consistency

The current Forest Service open road density is approximately 3.64 miles per square mile. The Forest Plan standards and guides open road density is 2.5 miles or less per square mile unless otherwise stated. Deer habitat has a desired open road density of 1.5 to 2.5 miles per square mile. The Ryan Ranch key elk area has an open road density goal of 0.5 to 1.5 miles per square mile. These guideline densities are used as desired thresholds and are not the basis for assessing Forest Plan conformance.

Each resource specialist analyzed roads that are proposed for closure and decommissioning during the Kelsey Roads analysis (Project Record, Roads Analysis, Appendix T). All Management Areas are presently above desired densities. Road closures and decommissioning would reduce the overall planning area road density. The further reduction in road density would occur through a seasonal road closure within the Winter Range and Key Elk Habitat. TS-11 states that “Density guidelines are not intended to be objectives in themselves, but are a means to accomplish wildlife resource objectives.” TS-12 states “Guideline densities will be used as thresholds for a further evaluation and will not serve as the basis for assessing conformance with the Forest Plan.” TS-13: “If a preferred project alternative would exceed these guidelines, a detailed further evaluation by a wildlife biologist would be required. … If the evaluation concludes that the net effect of the project is compatible with the Forest Plan wildlife objectives as proposed or with mitigation measures, or significantly enhances the conformance of the Implementation Unit with wildlife objectives, the project will be considered compatible with Forest Plan direction.” TS-14 further states “The biologist’s evaluation would be used by the project ID Team and line officer in deciding on a plan with best satisfies multiresource needs, and in preparing the NEPA document and Decision Notice. … Selection of project alternatives, which further evaluation finds are not compatible with Forest Plan wildlife objectives or will not significantly enhance conformance of the Implementation Unit with wildlife objectives, will require an amendment of the Plan.”

Road density reduction is consistent with the Forest Plan (TS-11 through 14). Road closure and decommissioning reduces road density toward the desired miles per square mile in each management area. Seasonal road closure further reduces density in both Deer Habitat (MA-7) and the Ryan Ranch

Key Elk Area, reducing harassment of big game during critical times of either foraging or fawning or both.

UNROADED AREAS

INTRODUCTION

Unroaded areas are defined in the FEIS for the Roadless Area Conservation Final Rule as "any area, without the presence of a classified road, of a size and configuration sufficient to protect the inherent characteristics associated with its roadless condition. Unroaded areas do not overlap with the inventoried roadless areas." (USFS 2000, page G-12). Unroaded areas have typically not been inventoried and are, therefore, separate from inventoried roadless areas. This document uses the term "unroaded area" to differentiate these areas from inventoried roadless areas. There is no Inventoried Roadless Area (IRA) within or contiguous with the Kelsey planning area. The nearest IRA is the North Paulina IRA, approximately 2.5 miles to the southeast of the southeastern edge of the planning area. Two (2) roads that currently provide east-west access through the Newberry National Volcanic Monument (NNVM) are located between the planning area and the IRA. There are no Forest-wide or Management Area standards specific to unroaded areas in the Deschutes Forest Plan.

EXISTING CONDITION

Much of NNVM within the planning area is unroaded. These areas are primarily large contiguous areas of lava flow. Approximately 7,040 acres of the total 18,140 acres of NNVM are roaded, leaving approximately 11,100 acres as unroaded. The roaded areas provided historical access for, primarily, the removal of commercial timber. Estimates for the size of the areas were made by visual approximation from the Bend-Fort Rock District Fireman's Map.

Included within NNVM is approximately 1,315 acres of the Mokst Butte Research Natural Area (RNA). A portion of this RNA is roaded. No activities are planned within Mokst Butte.

The effects discussion focuses on the values that may be provided by unroaded areas, including the following:

- Natural appearing landscapes for dispersed unroaded recreation opportunities such as hiking, wildlife viewing, hunting, and cross-country skiing, and the solitude they can provide.
- Protection of cultural and heritage resources.
- Habitat for threatened, endangered, and sensitive species.

ENVIRONMENTAL CONSEQUENCES

Effects Common to All Alternatives

Direct and Indirect Effects: There would be no direct or indirect effects from the action alternatives to the unroaded area within the lava flows. No activities would take place that would have any direct effect on the roadless character of the area.

Road proposals were developed through the Roads Analysis process. The transportation system in the project area was reviewed and evaluated by an interdisciplinary team. The analysis process is documented in the Kelsey Vegetation Management Roads Analysis. No new road construction was recommended; road closure and decommissioning has been identified.

Undisturbed or High Quality Soils
Impacts to soils where units overlap the unroaded area are expected to be negligible (Refer to Soils section beginning on page 3-131).

Habitat for Fish and Wildlife/Diversity of Plant and Animals
A portion of NNVM borders the Deschutes River. This area consists primarily of lava flow. Proposed Alternative 2 units 84, 85, and 87 and Alternative 3 units 200 and 87 are within NNVM adjacent to the river.

Protection of Cultural and Heritage Resources
Units that are proposed for treatment are areas that have had previous management activities. Any known sites within units would be avoided. Any sites that are found during project activities would also be avoided. There would be no direct or indirect impacts to cultural resources in the unroaded areas of the planning area.

Natural Appearance and Recreation Opportunities
Areas that could be considered unroaded and with no previous active management activities would not have new management activities. These areas would not be directly or indirectly affected.

Invasive plants
The risk of invasive plants invading these areas would be low. Mitigation measures listed in Chapter 2 are expected to be effective in limiting the introduction and spread of invasive plants in the project area. Effects are as described under Botany – Invasive Plants, beginning on page 3-195.

Cumulative Effects: Based on the Roads Analysis, reasonably foreseeable future management of the transportation system includes road closures and decommissioning, resulting in a net decrease of approximately 6.6 miles of road within the NNVM. Roads to be closed around the unroaded area may increase the degree of "roadless character" on a local level. Roads that are closed would remain in the transportation system. Roads that are decommissioned would be removed from the transportation system.

BOTANY

THREATENED, ENDANGERED, SENSITIVE

SUMMARY OF FINDINGS

A biological evaluation is documented in the Botany Report (Project Record, Appendix K, Close 2005). The current condition and expected environmental effects on Threatened, Endangered, or Sensitive plant species, as described in the Botany Report, is summarized and described. The Botany Report is located in and is incorporated by reference in the Project Record, Appendix K.

The activities that are proposed in the Kelsey Vegetation Management Project will not have adverse direct, indirect, or cumulative impacts to habitat, sites, or cause a loss of viability or a trend toward Federal listing for any species on the Region 6 Forester's Sensitive Plant List. None of the listed plant species were found to occur within the planning Area.

Federally listed Threatened or Endangered plant species or habitat, or plant species proposed for listing, are not documented or suspected to occur in the Kelsey Planning Area, therefore, activities proposed in the alternatives in Kelsey Project will have no effect on Federally listed plant species.

INTRODUCTION

The biological evaluation (BE) was conducted to comply with requirements of the Endangered Species Act of 1973, as amended. The Forest Service Manual (USDA Forest Service, 1995b) and the Forest Plan (USDA Forest Service, 1990) both state that habitat for sensitive plant and animal species shall be Managed or Protected to ensure that the species do not become threatened or endangered. The Forest Plan states management guides (defined as Conservation Assessments or Strategies) are to be developed and used. (A conservation assessment or strategy is the Forest Service's documentation for the management actions necessary to conserve a species, species group, or ecosystem). The Forest Service Manual states habitats for all existing native and desired nonnative plants, fish, and wildlife should be managed to maintain at least viable populations for each species (USDA Forest Service, 1995a). A viable population consists of a number of individuals adequately distributed throughout their range necessary to perpetuate the existence of the species in natural, genetically stable, self-sustaining populations (Phillips and Wooley 1994).

The extent of the surveys within the Kelsey Vegetation Management Project meets requirements for survey for Proposed, Threatened, Endangered, and Sensitive species (on the current Region 6 Forester's Sensitive Plant List, July 2004) and their habitats for which the Forest Service is responsible.

This biological evaluation is being prepared for the Kelsey Vegetation Management Project. Effects of activities associated with this project are evaluated for those Proposed, Endangered, Threatened, or Sensitive (PETS) plant species on the current Region 6 Forester's Sensitive Plant List (July, 2004) that are documented or suspected to occur on the Deschutes National Forest (DNF). If any project or species list changes occur, this BE will be reviewed for accuracy of the evaluation under the new situation; a re-evaluation may be required to adequately protect PETS plant species.

SURVEY METHODS AND RESULTS

Prefield reviews for all PETS plant species were conducted in April and June 1998. Habitat requirements of all PETS plant species known or suspected to occur on the Bend-Fort Rock Ranger District were compared with habitats that occur within the planning area.

Since the original prefield reviews for the Kelsey Planning Area were done, the R6 Sensitive Plant List has changed. The most recent list (July 2004) includes former Survey and Manage species in the Northwest Forest Plan (NWFP) area that were added to the list when the ROD (Record of Decision, 2004) was signed to remove Survey and Manage Standards and Guidelines from the NWFP. A review of the habitat requirements of former Survey and Manage plants and fungi on the R6 Sensitive Species List that are documented or suspected to occur on the Deschutes National Forest indicates that potential habitats for these species do not occur in the Kelsey Planning Area.

Plant surveys were conducted in Kelsey project units in 1998 and 2000. Surveys for other projects in the Kelsey Planning Area were conducted between 1990 and 1998. All surveys were conducted in accordance with methods approved by the Deschutes National Forest. Surveyors in the Kelsey project area traversed at least one-third of the total area of each unit in a semi-random fashion and specifically included all potential habitat for suspected sensitive plant species. The plant survey records are on file at Bend-Fort Rock Ranger District in the Botany files.

No PETS (potential, endangered, threatened, and sensitive) plant species were found during surveys in the Kelsey Planning Area and no habitats were noted in survey records where plant species added to the list had potential to occur.

EXISTING CONDITION

After reviewing the GIS Sensitive Plant Layer and past survey information, sensitive plant species were not found to occur within the Kelsey Planning Area. The prefield reviews indicated that two (2) species of PETS plants, *Castilleja chlorotica* and *Artemisia ludoviciana* ssp. *estesii*, have sites near the Kelsey Planning Area, but only *Castilleja cholortica* has potential habitat in the units to be surveyed in the project area. *Artemisia ludoviciana* ssp. *estesii* has known sites along the Deschutes River adjacent to the western boundary of the Kelsey Planning Area.

No federally listed threatened or endangered plant species or habitat, or plant species proposed for listing, are documented or suspected to occur in the Kelsey Planning Area (Table 89).

Table 89: Plant Prefield Review

R6 Sensitive Plant Species Documented or Suspected on the Deschutes National Forest	Range	Local Habitat	Occupied Habitat in Planning Area?/On Forest?	Probability of Occurrence in Project Area
Agoseris elata (vascular plant)	Washington and Oregon Cascades	Forest openings and forest edges adjacent to wet/moist meadows, lakes, rivers, and streams	No/Yes	Low; habitat marginal
Arabis suffrutescens	South-Central	Meadows, woods, summits,	No/No	Low; outside

Table 89: Plant Prefield Review				
R6 Sensitive Plant Species Documented or Suspected on the Deschutes National Forest	**Range**	**Local Habitat**	**Occupied Habitat in Planning Area?/On Forest?**	**Probability of Occurrence in Project Area**
var. *horizontalis* (vascular plant)	Oregon	Ridges, and exposed rock outcrops		known Range
Arnica viscosa (vascular plant)	South-Central Oregon Cascades, California	Scree, talus gullies, lava flows and slopes w/ seasonal runoff. May be in moraine lake basins or crater lake basins	No/Yes	Low; habitat marginal
Artemisia ludoviciana ssp. *estesii* (vascular plant)	Central Oregon	Upper riparian away from aquatic plants	No/Yes	Low; habitat marginal in planning area; sites near planning area
Aster gormanii (vascular plant)	Rocky ridges, outcrops, or rocky slopes	Northern West Cascades	No/No	Low; outside known range, habitat marginal
Astragalus peckii (vascular plant)	South-Central Oregon	Basins, benches, gentle slopes, and meadows.	No/Yes	Low; habitat marginal
Botrychium pumicola (vascular plant)	Central Oregon	Alpine-subalpine ridges, slopes, and meadows. Montane forest openings, open forest in basins with frost pockets, pumice flats	No/Yes	Low; habitat marginal
Calamagrostis breweri (vascular plant)	Oregon North Cascades and California	Non-forest moist-to-dry subalpine and alpine meadows, open slopes, streambanks, lake margins	No/No	Low; outside known range; habitat marginal
Calochortus longebarbatus var. *longebarbatus* (vascular plant)	South-Central Oregon and adjacent Northern California, South Central Washington and adjacent north-central Oregon	LP-PP forest openings and forest edges of vernally moist grassy meadows, occasionally along seasonal streams	No/No	Low; habitat marginal
Carex hystricina (vascular plant)	Oregon, Washington, California, Idaho	Wet to moist conditions in riparian zones, in or along ditches/canals in prairies or wetlands	No/No	Low; habitat marginal
Carex livida (vascular plant)	Oregon Washington, California, Idaho	In peatlands, including fens and bogs; wet meadows with still or channeled water	No/No	Low; habitat marginal
Castilleja chlorotica (vascular plant)	Oregon east Cascades	LP-PP, mixed conifer forest openings. PP at lower and LP at mid, and mixed conifer at highest elevations	No/Yes	Low; habitat marginal in planning area; sites near planning area
Cicuta bulbifera (vascular plant)	East Cascades Oregon and Washington	Shoreline of marshes. TNC records only for margins of Klamath Lake in 1902, 1950. Persistence at these sites considered doubtful	No/No	Low; outside Oregon range
Collomia mazama (vascular plant)	South-Central Cascades, Oregon	Meadows (dry to wet, level to sloping); stream banks and bars, lakeshores and vernal pool margins; forest edges and openings; alpine slopes	No/No	Low; outside known range
Dermatocarpon	Oregon, Washington	On rocks or bedrock in	No/No	Low; habitat

Table 89: Plant Prefield Review				
R6 Sensitive Plant Species Documented or Suspected on the Deschutes National Forest	**Range**	**Local Habitat**	**Occupied Habitat in Planning Area?/On Forest?**	**Probability of Occurrence in Project Area**
luridum (lichen)		streams or seeps, usually submerged or inundated for most of the year		marginal; sought, but not yet detected on DNF
Gentiana newberryi var. *newberryi* (vascular plant)	Oregon east and west Cascades, California	Wet to dry alpine, subalpine, and mountain mixed conifer zones, in forest openings and meadows, commonly with tufted hairgrass	No/Yes	Low; habitat marginal
Leptogium cyanescens (lichen)	Oregon, Washington	Generally riparian but recently documented in upland settings on vine maple, big leaf maple and Oregon white oak	No/No	Low; habitat marginal; sought, but not yet detected on DNF
Lobelia dortmanna (vascular plant)	Oregon East Cascades, Washington	Shallow water at margins of lakes, ponds, and rivers or in standing water of bogs and wet meadows	No/Yes	Low; habitat marginal
Lycopodiella inundata (vascular plant)	Oregon, Idaho, California, Montana – Circumboreal	Deflation areas in coastal backdunes; montane bogs, including sphagnum bogs; less often wet meadows	No/Yes	Low; habitat marginal
Lycopodium complanatum (vascular plant)	Oregon, Idaho, Washington +	Edges of wet meadows; dry forested midslope with >25% canopy cover	No/No	Low; outside known range, habitat marginal
Ophioglossum pusillum (vascular plant)	Oregon, Washington, California, Idaho +	Dune deflation plains; marsh edges; vernal ponds and stream terraces in moist meadows	No/No	Low; outside known range, habitat marginal
Penstemon peckii (vascular plant)	Central Oregon east Cascades	PP openings, open PP forests; rine/mixed conifer openings; recovering fluvial surfaces	No/Yes	Low; outside known range
Pilularia americana (vascular plant)	Oregon, California +	Alkali and other shallow vernal pools, not recently used stock ponds, reservoir shores	No/No	Low; outside known range, habitat marginal
Ramaria amyloidea (fungus)	Oregon, Washington, California	Mycorrhizal with true firs, Douglas fir, and western hemlock in humus or soil.	No/Yes	Low; habitat marginal
Rhizomnium nudum (bryophyte)	Oregon, Washington +	Moss found in moist coniferous forests. On DNF associates include lodgepole pine, Engelmann spruce, mountain hemlock, and western white pine	No/Yes	Low; habitat marginal
Rorippa columbiae (vascular plant)	Oregon, California, Washington	Wet to vernally moist sites in meadows, fields, playas, lakeshores, intermittent stream beds, banks of perennial streams, along irrigation ditches, river bars and deltas	No/Yes	Low; habitat marginal
Scheuchzeria palustris var. *americana* (vascular plant)	Oregon, Washington, California, Idaho +	Open to canopied bogs, fens, and other wetlands where often in shallow water	No/Yes	Low; habitat marginal

Table 89: Plant Prefield Review				
R6 Sensitive Plant Species Documented or Suspected on the Deschutes National Forest	**Range**	**Local Habitat**	**Occupied Habitat in Planning Area?/On Forest?**	**Probability of Occurrence in Project Area**
Schistostega pennata (bryophyte)	Oregon, Washington, circumboreal	Mineral soil in crevices on lower and more sheltered parts of root wads of fallen trees near streams or other wet areas	No/Yes	Low; habitat marginal
Scirpus subterminalis (vascular plant)	Oregon, Washington, California, Idaho +	Generally submerged to emergent in quiet water 2-8 decimeters deep, in peatlands, sedge fens, creeks, ditches, ponds and lakes	No/Yes	Low; habitat marginal
Scouleria marginata (bryophyte)	Pacific Northwest endemic; Oregon, Washington, Idaho, northern California, southwestern British Columbia	Exposed or shaded rocks in streams; seasonally submerged or emergent	No/No	Low; habitat marginal
Thelypodium howellii var. *howellii* (vascular plant)	Oregon East Cascades, Washington, California	No recent collections; closest TNC sites are Paulina Marsh, Tumalo State Park, Camp Polk, and Big Summit Prairie	No/No	Low; habitat marginal

ENVIRONMENTAL CONSEQUENCES

Table 90 summarizes the effects determination for sensitive plant species within the Kelsey planning area.

Table 90: Summary of Conclusions of Effects for Sensitive Plant Species			
Species	**Alternative 1 (No Action)**	**Alternative 2 (Proposed Action)**	**Alternative 3**
Agoseris elata	NI[36]	NI	NI
Arabis suffrutscens var horizontalis	NI	NI	NI
Arnica viscosa	NI	NI	NI
Artemisia ludoviciana ssp estesii	NI	NI	NI
Aster gormanii	NI	NI	NI
Astragalus peckii	NI	NI	NI
Botrychium pumicola	NI	NI	NI
Calamagrostis breweri	NI	NI	NI
Calochortus longebarbatus var. longebarbatus	NI	NI	NI
Carex hystericina	NI	NI	NI
Carex livida	NI	NI	NI
Castilleja chlorotica	NI	NI	NI
Cicuta bulbifera	NI	NI	NI
Collomia mazama	NI	NI	NI
Dermatocarpon luridum	NI	NI	NI
Gentiana newberryi var.newberryi	NI	NI	NI
Leptogium cyanescens	NI	NI	NI
Lobelia dortmanna	NI	NI	NI

[36] **NI** = No Impact

Table 90: Summary of Conclusions of Effects for Sensitive Plant Species			
Species	**Alternative 1 (No Action)**	**Alternative 2 (Proposed Action)**	**Alternative 3**
Lycopodiella inundata	NI	NI	NI
Lycopodium complanatum	NI	NI	NI
Ophioglossum pusillum	NI	NI	NI
Penstemon peckii	NI	NI	NI
Pilularia americana	NI	NI	NI
Ramaria amyloidea	NI	NI	NI
Rhizomnium nudum	NI	NI	NI
Rorippa columbiae	NI	NI	NI
Scheuchzeria palustris var. americana	NI	NI	NI
Schistostega pennata	NI	NI	NI
Scirpus subterminalis	NI	NI	NI
Scouleria marginata	NI	NI	NI
Thelypodium howellii ssp howellii	NI	NI	NI

Effects Common to All Alternatives

Direct and Indirect Effects: No plant species that are on the Region 6 Forester's Sensitive Plant List (July 2004) were found during surveys. Sites for two sensitive plant species, *Estes artemisia* and green-tinged paintbrush, have been documented near the planning area. The activities proposed in the alternatives in the Kelsey Vegetation and Fuels Treatments Project will not have direct or indirect effects to habitat, sites, cause a loss of viability or a trend toward Federal listing for *Artemisia ludoviciana* var. *estesii* or for Green–tinged paintbrush *(Castilleja chlorotica).* No known habitat for Threatened or Endangered plant species exists within the planning area. Table 89, page 3-202 displays plant species that are on the Region 6 Forester's Sensitive Plant List suspected or documented to occur on the Deschutes National Forest.

Cumulative Effects: Sensitive plant sites or suitable habitats were not found to occur in or near past, ongoing, or reasonably foreseeable future activities in the Kelsey Project Area. There would be no known cumulative impacts to any species on the Region 6 Forester's Sensitive Plant List.

BOTANY

INVASIVE PLANTS

SUMMARY OF FINDINGS

There is a HIGH risk of introduction and spread of invasive plants for all alternatives. This analysis compared the relative risk between alternatives based on the amount of disturbed ground associated with proposed treatments and the potential for high intensity wildfires. The relative risk ratings for the introduction and spread of invasive plants within the project area would result from, from lowest to highest, implementation of Alternative 1 (No Action), Alternative 2 (Proposed Action), and Alternative 3. Higher numbers of acres proposed in each alternative for commercial and non-commercial thinning, fuels reduction treatments, replanting, and sub-soiling would increase the risk of introducing or spreading invasive plants. Higher risk would be associated with higher numbers of miles of temporary road construction. Mitigations and Project Design Features would reduce the risk of the introduction and spread of invasive plants caused by project activities, including decommissioning and closing roads.

INTRODUCTION

The Botany Invasive Plant Report for the Kelsey Project is located in Appendix K of the Project Record and is incorporated by reference.

The consequences of noxious weed infestation can include alteration of the structure, organization, or function of ecological systems (Olson, 1999). Invasive plants can increase soil erosion, leading to a disproportionate loss of biologically active organic matter and nitrogen. Invasive plants have the ability to deplete nutrients and water in the soil to levels lower than native plant species can tolerate, allowing invasive plants to out-compete native vegetation. Many invasive plants are early successional species, meaning they colonize areas that have been recently disturbed. Since invasive plants have the ability to deplete available resources to lower levels than native vegetation can tolerate, they can quickly dominate disturbed sites. When invasive plants dominate native plant communities, native plant species diversity is decreased. Invasive plants can out-compete native species because they produce abundant seed, have fast growth rates, have no natural enemies, and are often avoided by large herbivores. Some invasive plants also produce secondary compounds, which can be toxic to native plant species or animals. Weed infestation can therefore lead to a decrease in native plant species, which can alter the ability of wildlife to find suitable edible forage.

At the watershed level, invasive plants can alter the seasonal water flow. Invasive plants create more erosion than native vegetation because they have fewer shallow roots, which would soak up and hold water. Invasive plants also have less canopy cover than native plants, increasing the amount of sunlight in direct contact with the soil and increasing the amount of water evaporated from the soil surface. This can create a hard crust on the soil, making it more difficult for additional moisture to penetrate. Soil surface run-off is increased when moisture cannot penetrate into the soil. The moisture held by the soil helps maintain stream levels throughout the summer. When invasive plants are present, there is an increase in erosion and surface run-off, leading to deterioration in watershed conditions.

An Invasive Plant Report was prepared (2005) by the project Botanist to assess the risk of the introduction and spread of invasive plant species. This includes the introduction and spread of invasive plants as a result of activities proposed in the Kelsey Vegetation Management Project.

MANAGEMENT DIRECTION

National Direction

The National Forest Management Act (1976) specifies that National Forest System lands "provide for a diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." The implementing regulations (36 CFR 219.26) for the National Forest Management Act states that "forest planning shall provide for diversity of plant and animal communities and tree species consistent with the overall multiple-use objectives." In addition, 36 CFR 219.27 (g) states that "management prescriptions shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which would be expected in a natural forest…reductions in diversity of plant and animal species from that which would be expected in a natural forest, … may be prescribed only where needed to meet multiple-use objectives. Planned type conversions shall be justified by an analysis showing biological, economic, social, and environmental design consequences, and the relation of such conversions to the process of natural change."

The Noxious Weed Management Act (1974) contains provisions to prevent the dissemination of invasive plants. Other provisions in the act authorize the cooperation of Federal agencies with agencies of State, districts, farmers' associations and similar organizations or individuals in carrying out operations or measures to eradicate, suppress, control or retard the spread of any noxious weed. In addition, 36 CFR 222.8 acknowledges the Agencies' obligations to work cooperatively in identifying noxious weed problems and developing control programs in areas where National Forest System lands are located.

Executive Order 13112 implemented on February 3, 1999 requires federal agencies to use relevant programs and authorities to prevent the introduction of invasive species and not authorize or carry out actions that are likely to cause the introduction or spread of invasive species unless the agency has determined, and made public, documentation that shows that the benefits of such actions clearly outweigh the potential harm, and all feasible and prudent measures to minimize risk of harm will need to be taken in conjunction with the actions. The USDA Forest Service ***Guide* to Noxious Weed Prevention Practices** (July, 2001) supports implementation of Executive Order 13112 on Invasive Species.

Regional Direction

Region 6 of the Forest Service has prepared an Invasive Species Environmental Impact Statement. The Final EIS and Record of Decision was released in June 2005 and the ROD was signed in October 2005. The DNF is in the process of preparing an Environmental Impact Statement for Invasive Plants on the Deschutes and Ochoco National Forests. It is expected that this will be completed in 2006. The Deschutes and Ochoco Invasive Plant EIS will be tiered to Regional Invasive Plant EIS and will provide site-specific analyses.

Forest Direction

The Forest Plan (1990) does not contain specific direction for noxious weed management. Standard FH-8, page 4-37, states that herbicides would be used in conjunction with the Mediated Agreement (1992) and Record of Decisions (1988) for the Final Environmental Impact Statement (Region 6 Vegetation Management FEIS) for Managing Competing and Unwanted Vegetation. Other sections of the Forest Plan make indirect references to maintaining habitat for wildlife species that are dependent on plant communities and habitat.

In 1998, the Deschutes National Forest Noxious Weed Control Environmental Assessment (DNF Weed EA) with its supplemental Deschutes National Forest Integrated Weed Management Plan (IWMP) was completed in accordance with the Regional Vegetation Management FEIS. The Decision Notice from the DNF Weed EA selected an alternative that allows a variety of noxious weed treatments, including herbicides (USDA Forest Service 1998).

The DNF Weed EA and IWMP identify and promote actions within the noxious weed management strategies of prevention, early treatment, maintenance, and awareness. Implementation of management strategies include analyzing the risk of noxious weed invasion during the project planning process and developing tactics to avoid introduction or spread of invasive plants, clean equipment provisions in contracts, actions to prevent weed introduction and spread, and suggestions for increasing awareness, both within the Forest Service and with the public, of invasive plants and the risks they pose.

Since 1994, gathering of site location and size for all known noxious weed sites has been undertaken. This information has been put into GIS and has been updated on an annual basis. Under the authority of the DNF Weed EA, invasive plants have been treated in the Kelsey Planning Area starting in 1999 using various methods, including herbicide treatments, under contract with Oregon Department of Agriculture.

EXISTING CONDITION

The Forest Service manages all lands within the Kelsey Vegetation Management analysis area except for 570 acres of private land within the Newberry National Volcanic Monument. Currently, weed infestations in the project area are relatively high. Treatments authorized by the 1998 Deschutes National Forest (DNF) Noxious Weed EA have been implemented annually on weed sites in and adjacent to the Kelsey Project analysis area. Chemical treatments at authorized locations have been contracted with Oregon Department of Agriculture annually since 2000. With continuing treatment, the weeds and the amounts of herbicides used to treat the weeds in the Highway 97 corridor and other roads in the Kelsey Project Area have been greatly reduced. In 2000, approximately 83 net acres of spotted and diffuse knapweeds and Dalmatian toadflax were treated with herbicides in and adjacent to the Kelsey Project Area. In 2003, approximately 5.5 net acres were treated with dicamba applied at a rate of approximately 16 ounces per acre, with a handgun sprayer targeting the individual weed plants. From 2000 to 2003 there was approximately an 80 percent reduction in the net acres treated for invasive plants with a decrease of approximately 88 percent in the amounts of herbicide used.

The 18 Fire, which occurred in 2003, created prime habitat for invasive plants. In 2004, the area of the 18 Fire was inventoried for weed invasions. Weed infestations that were found were treated manually and, where authorized in the 1998 Deschutes National Forest Noxious Weed EA along Forest Road 18, were treated with herbicides (Dicamba) on less than one acre, applied at the rate of 32 ounces per acre.

After reviewing the Deschutes National Forest GIS weed layer and past survey records for areas in the Kelsey Vegetation Management Project area, it was determined there are 13 weed sites with 6 different species of invasive plants covering approximately 90 acres within and adjacent to the Kelsey project area.

Spotted knapweed: Spotted knapweed (*Centaurea maculosa*) is a biennial or short-lived perennial composite with a stout taproot (Mauer and Russo, 1991). This species reproduces by seeds, which are dispersed by wind, passing animals, or humans. The competitive superiority of this species suggests pre-adaptation to disturbance (Roche et al, 1986 in Mauer and Russo, 1991). The initial invasion of spotted knapweed, like other invasive plants, is correlated highly to disturbed areas. Once a plant or colony is established though, it may invade areas that are relatively undisturbed or in good condition (Tyser and Key, 1988 and Lacey et al, in Mauer and Russo, 1991). Monitoring has shown that the spotted knapweed sites on the Deschutes National Forest have decreased in size and numbers of plants due to treatments with herbicides combined with manual treatments.

Diffuse knapweed: Diffuse knapweed (*Centaurea diffusa*) is a highly competitive herb in the sunflower family (Asteraceae). The plants first form low rosettes and may remain in this form for one to several years. After they reach a threshold size they will bolt, flower, set seed, then die. Thus they may behave as annuals, biennials, or short-lived perennials (Carpenter and Murray, 1998a). Diffuse knapweed is a highly competitive and aggressive plant that forms dense colonies (Zimmerman, 1997 in Carpenter and Murray, 1998a). It is especially adept at spreading along rights-of-way and can spread rapidly (Allred and Lee, 1996 in Carpenter and Murray, 1998a). Disturbed lands are prime candidates for colonization, but diffuse knapweed will also invade undisturbed grasslands, shrublands, and riparian communities (Zimmerman, 1997 in Carpenter and Murray, 1998a).

Dalmatian toadflax: Dalmatian toadflax (*Linaria dalmatica*) is a perennial herb in the figwort family (Scrophulariaceae). This species is classified as a weed in Europe, Russia, Canada, and the United States, and is common throughout North America (Carpenter and Murray, 1998b). A toadflax plant has from 1 to 25 vertical, floral stems. These floral stems have thick-walled, woody xylem and supporting fibers. Flowers are bright yellow and resemble snapdragons. The taproot may penetrate a meter into the soil. Horizontal roots may grow to be several meters long, and can develop adventitious buds that may form independent plants (Carpenter and Murray, 1998b).

Dalmatian toadflax is a persistent, aggressive invader and is capable of forming colonies through adventitious buds from creeping root systems. These colonies can push out native grasses and other perennials, thereby altering the species composition of natural communities. In North America, Dalmatian toadflax is considered a strong competitor. It is quick to colonize open sites, and is capable of adapting to a wide range of environmental conditions (Carpenter and Murray, 1998b).

In North America, *Linaria dalmatica* primarily occurs on sandy or gravelly soil on roadsides, railroads, pastures, cultivated fields, range lands, and clearcuts (Saner *et al*., 1995 in Carpenter and Murray, 1998b). Dalmatian toadflax is considered a strong competitor, reproduces by seed and vegetative propagation, and once established, high seed production and the ability for vegetative reproduction allow for rapid spread and high persistence (Saner *et al*., 1995 in Carpenter and Murray, 1998b). Dalmatian toadflax can adapt its growth to fit a range of habitats, and has a tolerance for low temperatures and coarse textured soils (Carpenter and Murray, 1998b).

Bull thistle: Bull thistle (*Cirsium vulgare*) is a biennial with a fleshy taproot. It reproduces solely from seeds that are dispersed by water, animals, and human activities. Disturbed areas are prime habitat for bull thistle to invade (Beck, 1999). On the Deschutes National Forest, bull thistle has been sighted, but has not proven to be an aggressive noxious weed. When it occurs on a disturbed site, it seems to decrease and disappear when native vegetation regains its pre-disturbance levels. In areas that are continually disturbed, such as roadsides, bull thistle may invade and persist if not controlled. Due to a combination of limited funds and noxious weed species of higher priority, bull thistle has not been actively treated on the Deschutes National Forest.

Russian thistle: Russian thistle (*Salsola kali*) is a summer annual that reproduces by seed. When the plant is mature it breaks off at the ground forming "tumbleweeds" that are tossed by the wind, scattering seeds. A single plant can produce 100,000 to 200,000 seeds. Seeds are dormant over winter allowing the seed to germinate in spring over a wide range of temperatures and with very little moisture, generally in late March or early April. Seed viability is short and rapidly declines after two years in the soil. A large, spreading root system enables plenty of shoot growth with little moisture (Morisawa, 1999). Considered very invasive, Russian thistle competes with native species and is found in disturbed areas such as roadsides, trails, abandoned fields, along streams and lakes, and overgrazed ranges and pastures (Morisawa, 1999).

Scotch thistle: Scotch thistle (*Onopordum acanthium*) is a branched, robust biennial that grows up to 10 feet or more in height and 6 feet in width. Stems have vertical rows of prominent, spiny, ribbon-like leaf material or "wings". Leaves can be large and are armed with sharp, yellow spines. Upper and lower leaf surfaces are covered with a thick mat of cotton-like or woolly hairs, which give the foliage a gray-green appearance. (issg Database, http://www.issg.org/database/species/ecology, 2005). The site on Highway 97 near the junction with North Paulina Road (Forest Road 9710) was manually treated and is now considered eradicated.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: Alternative 1 would leave the planning area in its present condition. Without additional ground-disturbing activities occurring, noxious weed habitat and the potential for new introductions would not change from the existing condition. Noxious weed treatments would continue to occur under authority of the 1998 DNF Weed EA.

Stand densities and fuel accumulations are predicted to be the highest for Alternative 1 because no activities are proposed in this alternative that would reduce stand densities and fuels. More than one-third of the planning area is classified as high or extreme for wildfire behavior potential based on current vegetation and fuel loadings (see Table 22, page 3-7 in the Fire and Fuels section).

Roads would be left in their current condition. No roads would be closed or obliterated. Closing would assist in preventing noxious weed spread. Decommissioning would create weed habitat within a portion of a Forest roadbed in the short-term but would also decrease the risk for spread of weed seeds in the long-term.

Because of the lack of additional ground disturbance, Alternative 1 has the lowest probability of spreading or introducing invasive plants when compared to Alternatives 2 and 3. However, the probability of the introduction and spread of invasive plants will still be considered HIGH, given that the area is prime for the invasion and spread of invasive plants due to Highway 97, Forest Service roads, recreation sites and activities, grazing allotments, OHV and user created trails, and the potential of high-intensity wildfire.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: Reducing the ground fuel accumulation, stand densities, and ladder fuels would reduce the potential for high-intensity fires in the future. For Alternative 2, fewer acres (approximately 1,175) of natural fuels and vegetation treatments would occur than in Alternative 3 (Table 91, page 3-215). Alternative 2 would not reduce the threat of future high-severity fires as efficiently as Alternative 3. Active management would occur on approximately 22 percent of the project area acreage. In the short-term, natural fuels treatments, vegetation treatments, and activities fuels treatments would create ground disturbance, reduce stand densities and ground cover, increasing habitat for invasive plants. In the long-term, reducing the probability of future high-intensity fires would decrease the probability of creating additional noxious weed habitat.

This alternative proposes the development of approximately 6.5 miles (16 acres) of temporary roads to access units proposed for treatment. Roads from previous Forest management activities would be used whenever possible. When activities accessed by the temporary roads are completed, these roads would be closed and rehabilitated. In the short-term, construction of new temporary roads would create additional noxious weed habitat. Use of these roads by vehicles and equipment would increase the likelihood of the introduction and spread of invasive plants. When these roads are eventually closed or decommissioned, noxious weed habitat and corridors for dispersal would be eliminated.

Alternative 3

Direct and Indirect Effects: Reducing the ground fuel accumulation, stand densities, and ladder fuels would reduce the potential for high- intensity fires in the future. For Alternative 3, more acres of natural fuels and vegetation treatments would occur than in Alternative 2 (Table 91, page 3-215). Therefore, Alternative 3 would reduce the threat of future high-severity fires more efficiently than Alternative 2. Active management would occur on approximately 25 percent if the Kelsey project area acreage. In the short-term, natural fuels treatments, vegetation treatments, and activities fuels treatments would create ground disturbance, reduce stand densities and ground cover, increasing habitat for invasive plants. In the long-term, reducing the probability of future high- intensity fires would decrease the probability of creating additional noxious weed habitat.

This alternative proposes the development of approximately 7.0 miles (17 acres) of temporary roads to access units proposed for treatment. Roads from previous Forest management activities would be used whenever possible. When activities accessed by the temporary roads are completed, these roads would be closed and rehabilitated. In the short-term, construction of new temporary roads would create additional noxious weed habitat. Use of these roads by vehicles and equipment would increase the likelihood of the introduction and spread of invasive plants. When these roads are eventually closed or decommissioned, noxious weed habitat and corridors for dispersal would be eliminated.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: In the long-term, noxious weed introduction, including the potential introduction of new weed species, and spread may occur in the planning area, regardless of which alternative is selected. Wind, water, vehicles, humans, and animals readily disperse weed seeds. Suitable habitat occurs along all travel ways within the project area. In addition, recreation activities in the project area and ground-disturbing activities along the highways and on adjacent lands will increase the risk of weed spread in the area.

In the short-term, the action alternatives would affect the potential for noxious weed infestation in the project area in two main ways. First, ground-disturbing treatment activities, such as harvest activities, fuels reduction activities, and temporary road construction, would increase the amount of open disturbed habitat available for infestation. Second, increased activity and traffic would heighten the chance for introduction of noxious weed seeds and propagules from vehicles, equipment, and personnel. The potential for noxious weed infestation would therefore increase with the amount of ground-disturbing activity proposed in each alternative.

In the long-term, the alternatives would affect the recovery of native vegetation and the reduction of open, disturbed habitat over time. Reforestation and re-establishment of tree canopy and native vegetation would reduce the amount of open, disturbed habitat suitable for noxious weed establishment. Proposed road closures (42.0 miles, 101 acres) and road decommissioning (7.7 miles, 19 acres)) are the same for both Alternative 2 and Alternative 3. Lowering open road density would reduce disturbed habitat and, therefore, corridors for weed introduction and spread. The potential exists for future high intensity fires, which would create additional area at risk to weed infestation. This risk decreases as the amount of fuel reduction activities increases.

The types of ground-disturbing activities that are proposed for both action alternatives are the same. Fuels treatment only is proposed in areas where thinning is not necessary at this time and where the goal is to reduce natural fuels to an acceptable level where an uncharacteristic, high intensity wildfire is less likely to occur or would not likely pose a risk to private lands. Natural fuels treatments include mechanical shrub treatments (mowing), underburning, and no natural fuels treatments in various combinations and sequences.

Botany mitigations and Implementation Guidelines, including prevention measures, such as: equipment cleaning provisions in contracts; ensuring that all Forest Service vehicles and equipment are cleaned before entering the project area; and cleaning equipment and vehicles when working in weed-infested areas before moving to uninfested areas. Along with early detection and treatment, these prevention measures would be used to help offset the risk of weed introduction and spread in the project area.

Cumulative Effects: Activities proposed in the Kelsey Project would not significantly increase the likelihood of invasive plant introduction and spread when considered along with other past, present, and foreseeable future project activities in the Kelsey planning area. Past and ongoing actions have contributed to ground disturbance in the Kelsey Project Area, increasing the risk of establishment by invasive plants. Weed risk assessments have been required for projects since the mid 1990s. If the risk of the introduction and spread of invasive plants is determined to be high or moderate, actions to reduce the risk are required during project implementation. Since 1998, the Integrated Weed Management Plan in the Deschutes National Forest Weed EA, along with the national *Guide to Noxious Weed Prevention Practices* in 2001, have been sources of Project Design Features, mitigations and recommendations used to reduce the risk of the introduction and spread of invasive plants for all projects.

All foreseeable future projects will include noxious weed risk assessments and project design features to reduce the risk of the introduction and spread of invasive plants.

Past activities in and near the Kelsey project area that could affect the habitat or spread of invasive plants include Lava Lands Visitor Center Fuels Reduction, Oregon Department of Transportation Weigh and Safety Station along Highway 97, and the 18 Fire Hazard Tree Removal and 18 Fire Salvage. Ground disturbance was associated with each project, which are all located in easily and well used travel areas, increasing the potential for seed habitat and germination

Noxious weed inventory and treatment has occurred on the Deschutes National Forest with accurate documentation of noxious weed sites beginning in the early 1990s. With approval of the Deschutes National Forest Noxious Weed Control Environmental Assessment in 1998, treatment with herbicides was permitted on selected sites, including sections of Highway 97, Cottonwood Road and South Century Drive accessing Sunriver, and the 18 Road in the Kelsey project area. In 2003 (the most recent records available), treatment of invasive plants has occurred on approximately 5.5 acres along these roads within the Kelsey project area, using dicamba applied at the rate of approximately 32 ounces per acre. Treatments have reduced the overall density, spread, and survival of invasive plants in the project area.

Grazing allotments within the planning area were active until approximately 1990. Grazing has been reauthorized on three allotments within and adjacent to the project area in the Cinder Hill Range Allotment Environmental Assessment, 2004. Livestock grazing has been shown to be a major factor in increasing the vulnerability of plant communities to weed invasion (Belsky and Gelbard, 2000). Livestock contribute to alien weed invasions by: (1) acting as vector for seed dispersal; (2) preferring native plant species over weed species; (3) creating patches of bare, disturbed soils that act as weed seedbeds; (4) destroying microbiotic crusts that stabilize soils and inhibit weed seed germination; (5) creating nitrogen-rich soils, which favor nitrogen-loving weed species; (6) reducing soil mycorrhizae favored by most native plant species; and (7) accelerating soil erosion that buries weed seeds and facilitates their germination (Belsky and Gelbard, 2000). Goats trained to graze on specific weeds, such as spotted knapweed, have been shown to be effective in reducing seed production and plant vigor (Williams, 2003 and Lamming, 2001).

Present projects include the Fuzzy Vegetation Management EA (2000) with activities similar to Kelsey continuing to be implemented through 2010. The activities that are along the western boundary of Fuzzy (Forest road 1810) are adjacent to the eastern boundary of the Kelsey planning area. Approximately 300 acres of Fuzzy were burned during the 18 Fire. Following the fire, Russian thistle infested several acres and is presently being treated through hand pulling. Thinning and fuels reduction treatments have also occurred along the boundary, providing areas of soil disturbance with no new sites of invasive plants being identified.

Foreseeable activities include Lava Cast Vegetation Management (2006, adjacent to southern boundary of Kelsey), Tumbull Vegetation Management (2006, west side of the Deschutes River, western boundary of Kelsey), and Opine Vegetation Management (2007, adjacent to the Fuzzy planning area, approximately 7 miles south and east of Kelsey). These projects would include prescribed burning, mechanical shrub treatment, non-commercial thinning, commercial harvest, and other associated activities. Lava Cast and Opine have a considerable amount of OHV use. The East Fort Rock OHV area is accessible by OHVs that also use the Kelsey planning area. All of the planning areas will likely have proposed road closures.

A Forest wide access management project is likely to occur that would focus on motorized recreation including: 1) development of a designated OHV trail system and play areas and 2) Forest road access. Prior analysis identified approximately 30 to 50 miles of designated trails that would be likely within the planning area. Trails would be designated on some closed roads; decommissioned roads that are converted to other uses; and new trail development. A play area would be designated at Luna Bess Quarry. Project initiation is unknown at this time, but is expected in the reasonably foreseeable future. The development of new trails would provide access that could disperse invasive plant seeds to new areas and provide a seed bed for seed germination. Potential use from a designated OHV play and staging area and trail system within the planning area would substantially increase the likelihood that new populations of invasive plants would be introduced and existing populations would spread.

Projects along the Highway 97 corridor in the Kelsey project area include:

South Century Drive Interchange: an interchange will be constructed at the intersection of Highway 97 and South Century Drive (Forest road 40). Two bridges will be constructed on Highway 97 to carry traffic over South Century Drive. Approximately 100 feet will separate the north and southbound bridges. Entry and exit ramps would allow access from Highway 97 to South Century

Drive and Forest road 9720. Approximately 35.5 acres of forestland will be converted to highway and interchange right-of-way. Construction is scheduled for summer 2006.

Highway 97 from Lava Butte to Wickiup Junction, Unit 1: Highway 97 will be increased from two lanes to four lanes. The first phase will be between the Lava Lands Visitor Center and the South Century Drive Interchange. The length of this segment is approximately 4.2 miles with no current estimate of the acreage of the additional right-of-way. Construction is likely to begin Spring 2007.

Cottonwood Road Extension: a two-lane forest road will be constructed (approximately 0.25 miles, approximately 1.5 acres) that will connect the east side of Cottonwood Interchange with Forest road 9721300. Forest road 9721300 will be upgraded to the south and provide temporary public access to Forest road 9720 during construction of the interchange at Highway 97 and South Century Drive (Forest road 40). The temporary development and use of this road will create a seedbed for and potential spread of invasive plants. Monitoring for and control of invasive plants would likely reduce the risk of establishment.

The present access to Lava River Cave from Highway 97 is proposed to be closed. The Cottonwood Road Extension would provide access to Lava River Cave, to the north, via Forest road 9721300. Forest road 9721300 would be upgraded for approximately 0.8 miles. Motorized travel would increase on Forest road 9721300 and could increase the spread of invasive plants. This road was originally the old Highway 97. Paving this portion of the road would decrease the amount of habitat available for noxious weed establishment but the disturbed areas immediately adjacent to the road would become viable habitat.

Access to Lava Lands Visitor Center from Highway 97 is likely to be changed. An access road is one possibility to be developed from Cottonwood Road to Benham Falls Road. The development of any road would create a seedbed for and potential spread of invasive plants.

RISK ASSESSMENT

The risk of the introduction and spread of invasive plants will be HIGH for all the alternatives due to major travel ways, management activities, the potential for high-intensity wildfires, and recreational use in the area. The relative risk ratings for the introduction and spread of invasive plants from lowest to highest are Alternative 1, Alternative 2, and Alternative 3. The assessment of the risk of the introduction and spread of invasive plants associated with activities proposed in the alternatives is based on the amount of ground disturbance that would occur for each alternative. Commercial harvest, non-commercial thinning, fuels reduction treatments, replanting, and sub-soiling would increase the risk of introducing or spreading invasive plants, increasing with each alternative because of the increase in proposed acreage. Higher risk would be associated with higher numbers of miles of temporary road construction. The risk of the introduction and spread of invasive plants would be reduced by closing or decommissioning roads. Table 91 displays the acreages or miles associated with the proposed activities in each alternative.

Table 91: Comparison of Relative Risk from Invasive Plants by Alternative

Action	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Relative Short-Term Risk	**3 (Lowest)**	**2**	**1 (Highest)**
Fuels Treatment Only (Acres)	0	3,935	4,495
With Non-commercial thinning and/or Pruning	0	745	730
Subtotal	**0**	**4,680**	**5,225**
Vegetation and Fuels (Acres)	0	2,220	2,540
Plus non-commercial thinning, and/or pruning	0	1,885	1,755
*With replant**	*0*	*210*	*110*
With sub-soiling	*0*	*670*	*405*

Table 91: Comparison of Relative Risk from Invasive Plants by Alternative			
Action	**Alternative 1 (No Action)**	**Alternative 2 (Proposed Action)**	**Alternative 3**
Subtotal	**0**	**4,105**	**4,295**
Vegetation Treatment Only (Acres)	0	430	760
Plus non-commercial thinning and/or pruning	0	45	265
With sub-soiling	*0*	*15*	*15*
Subtotal	**0**	**575**	**1,025**
Total Treatment Acres	**0**	**9,360**	**10,545**
Temporary Roads (Miles – Acres)	0	6.5 – 16	7.0 – 17

* Italicized actions and acres are within units that have been previously accounted for in proposed acres.

Alternative 3 poses the highest risk for noxious weed introduction and spread based on the greater number of acres proposed for treatments, which will cause more negative impacts to the soils.

Alternative 2 poses the next highest risk for the introduction and spread of invasive plants based on fewer acres being proposed for treatments than Alternative 3.

Alternative 1 (No Action) has the lowest probability of spreading or introducing invasive plants when compared to Alternatives 2 and 3 because of the lack of additional ground disturbance. The probability of the introduction and spread of invasive plants is still be considered HIGH, because this area is prime for the invasion and spread of invasive plants due to the major highways, Forest Service roads, recreation sites and activities, grazing allotments, and OHV user created trails in the Kelsey planning area.

MONITORING

The Kelsey Project area will be monitored (DEIS, Monitoring, Botany, page 2-52) to determine introduction, spread, and the effectiveness of ongoing treatments for invasive plants, regardless of which alternative is chosen. With the noxious weed treatment authorized by 1998 Deschutes National Forest Noxious Weed Environmental Assessment (DNF Weed EA), noxious weed sites in the project area will be treated in accordance with available funding.

SCENIC

INTRODUCTION

"Scenic attractiveness is the primary indicator of the intrinsic scenic beauty of a landscape and the positive responses it evokes in people. It helps determine landscapes that are important for scenic beauty, based on commonly held perceptions of the beauty of landform, vegetation pattern, composition, surface water characteristics, land use patterns, and cultural features" (*Landscape Aesthetics: A handbook for Scenery Management,* USDA, 1995*)*. Scenic attractiveness is ordinarily very stable. However, in rare circumstances, scenic attractiveness may change because of natural disasters or human alteration of the landscape. Change may increase the potential for a "typical or common" landscape to become "distinctive" (*Scenery Management System Handbook,* USDA, 1995).

Along scenic corridors, such as Highway 97 and secondary travel routes, natural disturbances such as past wildfires, insect and disease infestation, and wind damage are evident. As a result, a mosaic of disturbed forest conditions characterizes the Kelsey DEIS project area.

MANAGEMENT DIRECTION

The following are standards and guidelines from the 1990 Deschutes National Forest Land and Resource Management Plan as amended by the 1994 Northwest Forest Plan. The Standards and Guidelines for the Northwest Forest Plan shall take precedence except in cases where the Deschutes National Forest Plan is more restrictive or provides greater benefits to Late-Successional forest-related species (1994 ROD, page 8).

The Forest Service implementing regulations establish a variety of Scenic Quality Standards for scenic views. These include:

Retention (Natural-appearing landscape with high scenic integrity level);
Partial Retention (Slightly altered landscape with medium scenic integrity level);
Modification (Altered landscape with low scenic integrity level within the foreground as well as in the middleground landscape).

For the purposes of this analysis, the existing Forest Plan direction on scenic quality will be used. However, whenever possible, Scenic Integrity Objectives will also be displayed and discussed. Further direction regarding scenery management is found in Forest Service Manual 2380 (Landscape Management).

The Deschutes National Forest Plan allocates approximately 40 percent **(**18,220 acres) of the project area to Scenic Views **(**Table 92**)**. Newberry National Volcanic Monument and the Upper Deschutes Wild and Scenic River (designated scenic) are included within this allocation. The remaining portions of Scenic Views (10,120 acres) are within the Foreground (Retention – SV1 /Partial Retention – SV2,) and Middleground (Retention – SV3/Partial Retention – SV4) categories.

Table 92: Scenic Views Management Allocation for Kelsey Project Area

Management Allocation	Acres
Retention Foreground (SV-1)	2,725 acres
Partial Retention Foreground (SV-2)	2,835 acres
Retention Middleground (SV-3)	1,715 acres

Table 92: Scenic Views Management Allocation for Kelsey Project Area	
Management Allocation	**Acres**
Partial Retention Middleground (SV-4)	2,845 acres
Newberry National Volcanic Monument	7,620 acres
Deschutes River – Wild and Scenic (Scenic)	480 acres
Total	**18,220 acres**

There are two zones that fall within the project area as viewed by the visitor. Along the travel corridors, such as Highway 97 and County Road 40 (Retention Foreground), and Forest Roads 9720, 9710, and 9702 (Partial Retention Foreground) and the Deschutes River, trails, and developed recreation sites, foreground landscape extends one quarter mile on either side for a total of one-half mile corridor. The middle-ground landscape is the zone extending up to 5 miles beyond the foreground corridor.

DESIRED CONDITION

The landscape Character goal for this analysis area is to achieve a natural appearing landscape where management directions, the Desired Future Conditions, social and ecological framework of the management area is met.

Ponderosa pine in the Foreground (M9-4) will maintain or create a visual mosaic of numerous, large diameter, trees with stands of younger trees offering scenic diversity as seen from sensitive viewer locations, such as from a travel corridor. In the Middleground (M9-15), ponderosa pine will provide a strong textural element. Individual large trees with full crowns and immature stands that provide color constrast and provide replacement for large tree mortality are essential components in the landscape. Visible untimbered openings are desirable where the natural landscape contains similar openings, or where natural-appearing openings can provide additional diversity in the landscape where it is lacking.

Lodgepole pine in the Foreground (M9-51) will not have management emphasis to produce large diameter, older trees. Management will provide for healthier, fuller crowned, younger trees. In the Middleground (M9-64), lodgepole pine will provide a constant and often uniform texture and color. This id more important than individual trees and size of trees. The mosaic of relatively uniform textures created by maintaining tree canopy closure is an essential part in quality scenery. Natural appearing openings are desirable as long as their shape and size do not dominate the landscape with soil color contrasts.

Mixed conifer Middleground (M9-34) will be managed to maintain or create a mosaic of stands with essentially continuous tree canopies. Scenic diversity will be provided by natural-appearing openings that resemble those found within the natural landscape. Species and size class diversity is essential.

EXISTING CONDITION

High-density vegetation blocks views of areas with high natural scenic quality, particularly distant views and along designated scenic corridors, including the Deschutes River. Views of these areas are presently obscured or obstructed by stands of young growth ponderosa and lodgepole pine within foreground and middleground view areas, including Newberry National Volcanic Monument and the Upper Deschutes Wild and Scenic River.

Stands of trees, single species or mixed ponderosa and lodgepole pine, and diverse riparian species, provide strong line, textural and color patterns. Some stands provide occasional filtered-view openings that display cinder cones that provide unique form and structure although the density of vegetation limits views into the forest. A variety of forbs, shrubs, and grasses border the sides of the travel routes, including the Deschutes River.

Under the Visual Management System[37], noticeable deviations must blend with the landscape character being viewed over the long-term (5 years and beyond). Decades of fire suppression and other human activities have led to vegetative conditions that do not meet social expectations of the landscape character, such as the open, park-like ponderosa pine forest historically found within the area. The existing Scenic Integrity Level within the planning area has a low to medium rating, with both disturbed and undisturbed areas.

Other visually sensitive areas are Middleground Retention and Partial Retention Scenic Views, primarily cinder cones and buttes, including Lava Butte and Green Mountain. Some areas of Middleground views have stands of over stocked regeneration with large ponderosa. Facility developments, such as Lava Lands Visitor Center and urban interface developments deviate from the "natural appearing" landscape.

ENVIRONMENTAL CONSEQUENCES

Proposed action activities under Alternative 2 and 3 include: Mechanical shrub treatment, prescribed fire, non-commercial thinning and/or pruning, commercial harvest of wood fiber, reforestation, sub-soiling, and road closure.

Table 93 displays the total proposed activity acres within the Scenic Views allocation and other allocations within the Kelsey Vegetation Management project area.

Table 93: Planning Area Treatment Acres and Percent

Management Areas	Alternative 1 (No Action) Existing Condition	Alternative 2, (Proposed Action)	Alternatives 3
Scenic Views:			
a) SV1,SV2,SV3,SV4	10,135 Acres (22.0%)	2,970 Acres (29.3%)	3,725 Acres (36.8%)
b) Wild and Sceni River	480 Acres (01.0%)	65 Acres (13.5%)	115 Acres (24.0%)
c) NNVM	7,620 Acres (16.6%)	845 Acres (11.1%)	865 Acres (11.4%)
Other Allocations	27,755 Acres (60.4%)	5,450 (19.6%)	5,800 (20.9%)
Total	**45,990 Acres (100%)**	**9,330 Acres (20.3%)**	**10,505 Acres (22.8%)**

Alternative 1 (No Action)

Direct and Indirect Effects: The desired character of Central Oregon, with foreground views of lava flows and large ponderosa pine, would take longer to achieve without the proposed treatments to reduce stand density and fire risk in those areas of Scenic Views (MA-9). The entire acreage of Scenic

[37] The Forest Service has adopted a national policy for describing relative visual quality impacts and objectives. The visual descriptions in the new terminology replace the Visual Quality Objectives with descriptions of the relative scenic integrity of a piece of land. While exact comparisons have not been developed, "Retention" is roughly equivalent to "Very High or High" Scenic Integrity, while "Partial Retention" is roughly equivalent to "moderate" Scenic Integrity. Until a more comprehensive comparison of the elements of each system has been completed, the Forest Plan will not reflect amendments to these new descriptors.

Views would not be managed, altered or changed by management activity with the exception of wildfire suppression and normal routine stewardship activities. Scenic integrity and landscape character would remain essentially the same during the short-term duration (0 to 5 years), without disturbance, and could be adversely altered with uncharacteristic, high intensity wildfire or insect infestations through time (5 years and beyond). These events could cause high mortality of large ponderosa pine. The scenic resource would continue to be at high risk from natural disturbance regimes that would potentially lead to patch sizes larger than what historically occurred. Scenic Views located in areas of high intensity wildfire would take 40 to 80 years to reach conditions that are similar to present vegetative conditions following reforestation.

Views of large trees (greater than 21 inches dbh) and lava flows would continue to be impeded by dense vegetation. Small wildfires could increase sight distance and make lava flows and small buttes visible from travel corridors.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: Activities within the General Forest allocation would be more intensive while being consistent with visual objectives standards and guidelines of the Forest Plan. Scenic views would be enhanced. Proposed treatments would benefit long-term scenic quality, scenic integrity level, and landscape character. Proposed treatments within the foreground landscape of scenic corridors would create "filtered views" and open, park-like, late and old structure ponderosa pine stands. Treatments in dense stands would create natural appearing openings. The overall landscape character would draw attention to trees of variable ages and sizes. Views into the forested landscape would be created that would include lava flows and distant buttes. The visitor's experience would be enhanced along the travel corridors. There would be short-term, adverse effects to the scenic resource.

Alternative 3

Direct and Indirect Effects: Alternative 3 would move the scenic resource further toward desired future conditions. Approximately 1,220 additional acres would have vegetative and fuels treatments than Alternative 2 (Proposed Action), benefiting long-term scenic quality, scenic integrity, and landscape character. To be consistent with and address the intent of the Monument Plan, fewer acres (approximately 270) of mechanical fuels treatment would occur while increasing the use of prescribed fire. In the short-term, scenery in the Monument may be adversely affected by disturbance associated with stand treatment activities.

Forest Plan Consistency

Alternative 1 is not expected to meet the Desired Future Conditions for scenic views (MA-9) established under the Forest Plan directions. The present high tree density would not allow either foreground views into the forest or distant views in many locations. Activities within the General Forest allocation would be more intensive while being consistent with visual objectives.

Alternative 2 and Alternative 3 are expected to fully meet and be consistent with the Forest Plan directions for Scenic Views (MA-9) within the Kelsey DEIS project area. Both alternatives are expected to move the area closer toward the Desired Future Conditions, while specifically addressing other issues, such as Wildland Urban Interface, fuels build-up, wildlife habitat management, soil productivity, forest health, and scenic views.

CULTURAL RESOURCES

MANAGEMENT DIRECTION

Management direction for cultural resources is found in the Deschutes National Forest Land and Resource Management Plan, in the Forest Service Manual section 2360, the 2004 Programmatic Agreement between Region 6, Oregon State Historic Preservation Office (SHPO), and The Advisory Council On Historic Preservation. The Forest Plan directs the consideration of the effects to cultural resources for projects that fall within the Forest's jurisdiction. Further direction indicates that the Forest will determine what cultural resources are present on the forest, evaluate each resource for eligibility to the National Register of Historic Places (Register) and protect or mitigate effects to resources that are eligible.

The collection and analyzing of field data within specific project locations and with specified activities is an administrative and procedural process. The scale of analysis of potential effects for heritage resources, within the scope of this project, used the defined project analysis area. The gathered field data was analyzed to determine the potential to affect unevaluated heritage sites and evaluated historic properties. Mitigation measures to avoid or reduce these potential effects have been developed and monitoring criteria applied.

DESIRED CONDITION

The desired condition is not clearly stated in the Forest Plan. The implied goals of the Standards and Guides and the Monitoring Plan would be to know the location and extent of all cultural resources, have evaluated each one for eligibility to the Register, and have developed management plans for eligible properties that would provide protection or mitigate effects that would occur to the resource.

EXISTING CONDITION

The heritage resource is non-renewable and as sites are impacted over time from forest activities, they may pass a threshold of no longer being able to provide information that can help us understand how prehistoric or historic people used the area. The measure of impacts can be metric (square meters of surface or cubic meters of volume) leading to a qualitative measure of National Register eligibility. The scale of area is fairly discreet; the specific location of identified resources that have been determined eligible for the National Register of Historic Places or have not yet been evaluated for eligibility. The temporal scale is a less well defined. Each site location has been subject to impacts since the time it was first formed when past people used that location and left traces of their use behind. Many of these sites have temporal disturbance periods that run into the thousands of years. Records of specific projects, activities, or events that may have disturbed any specific site are available for the last 25 to 30 years. It is known that previous to Forest Service ownership, private use impacted much of the area through the removal trees through clearcutting over much of the planning area.

Twelve previous projects, between 1981 and 1997, conducted cultural resource surveys within the current analysis area. Of these, seven inventories were conducted to standards acceptable today and included surveys that covered approximately 4,000 acres. During the 12 previous surveys, a total of 54 cultural resource sites were recorded. An additional 1,000 acres were inventoried and an additional 22 cultural resource sites were located and recorded. Eleven (11) of the 76 recorded sites were determined eligible for the National Register of Historic Places, 11 were determined not eligible, and

54 are still unevaluated. Two (2) of these sites have both an historic and a prehistoric component, 16 are historic, and 58 are prehistoric. There are no known root or other vegetative gathering areas.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: Without implementation of proposed activities, disturbance to cultural sites would not occur. Vegetation would continue to conceal unknown sites and artifacts. The risk of a high intensity fire would continue. Wildfire could both reveal new cultural sites and damage new and previously recorded sites. Artifact hunters could potentially loot any revealed sites.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Alternative 2 (Proposed Action): Alternative 2 (Proposed Action) has ten (10) known cultural sites in areas proposed for commercial harvest, four (4) known sites in areas with proposed precommercial thinning, three (3) known sites where mechanical shrub treatments (mowing) would occur, three (3) known sites with both mowing and burning proposed, and eight (8) known sites within units proposed to be underburned.

Alternative 3: Alternative 3 has 11 known cultural sites in areas proposed for commercial harvest, four (4) known sites in areas with proposed non-commercial thinning, three (3) known sites where mowing would occur, four (4) known sites with both mowing and burning proposed, and eight (8) known sites within units proposed to be underburned.

Direct and Indirect Effects: Heavy equipment, log skidding, activity at landings, and pile burning could all adversely effect historic sites. Machine piling of slash could break and redistribute artifacts. Intense heat associated with pile burning could shatter lithic artifacts, disrupting dating analysis opportunities. Ground disturbing fire suppression activities, using hand tools or mechanical devices, can also impact prehistoric sites by breakage or redistribution of artifacts. Historic sites are vulnerable to glass and tin artifact damage in debris dumps or scatters using mechanical treatments. There is potential for damage to remains of historic structures, corrals, fence lines, and other historic artifacts of concern. Underburning can cause similar impacts as mechanical treatments to historic sites that contain perishable materials.

Hand thinning with chainsaws and no pile burning would not affect lithic scatter sites. Mechanical shrub treatment (mowing) has similar light ground disturbing impacts as hand thinning. Lithic scatter sites would not be adversely affected. Potential adverse effects can be avoided through on the site monitoring and modification of implementation if sites are found during operations. Decommissioning roads by subsoiling can destroy, break, or redistribute artifacts from the surface to a depth of one meter. Road closures that involve installed barriers to road use can do similar damage to a site. These road actions also have the beneficial effect of stopping ongoing damage from road use and maintenance.

Surface artifacts could be collected illegally in areas where unevaluated sites and significant historic properties are avoided during and following project implementation. Prescribed fire could escape and impact adjacent sites with both fire and fire control activities. Changes in vegetation and residual visual effects could change recreation use patterns where some types of dispersed recreation could move to adjacent locations that were avoided because of cultural sites. Road closures that avoid impacting cultural sites may not be effective and result in use that affects these sites.

Cumulative Effects: Potential effects from proposed activities are expected to be avoided or mitigated (Refer to following discussion), resulting in no increase to cumulative effects. All of the known sites have previously been disturbed or damaged, either by roads or past vegetation management activities. Several sites have disturbances that are undetermined or from natural events. Any resources present on adjacent private or state lands are outside the scope of this analysis and potential impacts to these were not considered.

Expected future potential sources of disturbance within the analysis are include hazard tree removal along developed roads and ongoing road maintenance. Oregon Department of Transportation (ODOT) projects could provide disturbance or damage to unknown cultural sites. ODOT projects are: 1) widening Highway 97 to four (4) lanes from near the Lava Lands entrance to the Sunriver exit (State Road 40); 2) constructing an interchange at the Sunriver exit (State Road 40and Forest Road 9720). This project would temporarily close access to Lava Cast Forest at this location. Access would occur from the Cottonwood Road interchange to Forest Road 9721300 to Forest Road 9720; 3) closing access to Lava Lands from Highway 97 and developing an access route from Cottonwood Road to the Benham Falls Road (Forest Road 9702), approximately 1.6 miles; 4) closing access to Lava River Cave from Highway 97 and developing an access route from Cottonwood Road interchange to 9721300 to Lava River Cave parking area.

MITIGATION AND MONITORING

Where proposed activities may impact eligible or unevaluated heritage resources, the following avoidance procedures will avert potential effects to either or both historic and prehistoric properties: 1) In units to be underburned, avoid burning and do not construct fireline or other ground disturbing activities these sites; 2) Do not locate any slash piles for burning within either evaluated or unevaluated properties; 3) Avoid mowing (MST) and minimize turning and maneuvering of the equipment in these sites; 4) Mechanical thinning and machine piling should avoid all historic properties and unevaluated properties; 5) Commercial harvest should avoid all historic properties within treatment units, landings, temporary roads, and skid trails; 6) Proposed road closure and decommissioning, or conversion to trails will avoid subsoiling, water barring, or other ground disturbance methods within the boundaries of sites.

Where sites need to be avoided by any treatment, an archaeologist will mark the area to be avoided prior to any needed implementation layout or design. Avoidance areas will be marked in any contractor files or maps as area to be avoided and not as archaeological sites. All areas to be avoided or otherwise should be monitored by an archaeologist once during implementation and after implementation has been concluded to confirm that avoidance measures were implemented and effective (Forest Plan Monitoring element).

The Oregon State Historic Preservation Office has agreed, that with these avoidance measures, this project will have no effect on significant or potentially significant heritage resources. If unidentified heritage resources are found during project implementation, they will be recorded and evaluated. An archaeologist will determine if further avoidance measures are needed in consultation with the Oregon SHPO.

RECREATION

EXISTING CONDITION

Recreation use is expected to rise approximately five (5) percent per year. This is similar to the expected population increase of Central Oregon and the increase in popularity of the area as a recreation destination. Developed and dispersed recreation sites and activities are concentrated in areas with substantial shrub and tree density. The density of the vegetation provides fuels that provide an immediate threat, in the event of wildfire, to these developed and dispersed recreation areas.

There is one (1) administrative closure to off highway vehicle (OHV) use within the planning area. This closure encompasses the area bounded on the north by the southern urban growth boundary in T18S, R12E, Sections 26-29; east by the power line in T18S, R12E, Sections 27 and 34; south by the southern boundary of T18S, R12E, Sections 32-34; and on the west by the west boundary of T18S, R12E, Sections 29 and 32.

There is also an area closure for the 18 Fire area that restricts motor vehicle use to designated open roads and will likely continue to be in effect for approximately two (2) years. This area closure is in place to prevent additional resource impacts to the area affected by the fire.

OHV use is not allowed within NNVM, except the use of snowmobiles when adequate snow is available. The remaining portion of the planning area is presently not limited to use by OHVs, with use occurring both on Forest roads and user created trails.

Developed Recreation

Developed recreation sites within the planning area include; 1) Lava Lands Visitor Center, 2) Lava River Cave, and 3) Benham Falls East Day Use area. There are five official non-motorized system trails within the planning area: 1) Bessie Butte; 2) Benham Falls day use area interpretive loop; 3) Benham Falls day use area to both Sunriver and Lava Lands Visitor Center; 4) Trail of the Molten Lava; and 5) Trail of the Whispering Pines. Trail of the Molten Lava and Trail of the Whispering Pines are associated with the Lava Lands Visitor Center. A canoe takeout is located between Sunriver and Benham Falls day use area at the end of Forest Road 600.

Dispersed Recreation

Dispersed recreation activities include camping, driving for pleasure, OHV use, flat-water river use, fishing, designated and undesignated trail use, firearm use, and forest products collection. Substantial recreation use occurs within the Wildland/Urban interface zone, primarily from Sunriver, Deschutes River Woods, and Woodside Ranch. Much of the trail from Sunriver to the day use area parallels the River, which also accesses dispersed recreation sites. Numerous roads and trails within the planning area, adjacent to the urban areas, are used as hiking, biking, skiing, and OHV trails. There are 111 recorded, dispersed campsites within the planning area. Approximately 25 percent of these sites (24) are located adjacent to the Deschutes River. The remaining dispersed sites (87) are primarily hunting camps that are used in the fall, receive moderate to no use during the summer season, and are not water related. Lava flows provide little recreation other than dispersed exploration and winter use. Resource vandalism and dumping of trash are dispersed problems in this area due to the proximity to the Bend urban area.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects
Developed Recreation: Developed recreation use would be expected to continue to increase. With no reduction in vegetation and fuels densities, there would be a continued high risk to loss or degradation of the developed recreation resource by wildfire. In addition, public health and safety of forest users would be at higher risk during a wildfire event due to compromised escape routes and potential for more intense wildfire events.

Dispersed Recreation: **N**o change would occur with dispersed recreation use and opportunities. Current dispersed use levels would be expected to increase. Adverse impacts from dispersed use in the form of sprawling campsites, trampled vegetation, compacted soils, depletion of woody debris, and undesignated roads would be maintained in the current condition or increase.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Developed

Direct and Indirect Effects: Proposed vegetation and fuels treatments would reduce fire risk, improve public safety, provide opportunities for more open views, and provide interpretive opportunities at developed sites where forest management activities have occurred. Thinning, mowing, and prescribed burning treatments would reduce the fire risk to Lava River Cave and the Benham Falls day use area interpretive loop. Short-term impacts to recreationists would occur during the proposed activities such as noise and dust. Trails and dispersed and developed sites may need to be closed during operations. Activities would occur outside of the peak recreation season that lasts from Memorial Day through Labor Day.

Dispersed

Direct and Indirect Effects: Recreational use associated with the Lava Lands Visitor Center to Benham Falls day use area to Sunriver designated trail (Black Rock and Deschutes River Trails respectively) would not likely have long-term change from existing use with implementation of the proposed vegetation activities. Treatments for the reduction of tree density and diseased trees would improve visual quality for the recreating public. Protection the trail resource would be provided through the design and administration of the proposed activities. The reduction of hazardous fuels would allow for more safe escape routes during a wildfire event.

Road closure and decommissioning activities, including seasonal road closure within Deer Habitat (MA-7) and Key Elk Habitat, would reduce and alter recreation access and use patterns within the planning area. Closed roads would continue to be accessible for administrative use for wildfire and suppression management activities, or by permit, but would prohibit general public use. Use during seasonal closure would be by permit only. Road closure and decommissioning, that is associated with reducing intentional or unintentional disturbance to elk in Key Elk Habitat, would impact the motorized access and use of dispersed campsites within the Wild and Scenic River corridor. Non-motorized access would continue to occur. It is estimated that nine (9), seasonal, non-water related sites would become inaccessible by motorized vehicles due to the decommissioning or closing of roads. Other numerous flat and dry sites could be utilized for dispersed recreation.

Cumulative Effects: Recreational use associated with the Lava Lands Visitor Center to Sunriver designated trail would not likely have long-term change from existing use with implementation of the proposed vegetation activities. The reduction of hazardous fuels would allow for a more safe escape route during a wildfire event.

Seasonal road closures in conjunction with other planning area seasonal or permanent road closures, for various wildlife concerns would seasonally affect motorized recreation use between planning areas. Use would be limited to designated roads, reducing the available access choices across the Forest. Decommissioned roads have been identified from the Kelsey Roads Analysis that would provide an opportunity to convert these roads to other uses, including motorized and non-motorized use.

Proposed road closure and decommissioning in Kelsey, Lava Cast, Opine, and East Tumbull would reduce access for dispersed recreation such as camping, sightseeing, and hunting. Even though the Forest would continue to provide areas of use for recreational opportunities, areas of historical use would possibly be no longer available or could be substantially altered. Use could become more concentrated, possibly reducing the quality of the recreation experience. Recreation use in certain areas could show a change in the type of recreation use and possibly an increasing trend in the type of use, for example hiking, biking, and horseback riding. Use by various motorized recreation could show a decline.

Forest Plan Consistency

Proposed activities are within the scope of the Deschutes National Forest Land and Resource Management Plan, the Newberry National Volcanic Monument Management Plan, Recreation Strategy Master Plan, and the Upper Deschutes River Wild and Scenic Management Plan.

RANGE

EXISTING CONDITION

Portions of two vacant grazing allotments, Sugar Pine and Bessie, are located within the planning area (Table 94). The allotments are located primarily within transitional rangeland. Livestock grazing was historically a common use of the planning area with official records indicating that grazing occurred as early as the 1930s. The completed Cinder Hill EA, September 2004 was initiated to determine future grazing activities, including those that may occur within the Bessie (Coyote) Allotment. Livestock grazing inside Newberry National Volcanic Monument (NNVM) is prohibited as part of the designation of the NNVM.

Grazing potential for livestock is: excellent, 5,199 acres (30 percent); moderate, 5,451 acres (32 percent); poor, 5,904 acres (34 percent); and very poor, 605 acres (4 percent). These ratings are based on climax community conditions and may not reflect current conditions on these portions of the two allotments. Management activities often substantially increase available forage for short periods of time. Wildfires have also increased forage quality and quantity of Idaho fescue.

Table 94: Grazing Allotment Status

Allotment	Total Allotment Acres	Acres and Percent of Allotment Within Planning Area	Permitted Livestock Type	Last Year Actively Grazed/Status
Sugar Pine	22, 236	3,447 (16%)	Cattle, Horses	1996/Vacant
Bessie	24,457	13, 712 (56%)	Cattle, Horses, Sheep, Goats	1991/Vacant

Sugar Pine Allotment

Approximately 16 percent of the allotment falls within the planning area. The allotment was grazed by sheep prior to 1972 and by cattle from 1972 until it became vacant in 1997. The current condition of forage species is poor to fair. Where management activities, such as tree thinning, mowing, and prescribed burning, has occurred, forage quantity is being maintained or is increasing. Improvements include 10 miles of barbed wire fence. The only source of water for livestock is permanent watersets, where temporary water troughs are placed during actual use and filled by hauling water. It is not expected that the portion of the Sugar Pine Allotment within Kelsey will be analyzed for livestock use in the foreseeable future. This allotment will remain vacated until further analysis is conducted.

Bessie Allotment

The allotment was established in 1936 as a community allotment (Coyote Allotment) to provide range for cattle and horses belonging to adjacent landowners. Prior to 1936, horses and sheep grazed the area. The Allotment was grazed until 1991 when it became vacant. Forage conditions are fair to good. Portions of the allotment treated to manage fuels along the urban interface are in good condition. Second-growth ponderosa pine continues to mature while plant structure and vigor of forbs, grasses, and shrubs is decreasing under stands of ponderosa pine as crown closure increases, particularly in dense stands. Improvements include 15.5 miles of barbed wire fence that have had little or no maintenance since 1991. Some private landowners are maintaining the existing boundary fence or have replaced it with private fence. The only source of water for livestock is six (6) permanent watersets, filled by hauling water (refer to Sugar Pine Allotment discussion above).

The Coyote Allotment was reanalyzed for use by livestock in the Cinderhill Grazing EA (2004). The Cinderhill Grazing EA decision split the Coyote Allotment into the Cinder Hill Allotment and the Bessie Allotment. Portions of three (North, South, and West) of the four pastures of the Bessie Allotment are within the planning area.

Grazing within the new Bessie allotment will be under contract or temporary (usually one year) permit(s) only. The West Pasture will be utilized as a "grass bank" providing backup grazing pasture for cattle operations for National Forest grazing permittees who experience loss of pasture due to catastrophic events such as wildfire. Grazing in this allotment will also be utilized to extend the effectiveness of fuel reduction treatments such as mechanical mowing or prescribed burning. Grazing, particularly with sheep and goats, will also be utilized to manage vegetation within utility corridors (for example gas and powerlines), road rights-of-way and other similar situations.

The number of cattle allowed in the allotment will be reduced from the current 450 to 200. The grazing season would be from May 15 to September 15 of each year and would be restricted to the West pasture only. A rest-rotation grazing system would be used allowing one or more pastures to be "rested" each year if or when grazing within the allotment exceeded one season.

The number of sheep allowed is 700 and the number of goats allowed is 500 (or an equivalent combination). The grazing season would be from May 15 to July 31. The maximum number of days grazing during the allowed periods would be 60 and all pastures could be utilized. Grazing by either or both sheep and goats could begin near and adjacent to the northern Wildland Urban Interface boundary in 2005 or 2006.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: This Alternative would allow vegetation conditions to continue to change in a direction that would not be beneficial to livestock forage production. The existing vegetative conditions, many acres referred to as poor, have been influenced by past management, including fire suppression, logging, and grazing. Without the influence of a disturbance, such as wildfire, vegetation will continue to evolve into older climax communities that are outside the historic range of variability. Canopy closure would increase and forage species such as Idaho Fescue and Bitterbrush would decline. The expected result would be decreased availability of forbs, grasses and shrubs.

Fences would continue to pose a threat to wildlife, such as mule deer, and to the forest user as they would not be removed or maintained. Continued uncontrolled OHV use of the area could conflict with livestock operations and range improvements.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: Approximately 5,960 acres for Alternative 2 (Proposed Action) are proposed for treatment within the allotments. A reduction of existing bitterbrush could limit seasonal grazing opportunities for a short period of time following treatments, one (1) to two (2) years for plant recovery. The proposed vegetation and fuels activities within the allotments would increase the quantity and quality of available livestock forage over time. Fuels treatment reduction of bitterbrush generally benefits grazing by providing greater amounts of available forage. Cattle prefer to graze open areas that have palatable grasses and forbs and will tend to utilize treatment areas where grass species increase production after treatment. This preferential grazing would, to some degree, offset cattle utilization of bitterbrush that remains.

Areas of reforestation would require exclusion of livestock, increasing the costs of reforestation. Livestock permittees have not been asked to bear this cost. Livestock would need to be excluded from herbicide application locations for two to four weeks following treatment.

Shrubs would be lost from burning and the creation and use of landings and skid trails. Mowing and burning would also be expected to result in short term losses, 1 to 2 years before individual plants recovered. Reductions in bitterbrush numbers and distribution could result in a reduction in potential livestock stocking levels to reduce the risk of livestock browsing the remaining plants and further reducing bitterbrush forage levels and winter forage for mule deer. Approximately four (4) percent of the Bessie allotment would be affected by the proposed treatments.

Alternative 3

Direct and Indirect Effects: Effects would be similar but to a greater extent than Alternative 2. Approximately 6,510 acres for Alternative 3 are proposed for treatment within the allotments. Alternative 3 would provide a more favorable effect to the range resource than Alternative 2 (Proposed Action) based on the number of acres proposed for treatment.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Cumulative Effects: Treatments would reduce the amount of antelope bitterbrush available in the project area. Livestock utilization of bitterbrush could reduce available bitterbrush for wintering mule deer. This is not anticipated in the Bessie Allotment. Grazing would be infrequent and used mainly for vegetation management.

The Cinder Hill Grazing EA analyzed the effects of grazing in vacated allotments, including the Bessie Allotment. Livestock may utilize existing roads for travel. Livestock and vehicles using the same routes can cause vehicle damage, personal injury, and injury to livestock

A Forest off highway vehicle (OHV) plan, which could include road closures, and a designated off highway vehicle (OHV) trail system and play area within the planning area and portions of the Bessie allotment, could: 1) increase the human/livestock interaction; 2) require the relocation of an existing water set; 3) concentrate compaction in new areas of new water sets; 4) increase fence line maintenance; and 5) decrease permittee access.

Livestock "water set" areas are often popular camping locations, creating dual use areas, which may be compatible as long as they occur at separate times. Water sets would continue to be utilized by recreational visitors when not being used for grazing operations. Expansion of water sets, because of recreational use, would not have a measurable impact on forage production or soil compaction. Water sets currently occupy less than one tenth of one percent (0.1 percent) of each allotment and the project area. Increasing the size of the area by 10 feet in all directions would result in an increase of impacted area to approximately 1.2 acres, an increase of approximately 17 percent per site, effectively eliminating the forage production in these impacted areas. These areas, that have soil and vegetative disturbance, also frequently have populations of invasive species of vegetation associated with the disturbed sites.

The 18 Fire burned approximately 3,520 acres of transitional rangeland in the Bessie Allotment. The fire area is closed to livestock grazing for the foreseeable future. Grazing will not be used to manage recovering vegetation or invasive plants. This could lead to an increase in “flashy fuels” that could influence the increase and size and spread of wildfires.

SPECIAL USES

EXISTING CONDITION

Various Special Uses and permitted utilities are allowed within the planning area. Special Uses that are under permit are maintained by the permittee. Tree removal work was conducted adjacent to aerial power lines in 1999.

Recreation: Several outfitter guides use the Deschutes River through this stretch. Sunriver Resort uses a location for guest and equipment pick up. Sunriver has a road use permit to use and maintain the red-cindered road that accesses the take out location.

Other uses include school field trips, eco tourism tours, rafting, weddings, photo shoots, occasional recreation events and uses similar to these.

Non-Recreation Special Uses: The Bonneville Power Administration (BPA) and Midstate Electric Cooperative, Inc. operate various power lines with up to a 125-foot wide right-of-way. The BPA line follows the 012 Road. Hazard tree removal work and mowing has occurred in the past. The BPA right-of-way is permitted under a Land Use Grant Instrument and Memorandum of Understanding. There are buried lines in several locations in the project area.

Pacific Gas and Electric (PG&E) Gas Transmission NW and Cascade Natural Gas operate several gas pipelines within the planning area. The right-of-ways are up to 100 feet. The PG&E pipelines follow the 013 Road. The PG&E gas pipeline rights-of-way are permitted under a Bureau of Land Management (BLM) easement. A portion of an associated meter station is outside the BLM easement and is authorized under special use permit. The Cascade Natural Gas pipelines parallel the 9720 Road on the north side, cross Highway 97 and follow County Road 40 on the north side and leave National Forest land at the rail road tracks.

Qwest Corporation operates several buried telephone lines within the Kelsey project area. Chambers Cable of Sunriver operates two (2) short sections of buried television cable that access private land.

Sunriver Environmental LLC operates an effluent pipeline and water line that enter the National Forest directly north of Cottonwood Road and leave National Forest system land at the west boundary of Section 28 in the NW /4. The right-of-way width is 10 feet.

Arnold Irrigation District has an irrigation flume on the east side of the Deschutes River. A portion of the head gate that steers the water into the flume is located on National Forest system land. Access is by a Forest system road. Use is authorized under an easement.

Central Oregon Irrigation District operates four (4) dikes along the east side of the Deschutes River.

State of Oregon Water Resources Department operates a cableway and gauging station located on the east side of the river. These are located directly adjacent to the Benham Falls Picnic Area.

Lands: The Oregon Department of Transportation (ODOT) and Deschutes County have easements to operate State Highway 97 and county roads, Cottonwood Road and Road 40, through the National Forest. ODOT has a weigh station with a portion that is within the existing ODOT easement and a portion outside the easement that is authorized under special use permit. ODOT is planning to reconstruct the Sunriver exit with an interchange at Highway 97 and county road 40. The Cottonwood interchange will involve rerouting the traffic pattern to Lava River Cave and Lava Lands. Highway 97 will also be widened to four (4) lanes from north of the Cottonwood interchange to the Sunriver exit.

ODOT operates a weather station with a buried power line that is approximately 370 feet long that serves this station. The power line right-of-way is 10 feet wide.

The state of Oregon owns the majority of Section 36 in T. 19 S., R. 11 E.

The Burlington Northern Railroad owns the right-of-way through T. 19 S., R. 11 E., Sections 16, 21, and 28. They own 50 feet on either side of the centerline of the tracks.

In a 1990 land exchange with Deschutes County, the Forest obtained a 40-acre parcel that was managed as a County park that included the Annette Dodds Cross Memorial. The Forest Service entered into a Memorandum of Agreement with the County and the family of Ms. Cross to not disturb the memorial plaque, while allowing management of the forest in accordance with the Forest Plan.

There is small piece of private land that contains the water tanks for the City of Sunriver. Access to this parcel is across National Forest lands.

Two (2) small, privately owned lots are located directly north of Sunriver and adjacent to the Deschutes River. These lots are each approximately 104 feet by 209 feet. The access is authorized across National Forest lands by an easement that is attached to the deed for the private land. A special use permit allows for use of a Government owned water well and pipeline that serve the two lots and a gate. The water pipeline right-of-way is 10 feet.

Minerals: Cinder pits are scattered throughout the planning area, with some still active. There are approximately 10 geothermal leases within the boundaries of the planning area.

ENVIRONMENTAL CONSEQUENCES

Effects Common to Alternative 1 (No Action), Alternative 2 (Proposed Action), and Alternative 3

There would be no changes to the existing special uses and utilities. Utility maintenance activities would continue as necessary. No adverse impacts would be expected with implementation of any alternative. A reduction in tree and shrub density in proposed units adjacent to utility lines would reduce the potential damage from wildfire and disruption of the service that the utilities provide to various communities and other developments.

ECONOMIC AND SOCIAL ANALYSIS

Table 95 summarizes the economic effects from each alternative. Refer to Project Record, Appendix O, Economic and Social Analysis, which is hereby incorporated by reference, for the economic efficiency analysis by alternative. The main factors affecting these values are the amount of fiber removed (0 to an estimated 19 Million Board Feet), subsoiling, planting, and road closure and road decommissioning. It does not include mechanical shrub treatments and prescribed burning, nor does it attempt to place a value on the benefits that may occur due to a possible future reduction of road maintenance and fire suppression costs. Amenity values, such as dispersed recreation, were not included in this analysis.

Table 95: Economic Effects of the Alternatives

Alternative	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Present Net Value @ 4%	0	$168,482	$395,740
Benefit Cost Ratio @ 4%	0	1.06	1.25
Returns to the Federal Government[1]	0	$1,190,819	$1,380,490
***Jobs Supported**	0	190	221

*** 14 jobs per one (1) million board feet is the regional average based on the 1997 Timber Sale Annual Report.**

Social factors important to Central Oregon, and specifically to land and forest management as a source of local income include: the region's rural setting and its history of farming and ranching; the manner in which the local population utilizes resources for recreation; the collection of wood for fuel; fish and game for sport; and the effect of an increasing population on the region's job market and economy.

Economic and Social Analysis Existing Condition

Demographics

Five Central and South Central Oregon counties: Klamath, Lake, Jefferson, Crook, and Deschutes, are considered in this analysis. The Kelsey Vegetation Management project area is located within Deschutes County. The total population for the five county area during the 2000 Census totaled 224,763. Populations and change for the region and by each individual county are displayed in the Table 96.

Table 96: Central Oregon Population Growth

County	Population		Change in Population	Percent
	1990 Census Data	2000 Census Data		
Jefferson Co.	13,676	19,009	5,333	39
Deschutes Co.	74,958	115,367	40,409	53.9
Crook Co.	14,111	19,182	5,071	35.9
Klamath Co.	57,702	63,755	6,053	10.5
Lake Co.	7,176	7,422	245	3.3
Central and South Central Oregon	167,672	224,735	57,063	34

Sources: US Bureau of the Census, Vital Records, Oregon Health Division

[1] Assumes ¾ of the revenues from stumpage of the Kelsey project to the Federal Government and ¼ of the revenues to Deschutes County for roads and schools.

The major population centers within the area are: Klamath Falls (19,462), Prineville (7,356), Bend (52,029), Redmond (13,481), Madras (5,078) and La Pine (5,799). Future population projections mimic that of the past decade. Deschutes, Crook, and Jefferson Counties are expected to continue with aggressive growth where more rural counties like Lake and Klamath County will continue to lag.

The population in the Central Oregon area is becoming both older and more diverse, a trend that is more like the nation and Oregon in general. More rural counties like Northern Klamath County and unincorporated areas such as La Pine, are much older than the National or Oregon average with more retirees. Central Oregon, except for Jefferson County, is less racially diverse than Oregon as a whole, although racial diversity is increasing, with the Hispanic population increasing the fastest.

The education attainment level, except for Deschutes County, within Central and South Central Oregon is similar to Oregon in general. The percentage of high school graduates ranges from lows of 47 percent in Crook and 44 percent in Jefferson Counties to highs of 56 percent in Deschutes and 49 percent in Klamath and Lake Counties. For Oregon as a whole it is 53 percent.

Employment

According to the 2000 Census, estimated civilian labor force has increased for all of the central counties but one (1) with a range of six (6) percent in Klamath County to 40 percent in Deschutes County. Lake County has decreased four (4) percent since the 1990 census. The labor force in Oregon as a whole increased 18 percent.

2003 unemployment rates in the individual counties were: Klamath 7.9 percent; Crook, 8.4 percent; Deschutes, 6.4 percent; Jefferson, 5.6 percent; and Lake, 6.4 percent. The unemployment rate in Oregon as a whole was 7.6 percent.

Oregon Employment Department; US Bureau of labor Statistics

Per capita personal income in 1999 (Table 97), as reported by the U.S. Department of Commerce, Bureau of Economic Analysis by county were as follows: Lake $20,285, Jefferson, $18,808, Klamath $20,886, Crook, $21,168 and Deschutes, $26,077. Although the per capita income in the area is traditionally lower than Oregon’s as a whole ($26,958), there has been a widening of the gap mainly due to the loss of relatively high paying jobs in the lumber and wood products industries. Deschutes County’s per capita income, which is the highest in the area and close to Oregon’s as a whole, is attributable to a number of factors. The first being that although Deschutes County also lost significant jobs in the wood products industry they have been replaced by other high-paying finance and real estate related jobs. In addition, the increase of high-paying “high” tech jobs and an influx of wealthy new-comers have bolstered all income measures (per capita, total personal income, and median family income) as compared to the other counties.

Table 97: Average Annual Wages in Central Oregon 1990 – 1999 *

Industry	1990	1999	Change	Percent Change
All Industries	$25,152	$25,516	$363	1.4%
Private Coverage	$24,089	$24,617	$527	2.2%
Agriculture, Forest and Fish	$19,630	$17,983	($1,647)	-8.4%
Construction and Mining	$29,156	$28,532	($625)	-2.1%
Manufacturing	$30,633	$30,807	174	0.6%
Lumber and Wood Products	$31,251	$31,811	560	1.8%

Table 97: Average Annual Wages in Central Oregon 1990 – 1999 *				
Industry	**1990**	**1999**	**Change**	**Percent Change**
Other Manufacturing	$29,028	$29,547	520	1.8%
Trans., Comm., and Utilities	$33,963	$35.231	$1,267	3.7%
Wholesale and Retail Trade	$18,510	$19,415	$905	4.9%
Finance, Insurance and Real Estate	$26,286	$28,468	$2,181	8.3%
Services	$21,493	$23,264	$1,771	8.2%
Government	$30,760	$30,485	($274)	-0.9%

Sources: Oregon Covered Employment & Payrolls by County and Industry

Although the past decade has seen a significant reduction in employment within the lumber and wood products industry, the lumber and wood products industry is still an important contributor to the local economies. In Crook County, 1,510 people were employed in the lumber and wood products industry. This accounts for 25 percent of all wage and salary employment in the county, and represents the third highest paying job in the county. In Deschutes County, 4,770 people were employed in the lumber and wood products industry. This accounts for 10 percent of all wage and salary employment, and represents the seventh highest paying job in the county. In Klamath County 3,180 people were employed in the lumber and wood products industry, accounting for 19 percent of all wage and salary employment. In Lake County, or 13 per cent of all wage and salary employment, was in the lumber and wood products industry. In Jefferson County, 1,150 people were employed in the lumber and wood products industry. This accounts for 19 percent of all wage and salary employment, and represents the third highest paying job in the county.

Employment and income statistical references do not specifically track recreation and tourism as a sector. Instead recreation and tourism contributes to several sectors, including: transportation, services (accommodations, eating and drinking, recreation), and retail trade. The Oregon Tourism Commission publishes an annual report with estimates to total travel related spending in each County. Estimates for 1999 were 20.4 million dollars in total travel spending in Crook, 414 million in Deschutes, 99.7 million in Klamath, 10.4 million in Lake and 52.9 million in Jefferson.

Estimated employments from these expenditures in industries supporting recreation and tourism are as follows:

- In Crook, 380 people, 6.3 percent of county wage and salary employment;
- In Deschutes County, 5,160 people, 10.5 per cent of county wage and salary employment;
- In Klamath, 1,930 people, 8.3 percent of county wage and salary employment;
- In Jefferson, 1,040 people, 16.8 percent of county wage and salary employment;
- In Lake 170 people, 7.7 per cent of county wage and salary employment.

Social

From a historical perspective, all of the local community's cultures were once natural resource-based. This is partially true today, especially in the more rural, less populated areas. Livestock, agriculture and timber were the backbone of the economic structure and continue to help define Central Oregon communities today. Since much of the surrounding land is administered by federal agencies, chiefly the Ochoco, Deschutes, Winema, and Fremont National Forests and the Prineville District of the BLM, changes in federal land use policies can impact the socioeconomic and socio-cultural way of life.

The following descriptions portray communities only in the very most simplistic terms and do not capture the full community richness. Many of the communities (rural industrial, as defined in the Deschutes NF Forest Plan) within Central and South Central Oregon, such as Crescent and Gilchrist, are closely tied to the Forests in work, subsistence, and play, and are directly affected by what happens on the Forests. The relationship between the Forests and these communities is based in part by: logs for their harvesting, manufacturing, and transportation businesses; and catering to recreation users and tourists that are drawn to the area. People from these communities also use fuel wood, fish, special forest products and game for part of their subsistence and/or recreational activities. Recreation (often roaded and/or motorized) is also an important component of the life styles for many of the people living in these communities.

Bend (Central Oregon Urban Center, as defined in the Deschutes NF Forest Plan), is the dominant community in the Central Oregon Region. It has a large industrial sector with wood products playing a major role, and a large service sector based on recreation and tourism. In addition, the financial and real estate sectors, and economy as whole, has increased substantially as people have moved into the area because of the amenities the surrounding area provides, much of which is associated with the national forests. It is also the major shopping and service center for most of the communities within the area. Because of its population size and density, and economic and social diversity, the health of the wood products and service sectors of the economy, along with environmental and amenity values, play an important role in defining what is important to the Bend community.

Communities such as Prineville, Redmond, and Madras from a historical perspective, better fit the "rural industrial" community. With their increasing population growth and diversifying economies, they are developing a more interests similar to those of Bend's. With the recent weakening of the economy, it is clear that these communities are still very much tied to the woods product industries both economically and culturally. Other communities within the area (e.g. Paulina, Silver Lake) can generally be defined as ranching or farming communities. These communities are closely tied to the Forests in work, subsistence, and play, and are directly affected by what happens on the Forests. These communities are linked more economically because of the need for summer forage for livestock, not timber, and to provide services for recreation and tourists. These communities generally have no manufacturing based industries and have small, un-diversified economies. Like "rural industrial communities", the people who reside in these communities also use fuel wood, fish, and game for part of their subsistence and/or recreational activities.

The over-riding demographic trend in the area is that of rapid population increase through immigration. With the general improvement of living and working accommodations that is occurring through the area and the influx of retirees, many of who are well to do, and professionals from many specialty areas, rapid economic and social change is occurring.

Economic and Social Analysis Environmental Consequences

Economic Efficiency

Forest Service Handbooks 1909.17 and 2409.18 direct the evaluation of Economic Efficiency for proposed projects. To assess the economic efficiency of the action alternatives, costs and anticipated timber volumes were entered into TEA.ECON with the volume evaluated as a whole with a four (4) percent discount rate (http://www.fs.fed.us/rp/nr/fp/FPWebPage/ForestProducts/ForestProducts.htm). TEA.ECON uses the Transaction Evidence Appraisal (TEA) system to generate basic gross timber values and estimated advertised rates. Values for timber are generated using advertised rates in the appropriate geographic area and appraisal zone. Rates were updated for the analysis and used the following cost file: version 04411, 12/31/2004.

The analysis can be used to compare alternatives, not to give an absolute number for the outputs. Numbers useful for comparing alternatives include a benefit/cost ratio, discounted benefits, discounted costs and present net value. Effects on the local economy include estimated number of jobs created or maintained.

Volume

Estimating value and volume is dependent primarily on species and the diameter of trees. Timber volume estimates are:

Alternative 2 (Proposed Action) – Total volume of 26,100 CCF (13.6 million board feet [MMBF]): 18,075 CCF of ponderosa pine sawtimber; 1,500 CCF of lodgepole pine; and 6,525 CCF of fiber.

Alternative 3 – Total volume of 30,300 CCF (15.8 MMBF): 21,225 CCF of ponderosa pine sawtimber; 1,500 CCF of lodgepole pine; and 7,575 CCF of fiber.

Costs

The commercial harvest operation costs were developed for Alternative 2 and Alternative 3. The net sale value would depend on the market value of the timber when sold and the actual logging costs. These figures are based on the analysis discussed above. Logging costs (Table 98) include stump to truck (what it costs to get the trees from the harvest unit to the landing), haul (getting the trees from the landing to the mill), road maintenance, temporary road development, and slash disposal. Cost assumptions are as follows:

2/3 of the zone average was used for both stump to truck and log haul due to short skidding distances, high production mechanized systems and mill vicinity.

Zone averages were used for brush disposal, road maintenance, and temporary road development.

Table 98: Expected Ground Based Logging Costs Of Action Alternatives

Alternative	Acres	Total Volume (CCF)	Stump to Truck (CCF)	Brush Disposal (CCF)	Road Maintenance (CCF)	Temporary Road (CCF)	Haul (CCF)	Total Cost Per CCF
2	4,645	26,100	$77.89	$5.26	$5.22	$0.45	$32.39	$121.21
3	5,345	30,300	$77.89	$5.26	$5.22	$0.45	$32.39	$121.21

In addition to logging costs by unit, the following additional costs include:

Alternative 2 (Proposed Action)

Weed treatment/monitoring of off-road equipment to reduce the potential of spreading nonnative plants

Transportation planning (roads analysis) costs of $6,525 ($0.25/CCF)

Sale Preparation costs of $313,200 ($12.00/CCF).

Sale Administration costs of $130,500 ($5.00/CCF).

DEIS planning and survey costs of $215,325 ($8.25/CCF)

Alternative 3

Weed treatment/monitoring of off-road equipment to reduce the potential of spreading nonnative plants

Transportation planning (roads analysis) costs of $7,575 ($0.25/CCF)

Sale Preparation costs of $363,600 ($12.00/CCF).

Sale Administration costs of $151,500 ($5.00/CCF).

DEIS planning and survey costs of $249,975 ($8.25/CCF)

Reforestation was considered in this analysis even though the fire and not timber salvage created the need for reforestation. Planting of trees and associated activities would occur to the same degree under Alternative 3; however, the net revenues generated by the sale of this timber would provide a potential additional source of funding for reforestation (KV receipts), albeit not the only source of funding under Alternative 2.

Other activities, which are intended to expedite the restoration of a ponderosa pine forest, under Alternatives 2 and 3 include subsoiling of landings, main skid trails and temporary and inventoried roads to increase soil productivity and improve habitat conditions.

The following table, Table 99, identifies reforestation costs associated with Alternatives 2 and 3.

Table 99: Reforestation Cost Per Acre By Regeneration Prescription (Including Overhead Costs Inflated To 2009)

Activity	Cost Per Acre[1]	Plant			Natural Regeneration	
		Dwarf Mistletoe Reduction	Ponderosa pine Restoration	Regeneration Deer Habitat	Regeneration Study	Lodgepole Pine
Whipfell	$100	$100	$100			$100
Grapple Pile	$242					$242
Prune	$142	$142	$142	$142	$142	
Plant	$512	$512	$396	$396	($396[2])	
Tube	$563	$563	$540	$540	($540[2])	
Release	$142	$142	$142	$142	($142[2])	
Survey						
1st Year	$6	$6	$6	$6		
2nd Year	$6	$6	$6	$6		
3rd Year	$6	$6	$6	$6	$6	$6
5th Year	$6				$6	$6
6th Year	$6				($6[2])	
7th Year	$6				($6[2])	
Total		**$1,477**	**$1,477**	**$1,238**	**$154 ($1,090[2])**	**$354**

[1] Includes inflation and overhead assessment. Refer to Table 5-3 for detail of cost calculations.
[2] Additional reforestation cost if adequate natural regeneration is not present within 10 years of harvest.

Alternative 1 (No Action)

Direct and Indirect Effects: Selection of this alternative would result in no active management of the resources except for ongoing management activities such as future fire suppression, road maintenance, and roadside hazard tree felling. There would be no net sale value, and no additional jobs would be created or maintained. There would be no benefits to the local economy. The economic benefits to local economies stand density reduction, and fuels hazard reduction would not be realized. Although Alternative 1 would generate no current revenues to return to the Treasury of the United States of America there is a cost resulting from the expenditure of planning monies.

No shrub or tree density reduction would occur. Bark beetle risk would continue to remain high and resulting tree mortality would increase fire risk and reduce tree economic value. Fire risk remains high and would have the potential to be more difficult to control due to the high fuel loading. This potential could require more resources to control fire, create increased dangers to wild land fire fighters and increase costs to contain a fire. Future expenses to thin stands under Alternative 1 would not be needed.

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Alternative 2 reduces future fuel loads but less than Alternative 3. Resources required to control or manage fires could be substantially less than Alternative 1 but less than Alternative 3. Alternative 3, has the best opportunity to accelerate the establishment and development of a large diameter ponderosa pine stand and provides the best assurance that the stand can develop past the age when small diameter trees are susceptible to ground fire mortality. Alternative 3 provides the most opportunity for employment in the woods industry.

An estimated 58 timber and timber-related jobs would be created or maintained. Timber could be logged in one year, and should be carried out as early as possible if this alternative is selected due to the continuing decrease in economic value from decay and insects. Indirect benefits from employment would contribute to the local economy.

Cumulative Effects: The cumulative effects of all alternatives with regard to economic efficiency in the foreseeable future are based on costs and revenues. The cumulative effects on forest resources are discussed in other reports of this DEIS. All resources have a value, though many are difficult to identify in dollar terms.

In all alternatives the possibility of wildfire returning is high because of the location, weather and vegetation. What varies between alternatives in regards to fire is the fuels and future stand structure following implementation of the proposed forest management activities as proposed. The level of natural fuels that remain across the planning area following treatment activities will contribute directly to the investment needed when fires return to the project area. Fuels accumulating in the next three decades may need treatments to protect the developing young ponderosa pine forest. These treatments may include prescribed fire or mechanical mowing of the shrub layer.

Over the last 10 years, an annual average of approximately 68.2 MMBF of timber has been sold from the Deschutes National Forest. In the near future, the amount of timber offered for sale is expected to be near this annual average. The Deschutes National Forest is expected to continue offering timber for sale and is expected to continue making contributions to the local economy as a result of timber harvest activities. There would be no additional benefits to the local economy as a result of timber harvest with Alternative 1. In this scenario, the projected amount of volume from either Alternative 2 or Alternative 3 may or may not be provided to the local economy, depending on the feasibility of substituting and implementing other ongoing planned projects.

CIVIL RIGHTS AND ENVIRONMENTAL JUSTICE

Civil Rights legislation and Executive Order 12898 (Environmental Justice) direct an analysis of the proposed alternatives as they relate to specific subsets of the American population. The subsets of the general population include ethnic minorities, disabled people, and low-income groups.

Environmental Justice is defined as the pursuit of equal justice and protection under the law for all environmental statutes and regulations, without discrimination based on race, ethnicity, or socioeconomic status. The minority and low-income populations groups living in counties that surround the project area work in diverse occupations. Some minorities, low-income residents, and Native Americans may rely on forest products or related forest activities for their livelihood. This is especially true for those individuals that most likely reside in the rural communities adjacent to National Forest Lands.

Alternative 1 (No Action)

***Direct and Indirect Effects*:** This alternative would continue the local economic situation as described under the heading “Social Impact Analysis.”

Effects Common to Alternative 2 (Proposed Action) and Alternative 3

Opportunities for employment of minority and low-income workers may occur through the various activities, such as thinning and hand piling of small diameter material and planting group openings. The action alternatives developed for this project have the potential to bring in workers from the outside to perform thinning, reforestation, and related activities.

The primary services needed by the workers would be food and shelter. Local businesses that can supply food (grocery stores and restaurants) and other services would capture most of the money being spent by the workers in the area. It is not likely that businesses would need to increase their employment, either by temporarily adding employees, or giving present employees more hours.

A road closure order currently limits access for special forest products. Resources gathered for subsistence or of cultural importance, such as edible plants or animals, or materials for shelter, are not likely affected by any federal action proposed within the fire area. Road decommissioning near the Deschutes River would reduce the opportunity for motorized access for fishing and camp along the river. Even though areas that have been used for dispersed camping along proposed road closures and decommissioning would no longer be utilized, many areas would continue to be accessible.

AIR QUALITY

SMOKE

Air quality would be affected primarily by smoke produced during prescribed fire and pile burning proposed in Alternatives 2 and 3. Under Alternative 1, no prescribed fire or pile burning is proposed though there would be smoke production with a future wildfire.

The principle impacts of burning forest residues, whether by prescribed fire or wildfire, relate to temporary visibility reductions and effects on human health. Emissions from fire (smoke) results in the release of particulates into the atmosphere. These emissions could possibly affect the health of forest workers, visitors, and residents of Bend and Sunriver and other areas to the East of Deschutes County. According to the Clean Air Act of 1977 and 1990, Federal Land Managers will attempt to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare..."

The critical pollutants thought to affect human health include particulate matter emitted in smoke that is less than 10 microns in diameter (PM10). Particulates less than 10 microns are able to traverse the nose and mouth (known as the "extra thoracic airway") and enter the upper airways starting with the trachea. Due to their very small size and weight (the average human hair is 70 microns in diameter), PM10 can remain airborne for weeks. Over 90 percent of smoke particles are less than 10 microns. Wood smoke has been documented to be mutagenic, though no direct studies have proven it is carcinogenic to humans. Mutagenic compounds cause changes to the structure of a cell in ways that can be transmitted during cellular division. This is of primary concern because mutations can be precursors for cancer [Boutcher, 1992]. Exposure to PM10's aggravates chronic respiratory diseases such as asthma, bronchitis and emphysema.

Burning debris will release carbon dioxide and water (making up about 90 percent of the total mass emitted from the combustion process), criteria pollutants (those pollutants regulated by the EPA under the clean air act), including carbon monoxide and sulphur/nitrogen oxide, and hazardous air pollutants (also known as ("air toxins"). Air toxins include several hundred known substances including the class of compounds known as aldehydes (formaldehyde's, acetaldehyde and acrolin) and polynuclear aromatic hydrocarbons (PAHs), several of which are known to be carcinogenic.

Research to date has yet to determine if levels/durations of exposure to these pollutants from prescribed fire operations are significantly affecting human health. However according to sources at the EPA, particulate matter that exceeds human health standards have been measured up to three miles downwind of prescribed burns. Also, according to studies conducted by the California Department of Health Services, John Hopkins University and the National Institute for Occupational Safety and Health, small but significant changes in pulmonary function occur when wild land firefighters are tested before and after a single fire season. Wild land firefighters exposure to CO over a full shift are generally well below occupational health limits, but there were some brief (1-minute) peak exposures that exceed short- term ceiling limits (not to be exceeded for any amount of time) of 200 parts per million.

Smoke Management would be regulated by the Department of Ecology and The Oregon Department of Forestry according to the Oregon Smoke Management Plan Oregon Revised Statutes 477.013. The policy of the plan is to improve the management of prescribed burning as a forest management and protection practice; and to minimize emissions from prescribed burning consistent with the air quality objective of the Interim Air Quality Policy on Wildland and Prescribed Fires, Federal Clean Air Act, and the State of Oregon Clean Air Act Implementation Plan developed by the Department of Environmental Quality under ORS 468A.035 [1989 c.920 s.2].

The State Forester will:
- Coordinate the administration and operation of the plan;
- Issue additional restrictions on prescribed burning in situations where the air quality of the entire state or any part thereof is, or would likely become, adversely affected by smoke;
- Issues daily burning instructions when needed;
- Annually evaluates state-wide burning operations under the plan and provides copies of the summary to interested parties.

The Department of Environmental Quality will:
- Maintain real time air quality monitoring network that is used by ODF;
- Provide information on field burning activities;
- Establishes criteria for air pollution emergencies and notifies ODF of episode stages such as alerts, warnings, and emergencies;
- Regulates the emissions of air pollutants to ensure compliance with adopted standards, limits, and control strategy plans. The ODF smoke Management Plan is jointly developed plan that governs prescribed burning;
- Notifies the Department of Forestry when the air in the entire State or portions thereof is or would likely become adversely affected by smoke.

The Forest Service (USFS)) is required by law to follow the directions of the Forester for the protection of air quality in conducting prescribed burning operations. They are to follow smoke management weather forecasts and instructions, as provided by the Oregon Smoke Management Plan and the Operational Guidance for the Oregon Smoke Management Program, (Directive 1-4-1-601).

Tables 27 and 28, page 3-16 displays the type of burning proposed and an estimate of smoke emissions using an estimate of tons per acre of fuel consumed during the burning operations. All prescribed fire and pile burning would be conducted under the State of Oregon Smoke Management System to track smoke produced and would be coordinated through Oregon Department of Forestry.

Prescribed fire and pile burning would be conducted under favorable smoke dispersal conditions, to avoid impacts to urban areas and Class I airsheds (Clean Air Act discussion below). Inversion conditions, which would increase the potential for smoke pooling in valleys and drainages, would be avoided during burning operations.

The City of Bend is an area where air quality is of interest and is closely monitored for smoke intrusion and effects from prescribed fire. Burning done under favorable smoke dispersion conditions would not affect air quality in Bend.

Visual Effects: Visual effects to Class I airsheds would be minimal since these airsheds are higher in elevation than the majority of the project area. The closest Class 1 airshed, the Three Sisters Wilderness, is located approximately 15 miles to the northwest of the planning area, at the nearest point. The summer northwest prevailing wind patterns would result in minimal potential for impacts.

Dust: Dust would be created from proposed operations in Alternatives 2 and 3, such as log haul on roads and operation of machinery within treatment units. Dust abatement and signing would be conducted on haul routes to minimize effects and hazards to public safety. Dust created during operations would be short term.

Herbicides: No effects on air quality would be expected as a result the application of hexazinone for the control of unwanted plants associated with planted seedlings (refer to discussion on page 3-47). Hexazinone does not evaporate easily and burning hexazinone-treated wood does not create additional toxic byproducts (compared to burning of untreated wood) (Information Ventures, Inc. 1995).

THE CLEAN AIR ACT

A Class 1 airshed designation does not allow human-caused activities outside the wilderness to adversely affect air quality within the wilderness. The closest Class 1 airshed, the Three Sisters Wilderness, is located approximately 15 miles to the northwest of the planning area, at the nearest point. Custodial activities such as wildfire suppression occur regardless of which alternative is selected. Although human-caused impacts are of consequence to wilderness values (Forest Plan, Appendix 4-19), implementation of Alternative 1 (No Action) would have the greatest likelihood for impacting the Three Sisters Wilderness airshed because of the overall risk of an uncontrolled release of particulate matter resulting from wildfire. Adverse impacts to the wilderness would be unlikely, as the prevailing winds do not generally occur from the southeast. Because of measures designed to disperse smoke during favorable conditions, implementation of action alternatives are expected to protect air quality related values and have no visible impact to the wilderness area.

The management alternatives would influence air quality from both within and outside the Monument from prescribed burning. Outside, prescribed burning would cause smoke to drift into the Monument and would likely provide a temporary reduction in air quality for one (1) to three (3) days. The influence of prescribed burning within the Monument would likely be similar as that from outside. Alternative 3 smoke emissions would total more than those implemented under Alternative 2. The overall differences in effects would be slight due to prescribed burning occurring over a minimum of five (5) years, an additional 33 acres within the Monument and 190 acres per year outside the monument with Alternative 3. Due to the location, many of these acres would not cause smoke to drift into the Monument.

OTHER DISCLOSURES

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 Congress, this includes using all practicable means and measures 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 (NEPA Section 101).

Maintaining the productivity of the land is a complex, long-term objective. The action alternatives meet the purpose and need to protect the long-term objective of the project area through the use of specific Forest plan Standards and Guidelines, mitigation measures, and BMPs. Long-term productivity could change as a result of the various management activities proposed in the alternatives. Timber management activities would have a direct, indirect, and cumulative effect on the economic, social, and biological environment. Those effects are disclosed in Chapter 3 of this analysis.

Soil and water are two key factors in ecosystem productivity, and these resources would be protected in all alternatives to avoid damage that could take many decades to rectify. Sustained growth of trees, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. No long-term effects to the quality and quantity of water resources would be expected to occur as a result of management tree thinning activities.

All alternatives would provide wildlife habitat that is necessary to contribute to the maintenance of viable, well-distributed populations of existing native and non-native vertebrate species. The abundance and diversity of wildlife species depends on the quality, quantity, and distribution of habitat, whether for breeding, feeding, or resting. Management Indicator Species are used to represent the habitat requirements of all fish and wildlife species found within the project area. By managing habitat of indicator species, the other species associated with the same habitat would also benefit. The alternatives vary in risk presented in both fish and wildlife habitat capability.

The no action alternative would likely continue to provide slower tree growth rates, affecting the long-term productivity, for both resources, such as wildlife, and economics, of timber resources. The action alternatives would likely provide an environment that would protect trees and enhance associated growth rates, attaining late and old structure more quickly and providing structural diversity for wildlife. Although the length of time and success rates could vary and be dependent upon natural processes, trees would be regenerated to provide more desirable wildlife habitat.

Unavoidable Adverse Effects

Several expected adverse effects, including some that are minimal and/or short term, were identified during the analysis. Resource protection measures or mitigations were identified and considered for each of these as a means to lessen or eliminate such effects on specific resources. See mitigation measures starting on page 2-42 and DEIS, Appendix F, Implementation Guidelines. Resources that have been determined to have potential adverse effects (resulting from any of the alternatives) are documented within the appropriate Environmental Consequences sections of each resource in Chapter 3.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of "... any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. No significant irreversible or irretrievable commitment of resources would occur under Alternative 2 (Proposed Action) or Alternative 3.

Irreversible: Those resources that have been lost forever, such as the extinction of a species or the removal of mined ore. The proposed activities would result in a commitment of rock for road reconstruction.

Irretrievable: Those resources that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

The proposed activities would result in few direct and indirect commitments of resources; these would be related primarily to thinning operations. A temporary, short-term loss of the shrub component would also be lost

There would be an irretrievable loss of firm wood fiber over the long-term under Alternative 1 (No Action), as existing dead lodgepole pine deteriorates in value and is unable to be utilized for commercial firm wood fiber.

The development and use of temporary roads and logging facilities is considered an irretrievable loss of soil productivity until their functions have been served and disturbed sites are returned back to a productive capacity. The action alternatives include soil restoration activities (subsoiling) that would improve the hydrologic function and productivity on detrimentally disturbed soils.

PRIME LANDS

The Secretary of Agriculture issued memorandum 1827 which is intended to protect prime farm lands and rangelands. The project area does not contain any prime farmlands or rangelands. Prime forestland is not applicable to lands within the National Forest System. National Forest System lands would be managed with consideration of the impacts on adjacent private lands. Prime forestlands on adjacent private lands would benefit indirectly from a decreased risk of impacts from wildfire. There would be no direct, indirect, or cumulative adverse effects to these resources and thus are in compliance with the Farmland Protection Act and Departmental Regulation 9500-3, "Land Use Policy".

HUMAN HEALTH AND SAFETY

No significant adverse effects to public health or safety have been identified. The effects of implementation of the alternatives are well known, not highly controversial, and do not involve any unique or unknown risks. Effects meet or exceed state water and air quality standards.

Thinning And Burning

An elevated wildfire risk would remain a concern along the wildland/urban interface and along public escape routes. Fine airborne particulate matter could increase the incidence of respiratory problems during wildfires. Shading and associated ice on Cottonwood Road would remain a concern to drivers during the winter months. Proposed activities would improve public health and safety by: 1) the reduction of the risk of entrapment from wildfire; 2) the reduction of the risk of wildfire encroachment onto private and urban lands; 3) the reduction of the risk of increased airborne particulates from wildfire; and 4) the reduction of winter shade and associated ice on Cottonwood Road.

Herbicide Application

The summary of the herbicide discussion begins on page 3-45 of this Environmental Consequences chapter. The herbicide analysis is located in the Project Record, Appendix E.

CONSISTENCY

CONSISTENCY WITH NATIONAL FOREST MANAGEMENT ACT (NFMA)

Consistency with the requirements of 16 U.S.C. 1604(g)(3)

(Note: these requirements referenced in the 2005 regs at 219.12(b)(2))

The Forest Plan identifies research needs associated with uneven-aged management. A need has been identified for an empirical study in even-aged, second growth ponderosa pine stands to evaluate the short and long-term effects of several silivicultural treatments, including uneven-aged management. Alternatives 2 and 3 respond to this need. Effects of study treatments have been documented. Research will not produce substantial or permanent impairment of the productivity of the land (requirement of 1604(g)(3)(C)).

There is assurance that harvested lands can be adequately restocked within five years after the harvest proposed with Alternatives 2 and 3 (requirement of 1604(g)(3)(E)(ii)).

Lands would be more than minimally stocked following: 1) all intermediate cutting methods, and 2) the uneven-aged single tree selection method associated with the study (Prescription 92).

Areas with less than minimum stocking following regeneration cutting methods (Prescriptions 6, 7, 8, 10, and 93) would be reforested within five years of harvest by either planting or natural regeneration. There is assurance that lodgepole pine will adequately restock the area harvested with the seed tree method (Prescription 10). Effectiveness of ponderosa pine natural regeneration with the uneven-aged group selection method (Prescription 93) will be evaluated for research purposes. If adequate stocking is not present within 3 years, ponderosa pine seedlings would be planted within the group cuts. The other regeneration cuts (Prescriptions 6, 7, and 8) would be planted with ponderosa pine seedlings within five years of harvest.

The harvesting systems proposed with Alternatives 2 and 3 have not been selected primarily because they will give the greatest dollar return or the greatest unit output of timber (requirement of 1604(g)(3)(E)(iv)). Harvesting systems have been selected that would contribute towards meeting Forest Plan management area objectives, addressing identified needs for action, and responding to various resource concerns (ie: reducing risk to bark beetle attack).

Proposed use of clearcutting with Alternatives 2 and 3 is the optimum method to create new stands of cover within Deer Habitat and the proposed use of seedtree cutting will meet objectives and requirements of the Forest Plan (requirement of 1604(g)(3)(F)(i)).

Proposed clearcut and seedtree cut blocks would be shaped and blended to the extent practicable with the natural terrain (requirement of 1604(g)(3)(F)(iii)). The size of these blocks would not exceed the size limits established in the Forest Plan (requirement of 1604(g)(3)(F)(iv)).

Consistency with the requirements of 16 U.S.C. 1604(m)

Mean annual increment (MAI) and culmination of mean annual increment (CMAI) are only meaningful concepts under even-aged management and apply at the time of regeneration cut (FSH 1909.12 sec. 61.3). These concepts are not applicable to intermediate harvest and uneven-aged management (FSH 1909.12 sec 61.3). Prior to regeneration cut, stands of trees should have generally reached CMAI of growth (FSM 1921.12f; 16 U.S.C. 1604(m)(1)). Exceptions are permitted for a variety of reasons if they are consistent with the land management plan (FSH 1909.12 sec. 61.3. 16 U.S.C.1604(m)(2)).

Even-aged regeneration cut using the clearcut method is proposed in Deer Habitat to create new stands of cover for big game. Treatments would occur within ponderosa pine stands that are 50 to 80 years old. The Managed Yield Table for the Deschutes National Forest Ponderosa pine working group (Table 7a, Deschutes FEIS LRMP, Appendix B, page 73) shows culmination of mean annual increment occurring at age 155 where Deer Habitat is the management emphasis. Proposed regeneration cut would occur prior to culmination of mean annual increment.

Even-aged regeneration cut using the seed tree method (Prescription 10) is proposed within General Forest to regenerate a mixed stand of ponderosa and lodgepole pine. Past beetle mortality of lodgepole pine overstory has substantially reduced stocking of the upper canopy layer. Mean annual increment has culminated.

CONSISTENCY WITH NATIONAL FOREST POLICY ON CLEARCUTTING

In an announcement on June 4, 1992, Chief F. Dale Robertson announced a policy that would reduce the amount of clearcutting that would be done on national forests. With this policy, clearcutting would be limited to areas where it is essential to meet forest plan objectives and involve one or more of the following circumstances:

To establish, maintain, or enhance habitat for threatened or endangered species.
To enhance wildlife habitat or water yield values, or to provide for recreation, scenic vistas, utility lines, road corridors, facility sites, reservoirs, or similar developments.
To rehabilitate lands adversely impacted by events such as fires, windstorms, or insect or disease infestations.
To preclude or minimize the occurrence of potentially adverse impacts of insect or disease infestations, windthrow, logging damage, or other factors affecting forest health.
To provide for the establishment and growth of desired tree or other vegetative species that are shade intolerant.
To rehabilitate poorly stocked stands due to past management practices or natural events.
To meet research needs.

The proposed use of clearcutting (Prescription 8) is consistent with the national policy. Clearcuts would be used to enhance wildlife habitat and use of this harvest method would be limited. For Alternatives 2 and 3, approximately one (1) percent of proposed cutting would use this method (Table 33, page 32).

CONSISTENCY WITH THE UPPER DESCHUTES WILD AND SCENIC RIVER – OUTSTANDINGLY REMARKABLE VALUES (ORV) AND SPECIAL ATTRIBUTES

The segment of the Deschutes River that is located within the Kelsey planning area is segment 4. The outstandingly remarkable values in this scenic designated area of the Upper Deschutes River are geologic, fishery, vegetative, wildlife, cultural, scenic, and recreational. The proposed activities would not change the existing condition and would not have a direct and adverse effect on the values for which the Deschutes River was designated a Wild and Scenic River. The following discussion pertains to only the Kelsey planning area.

The geologic ORV of segment 4 consists of lava flows bordering approximately one-half of the western boundary of the planning area. These flows are primarily located within NNVM, including adjacent to the river on the western boundary of the planning area. Treatments are not proposed along the river that is adjacent to the lava flows, and would not affect these areas. The other one-half of the areas bordering the river are within upland vegetation and are not considered geologically significant.

Fisheries are regarded as an ORV in Segment 4 because of the redband trout (*Oncorhyncus mykiss gairdneri*) fishery (UDWSR EIS). The Federal Wild and Scenic River and State Scenic Waterway Acts established an overriding goal to protect and enhance the ORVs for which the river was designated (UDWSR EIS, 1996). A total of 68 acres within the Upper Deschutes Wild and Scenic River Corridor are proposed for vegetation and fuels treatment. Only 11 acres would be treated within the RHCA. There are no ephemeral channels, nor any sign of surface run-off or gullying within the units. Silvicultural activities would reduce competition for ponderosa pine, resulting in healthier, larger, and taller site-potential trees. Large ponderosa pines are desired to provide shade, riverbank stability, and future instream large wood. The action alternatives would protect and enhance the fisheries ORV in the short-term. There is potential for it not to protect and enhance fisheries in the long-term, under the scenario of catastrophic fire or insect and disease epidemics.

Vegetation, including aquatic, riparian, and upland, affect all other river values. Within the RHCA of the Deschutes River, a total of 11 acres (Alternative 2) and 22 acres (Alternative 3) would be treated with thinning and fuels reduction, which would be restricted to non-conventional methodology, such as horse or ATV logging. Treatments would occur within upland vegetation. No treatment would occur within 100 feet of the waters edge or within riparian habitat. All RHCA units currently have high stand densities and are at high risk to widespread mountain pine beetle mortality or to uncharacteristic, stand replacing wildfire. Treatments within the RHCAs would reduce the risk for watershed degradation from wildfire, and tree mortality from insect vectors and mistletoe.

Wildlife populations in Segment 4 were determined to be ORVs because of the diversity of bird populations. This area is also a portion of the Ryan Ranch Key Elk Habitat Area. Mitigations, such as a seasonal closure to motorized access except where designated, would provide protection from intentional and unintentional harassment and protect this ORV.

Cultural sites exist along the Upper Deschutes River Corridor, including many prehistoric sites that are eligible for inclusion in the National Register of Historic Places, making this an ORV. Historic and prehistoric values would not be affected by the proposed activity. Proposed activities would not occur in any known sites. Any new sites would be avoided if found during the implementation of activities.

Scenic values in Segment 4 contain “the greatest ‘natural’ diversity of land form, vegetative character and water features in the Upper Deschutes corridor” (page 36, Upper Deschutes Wild and Scenic River Plan). Natural events, such as wildfire and insect infestations, could substantially alter the visual quality of this portion of the planning area that borders the river. The proposed activities would protect these areas from a substantial change in scenic values. Large ponderosa pine, greater than 21 inches dbh, would be emphasized in those areas proposed for density reduction treatments. Dense lodgepole pine stands would be treated, reducing the likelihood of a stand replacement event.

Recreation values would not be affected, long-term, by the proposed vegetation activities. Water-based recreation would not be precluded because of vegetation management activities. Land-based recreation could be temporarily restricted as a result of potential hazards associated with thinning and associated forest activities. Road closures, consistent with the River Plan, would reduce motorized access to dispersed sites and for dispersed activities. Non-motorized access would continue.

CONSISTENCY WITH THE NEWBERRY NATIONAL VOLCANIC MONUMENT COMPREHENSIVE MANAGEMENT PLAN

Natural Ecological Succession

M-1. Land management activities should allow natural ecological succession of vegetation to continue to the maximum extent practical. Where natural succession is not practical, analysis of projects and activities should explain why it is necessary to intervene and how this intervention is consistent with the purposes and provisions of the Monument legislation.

The NNVM Comprehensive Management Plan (1994) includes the following discussion on natural ecological succession:

> Natural ecological succession refers to the successive changes in the structure and composition of plant and animal communities that occur when natural ecological processes are allowed to evolve without human intervention. In Central Oregon, wildfires are a disturbance cycle associated with these processes. It is not feasible to allow wildfires to burn at random within the Monument due to issues of human safety and protection of public property. ...Within the Monument the closest we can come to allowing for "natural ecological succession" is in areas where we can use a prescribed natural fire management strategy. (Page 19)

To date there is no prescribed wildfire plan to allow natural fires to burn within the Monument. Wildfires within the Monument are to be suppressed to ensure no more than 300-400 acres burn annually as a result of wildfire (NNVM S&G M-43).

Purposes and provisions from the Monument legislation (Public Law 101-533-Nov. 5, 1990) considered pertinent to proposed vegetation treatments include the following:

1) Provide for the conservation, protection, interpretation, and enhancement of its ecological, botanical, scientific, scenic, recreational, cultural, and fish and wildlife resources (Sec 1 (a)).
2) Timber removal shall be permitted to achieve the purposes of the Act and to protect health and safety. Timber within the Monument shall not be considered part of the allowable sale quantity for the Deschutes National Forest (Sec 2 (e) (1)).
3) Action can be taken to the extent practicable to ensure that tree diseases, insect infestations, fire hazards, and fires within the Monument do not seriously threaten resources outside the Monument (Sec 2 (g)).

Most purposes and provisions are addressed in the NNVM Comprehensive Plan S&G M-8.

M-8. Intent: Overall, any projects to alter existing vegetation should respond to one or more of the following needs:

1) *Protect existing large, old trees and provide for the perpetuation of the genetic heritage they represent,*
2) *Reestablish conditions that allow natural ecological succession of vegetation to the maximum extent practical,*
3) *Protect public health and safety,*
4) *Enhance wildlife or sensitive plant habitat, scenic quality, or recreational values, and*
5) *Reduce serious threats from insects, fire, or disease to resources outside the Monument.*

Alternatives 2 and 3 propose to alter vegetation within NNVM by underburning, mowing, and thinning. Consistent with the NNVM Management Plan, treatments would respond to one or more of the needs identified in Standard and Guide M-8 (Table 100).

Proposed treatments would protect existing large trees. Proposed thinning, mechanical shrub treatment, and underburning would protect large tree from wildfire by reducing ladder fuels. By reducing stand density, thinning would protect existing large trees from bark beetle attack.

Proposed treatments would establish conditions that would better allow natural ecological succession to occur. Historically, low intensity wildfires maintained relatively low tree densities. Proposed thinning would reduce tree density to levels more similar to what would have existed under frequent, low intensity wildfires. Conditions more similar to what existed under historic fire regimes would be created by 1) mechanical shrub treatment, which would reduce shrub height, and 2) underburning, which would kill some of the lower tree branches and would reduce needlecast, duff, and shrubs.

Proposed treatments would provide for public safety by reducing potential for high intensity wildfire along main access routes (Highway 97, Forest Road 9702, 9710 and 9720) and around areas of high visitor use (Lava Lands Visitor Center, Lava River Cave, and Benham Falls Day Use Area). In the event of wildfire, potential for safely evacuating visitors would be increased. Specific to Alternative 3, proposed thinning at the Cottonwood junction would enhance motorist's visibility.

Reductions in tree density would enhance scenic quality. Proposed thinning around Lava River Cave (Units 99 and 100) would open up views of the Cascades. Proposed thinning along road 9702 would open up vistas of adjacent lava flows.

Proposed treatments would reduce potential for a natural wildfire in the Monument to threaten resource values outside the Monument by reducing risk of high intensity fire and fuel continuity.

As permitted by Monument legislation, Alternatives 2 and 3 propose to remove timber to achieve purposes of the Monument legislation. Both alternatives would remove approximately the same amount of volume. Alternative 2 would remove an estimated 2,150 CCF (1,120 MBF) of timber. Alternative 3 would remove and estimated 2,170 CCF (1,130 MBF). Consistent with Monument legislation, none of the timber removed from the Monument would be considered a part of the allowable sale quantity for the Deschutes National Forest. While not a part of the allowable sale quantity, commercial volume removed would count towards the annual district sale program.

Table 100: Alternatives 2 and 3 consistency with NNVM Standard and Guideline M-8

Unit	Alternative	Proposed Treatment	Protect existing large trees from:		Reestablish conditions that allow natural ecological succession	Protect public health and safety	Enhance scenic quality	Reduce fire threat to resources outside NNVM
			High Intensity Wildfire	Bark Beetle				
9	2, 3	Underburn			Yes			
10	2	Underburn			Yes			Yes
11	2, 3	Thin	1/	Yes	1/			Yes
		Underburn	Yes		Yes			Yes
25	2	MST/Underburn	Yes		Yes			Yes
38	2	Thin	Yes	Yes	Yes	Yes		Yes
		MST/Underburn	Yes		Yes	Yes		Yes
61	2, 3	Thin	Yes	Yes	Yes			Yes
	2	MST/Underburn	Yes		Yes			Yes
	3	Underburn	Yes		Yes			Yes

Table 100: Alternatives 2 and 3 consistency with NNVM Standard and Guideline M-8

Unit	Alternative	Proposed Treatment	Protect existing large trees from: High Intensity Wildfire	Protect existing large trees from: Bark Beetle	Reestablish conditions that allow natural ecological succession	Protect public health and safety	Enhance scenic quality	Reduce fire threat to resources outside NNVM
65	2, 3	Thin	Yes	Yes	Yes			
66	2, ~~3~~	Thin	Yes	Yes	Yes			Yes
		MST/Underburn	Yes		Yes	Yes		Yes
82	2, 3	MST/Underburn	Yes		Yes	Yes		Yes
84	2	MST/Underburn	Yes		Yes	Yes		Yes
85	2	MST	Yes		Yes	Yes		
87	2, 3	Thin	Yes	Yes	Yes		Yes	Yes
		Underburn	Yes		Yes		Yes	Yes
88	2, 3	Thin	Yes	Yes	Yes	Yes	Yes	
		MST/Underburn	Yes		Yes	Yes	Yes	
89	2, 3	Thin			Yes	Yes		
		MST/Underburn			Yes	Yes		
90	2, 3	MST/Underburn	Yes		Yes	Yes		
94	2	Thin	1/	Yes	1/	1/		
		MST	Yes		Yes	Yes		
95	2	MST	Yes		Yes			
96	2,3	Thin	Yes 2/	Yes	Yes 2/			
	2	MST/Underburn	Yes		Yes			
	3	Underburn	Yes		Yes			
97	2, 3	Thin	Yes	Yes	Yes	Yes	Yes	
98	2, 3	Thin	Yes		Yes	Yes	Yes	
		MST/Underburn	Yes		Yes	Yes	Yes	
99	2, 3	Thin			Yes	Yes	Yes	
		MST/Underburn			Yes	Yes	Yes	
100	2, 3	Thin	Yes		Yes	Yes	Yes	
		MST/Underburn	Yes		Yes	Yes	Yes	
101	2	MST/Underburn	Yes		Yes			
102	2, 3	Thin	Yes	Yes	Yes			
	2	MST/Underburn	Yes		Yes			
	3	Underburn	Yes		Yes			
104	2	Underburn/MST	Yes		Yes			Yes
200	3	Thin	Yes	Yes	Yes			
		Underburn	Yes		Yes			Yes
234	3	MST/Underburn	Yes		Yes			
237	3	MST/Underburn	Yes		Yes	Yes		Yes
238	3	MST/Underburn			Yes			Yes
275	3	Underburn			Yes			Yes
276	3	Thin			Yes	Yes		
		MST			Yes	Yes		
278	3	Thin	Yes		Yes			
325	3	MST/Underburn	Yes		Yes			Yes
338	3	Thin	Yes	Yes	Yes	Yes		
		Underburn	Yes		Yes	Yes		Yes
366	3	Thin	Yes	Yes	Yes			Yes
404	3	MST/Underburn	Yes		Yes			Yes

1/ Previously thinned. Proposed thinning would not significantly reduce ladder fuels.
2/ Thinning would reduce wildfire risk in the northwest portion of unit that hasn't been previously thinned.

Re-establishment of Historic Ponderosa Pine Old Growth

M-15. Where practical in light of other resource objectives, reestablish "historic" ponderosa pine old growth (over time) on a substantial portion of the ponderosa pine sites. The intent is to create (over time) fuel conditions that allow stands to be maintained and perpetuated solely with prescribed fire (or where appropriate, prescribed natural fire) rather than through mechanical treatments. While prescribed fire or natural prescribed fire is the preferred treatment method, some mechanical treatments may be needed before fire can be used safely. The choice of which sites to manage for this condition should be integrated with other resource objectives such as wildlife habitat, scenic quality, and recreation.

The NNVM Comprehensive Management Plan (USDA Forest Service, 1994) describes historic ponderosa pine old growth as having in part the following characteristics:

Dominant trees greater than 21 inches dbh and at least 150 years of age.
Dominant tree stocking typically 18 to 40 trees per acre. Minimum acceptable is 13 trees per acre (Region 6 – Interim Old Growth Definitions).
Stand size typically between 40 and 100 acres. Minimum acceptable is 10 acres.
Small gaps of ½ acre to several acres (with a norm of about ½ acre) may occur.

Ponderosa pine vegetation is present on 4,729 acres of the Monument (USDA Forest Service, 1994c). A majority of this ponderosa pine is within the Kelsey Planning Area (4,250 acres or 90 percent of Monument total). Monument management zones included in the Kelsey Planning Area include the Lava Butte Zone and the Transition Zone. Within both of these zones, the NNVM Plan identifies reintroduction of fire and reestablishment of fire-based, historic ponderosa pine old growth as one purpose. An objective identified in both zones is to preserve and sustain large, old-growth ponderosa pines.

Thinning proposed in Alternatives 2 and 3 is consistent with the intent of reestablishing, over time, historic ponderosa pine old growth. Majority of proposed thinning would retain approximately 35 to 50 trees per acre trees (Prescription 2, Attachment 3). Generally the largest diameter trees with the fullest live crown and least amount of dwarf mistletoe would be retained. All existing trees greater than or equal to 21 inches dbh would be retained. Following thinning, stands would be more open and park-like. Tree stocking would be similar to the dominant tree stocking that was present in historic ponderosa pine old growth. Stands thinned to this wide spacing would remain at low risk to bark beetle attack for approximately 50 years, minimizing the need for mechanical equipment to operate.

Proposed mechanical shrub treatment would facilitate use of prescribed fire. Reduced brush height would 1) lengthen the window for burning and 2) increase potential of having scorch heights on tree trunks less than 6 feet (Visual Quality Objective: NNVM S&G M-76).

Used separately or in combination, proposed treatments would help restore, over time, historic ponderosa pine old growth. Greatest amount of ponderosa pine restoration, considering past and proposed treatments, would occur with Alternative 3 (Table 101). With this alternative, treatments to restore ponderosa pine would be done on approximately 41 percent of the total acreage identified for restoration in the Record of Decision (USDA Forest Service, 1994b).

Table 101: Amount Of Ponderosa Pine Restoration[1] Treatments In NNVM – Past And Proposed					
Alternative	Restoration Treatments			% of NNVM Ponderosa Pine Type (4,729 acres)	% of acres ROD identified for long term restoration of Ponderosa Pine (3,700 acres)
	Past (Acres)	Proposed (Acres)	Cumulative (Acres)		
1 (No Action)	391	--	391	8%	10%
2 (Proposed Action)	391	926[2]	1,317	28%	36%
3	391	1,119[2]	1,510	32%	41%

[1] Includes planned or accomplished thinning, mechanical shrub treatment, and underburning.
[2] (Proposed treatment acres) – (59 acres previously treated in Garden T.S.)

Amount and Timing of Restoration Treatment

The following provide direction on the amount and timing of restoration work:

1. Record of Decision (ROD) for Monument Plan
   - Signed August 1, 1994. Alternative C modified was the selected alternative.
   - Anticipated life of the plan of 10 to 15 years.
   - The amount of restoration activities (prescribed fire and/or mechanical treatments such as thinning) undertaken to reintroduce fire in ponderosa pine stands would range from 120 to 400 acres in the first decade.
   - Over the long term, about 3,700 acres would undergo such restoration activities.
2. Table 1 (NNVM Comprehensive Management Plan, pages 14 and 15).
   - In the long term 190 acres per year would be treated to restore ponderosa pine old growth.
3. Activity schedule (NNVM Comprehensive Management Plan, pages 180 through 184).
   - Outlines amount of restoration work to be done within the first decade by management zones within the monument.

First Decade: To date, decisions have been made to restore 391 acres of ponderosa pine within NNVM (Table 102). Of the planned restoration treatment, 29 percent has been completed. Approximately 57 percent has been partially completed. Treatment has yet to begin on 14 percent of the areas planned for restoration. To date, approximately 55 acres have been underburned. This is approximately 18 percent of the total acres currently planned for underburning within the Monument (306 acres).

Table 103 compares currently planned restoration to direction found in the ROD and NNVM Management Plan. Currently planned level of restoration is within the range of restoration treatment (120 to 400 acres) the Record of Decision indicated would be undertaken within the first decade of the plan (1994 through 2004). This level of restoration is 84 acres less than the amount outlined in the Activity Schedule of the NNVM Plan. Within this first decade, more acres of restoration have been planned in the Lava Butte Zone than outlined in the activity schedule of the Monument plan. Fewer acres have been planned in the Transition Zone.

Long Term: Alternatives 2 and 3 propose additional restoration work in the ponderosa pine type (Table 104). With Alternative 2, approximately 985 acres of restoration work would be done. Alternative 3 would restore 1,178 acres. For both alternatives, the majority of the treatments would be within the Lava Butte Zone. It is assumed up to an additional 84 acres could still be treated in the first decade. The remainder of proposed treatments would occur after the year 2004, the period identified in the Monument Plan as the "long term".

Calculating proposed long term rate of ponderosa pine restoration depends on the length of time before the area is analyzed for additional restoration work. Planning additional restoration would likely occur no sooner than 5 years from this decision date. More likely it would occur in at least 10 years. Restoration rates assuming 5 and 10 years until additional restoration work is planned. For all but the 5 year period assumed in Alternative 3, long term rate of restoration is below the rate of 190 acres per year identified in the Monument Plan.

Table 102: Prior Treatment Decisions Within Newberry National Volcanic Monument And Status Of Completion

Name	Acres	Treatment[1]	Completed	Partially complete	No treatment
Garden					
Unit 1	24 acres	Thin	24 acres		
Unit 2	35 acres	Thin	35 acres		
NNVM Old Growth PP Restoration EA					
Unit 1A	35 acres	MST/Prune/Thin/Underburn		35 acres	
Unit 1B	55 acres	MST/Underburn	55 acres		
Unit 1C	17 acres	MST/Prune/Thin/Underburn		17 acres	
Unit 1D	75 acres	MST/Thin/Underburn		75 acres	
Unit 2A	59 acres	Thin/Underburn		59 acres	
Unit 2B	55 acres	Thin/Underburn			55 acres
Lava Lands Thin CE					
Unit 1	20 acres	Thin/MST		20 acres	
Unit 2	6 acres	Thin/MST		6 acres	
Unit 3	8 acres	Thin/MST/Underburn		8 acres	
Unit 4	2 acres	Thin/MST/Underburn		2 acres	
Total	**391 acres**		**114 acres**	**222 acres**	**55 acres**

[1]MST: Mechanical Shrub Treatment

Table 103: Comparison of NNVM treatments planned in Decade 1 to Record of Decision and Monument Plan

	Transition Zone	Lava Butte Zone	Total
Record of Decision	Not stated	Not stated	120 - 400 acres[1]
Activity Schedule	300 acres	175 acres	475 acres[1]
Previously Planned	114 acres	277 acres	391 acres
Difference[2]	186 acres less	102 acres more	84 acres less

[1] Note difference in the amount of restoration work planned according to the ROD and the Plan.
[2] previously planned amount compared to activity schedule.

Table 104: Proposed Acres Of Ponderosa Pine Restoration Treatment In NNVM And Long Term Rate Of Restoration

Alternative	Total Proposed Treatment Acres	Treatment by Management Zone		Treatment by Decade[1] Acres		Long Term Rate of Restoration[2] Acres Per Year	
		TZ Acres	LBZ Acres	Remainder of First Decade (2002 – 2004)	Long Term (2005+)	5 year (2005 – 2010)	10 years (2005 – 2015)
2	985	222	807	84	901	168[3]	84[3]
3	1,178	145	913	84	1,094	207[4]	104[4]

[1] Start of first decade: August 1994 (ROD Signature Date).
[2] Long term treatment acres divided by 5 or 10 years (potential length of time before additional acres are analyzed for restoration treatment). The NNVM Plan identified a long term rate of restoration of 190 acres/year.
[3] (901 acres – 59 acres previously treated in Garden T.S.) / (5 or 10 years)
[4] (1,094 acres - 59 acres previously treated in Garden T.S.) / (5 or 10 years)

Habitat Diversity

M-10. Maintenance of Habitat Diversity: Overall, restoration activities should provide for habitat diversity, including horizontal, vertical, and vegetative species diversity. Vegetation projects should contribute to habitat diversity at the stand level and/or landscape levels. Ensure that restoration activities provide for the enhancement and long-term maintenance of unique plant communities, including meadows, riparian vegetation, and vegetation at the edges of lava flows.

Consistent with NNVM Standard and Guide M-10, restoration treatments (mowing, underburning, thinning) proposed in Alternatives 2 and 3 would provide for habitat diversity, including horizontal, vertical, and vegetative species diversity. Proposed thinning would increase horizontal diversity at the landscape level by creating a mosaic of lightly stocked and more heavily stocked stands. Proposed treatments would retain a variety of single story stand structures and multi-story stand structures. Existing vegetative species diversity would be maintained. Proposed underburning may increase prevalence of some grass and forb species.

Integrated Insect/Disease Management

M-12. It is recognized that insects and disease play an important role in ecosystem function. However, in some cases, the level of insect and disease activity or the location of such activity could preclude the accomplishment of important goals of the Monument legislation. Treatment to reduce or prevent insect or disease effects should be a result of integrated resource analysis that has identified quantifiable land management objectives, based on the intent of the Monument legislation. Treatment on an isolated stand-by-stand basis is not recommended, but may be required to meet a particular resource objective.

In the event of a bark beetle outbreak, larger diameter trees would likely be killed. Depending on degree of mortality, accomplishment of Monument goals could be prolonged or precluded. According to the Monument Plan, it is desired to have 60% of ponderosa pine in mid to very late successional stages (greater than 150 years old). Potential of achieving this desired condition is reduced by the number of acres currently at risk to bark beetle attack (Table 33).

Proposed thinning with Alternatives 2 and 3 would increase the number of acres at low risk to bark beetle outbreak (Table 105). There would be a corresponding increase in the potential to develop desired amounts of ponderosa pine old growth. Insects would continue to play a role in ecosystem function, particularly in areas imminently susceptible to bark beetle.

Table 105: Bark Beetle Risk Within Kelsey Portion Of NNVM Compared To Desired Amount Of Late Or Old Ponderosa Pine

Alternative	Imminently Susceptible to Bark Beetle		Low Risk to Bark Beetle		Desired Amount of Ponderosa pine in Mid to Very Late Successional Stage (>150 years)
	Acres	% Forested Area	Acres	% Forested Area	
1 (No Action)	4,213	54%	3,639	46%	60%
2 (Proposed Action)	3,738	48%	4,114	52%	60%
3	3,734	48%	4,118	52%	60%

Mechanical Treatments

M-13. Where feasible and practical, favor manual methods for vegetation restoration activities. If mechanized equipment must be used, choose equipment and methods that avoid or reduce undesirable impacts to soils and damage to vegetation intended to remain on the site. The following guidelines are some ways to avoid or reduce undesirable impacts when heavy machinery is used:

Consider aerial or cable systems on slopes sensitive to soil displacement.

Use designated travel routes for heavy equipment.

Limit machinery operations to times when soils are least likely to be disturbed or compacted, such as when they're dry, frozen, or covered with snow.

While manual thinning to achieve desired stocking level is feasible, it was considered impractical. If retained on site, felled trees would create a high fuel loading. Increased fuel loading would narrow the burning window or make it infeasible to safely re-introduce fire.

With proposed mechanical thinning, felled trees would be whole tree yarded and processed at the landing. Skid trail would be approximately 75 to 100 feet apart and would be 14 to 16 feet wide. Approximately 15 to 20 percent of the unit would be in skid trails. No trees would remain in skid trails. Brush present in skid trails would be crushed. By requiring skidding to occur over snow or frozen ground there would be little disturbance to the duff layer. There would be minimal effect to grass and forbs. There would be approximately 1 landing per 10 acres. Average landing size would be 90 feet by 75 feet (approximately .2 acre). Approximately 2 percent of the treatment area would be in landings. There would be no vegetation present in the landings. With processing of trees at landings (limbing trees and cutting off tops), relatively large slash piles would be created at the landings. Slash piles would remain on the landings until slash piles can be utilized or burned.

Mitigation measures specifying season of operation and frequency of skid trails would minimize undesirable impacts to soil. With a relatively wide residual tree spacing, in combination with standard contract provisions specifying for methods of operation, damage to vegetation intended to remain on the site would be negligible.

M-14. Machine piling of slash during fuels treatment should be used only when no other method can accomplish objectives, and should generally be avoided on slopes over 30 percent. Minimize impacts of machine piling by piling no more than needed to break up fuel continuity.

With Alternatives 2 and 3, machine piling of slash would occur only on landings.

Mokst Butte Research Natural Area (RNA)

TZ-1. Manage Mokst Butte Research Natural Area (RNA) in accordance with provisions of the final Establishment Report and Designation Order for this RNA.

No alternative proposes treatment within Mokst Butte Research Natural Area (RNA). Consistent with the NNVM Plan, the RNA would continue to provide baseline ecological research opportunities.

EXECUTIVE ORDERS 11988 (FLOODPLAIN MANAGEMENT) AND 11990 (PROTECTION OF WETLANDS)

Executive Orders 11988 and 11990 direct Federal agencies to avoid, to the extent possible, both short-term and long-term adverse impacts associated with the modifications of floodplains and wetlands.

All alternatives have no specific actions that adversely affect wetlands and floodplains. Proposed activities are compliant with the orders and USDA Departmental Regulation 9500-3. Refer to discussions related to this topic in the soils (page 3-142), fisheries (page 3-171), and hydrology (page 3-182) resource sections in Chapter 3 for more information.

COMPATIBILITY WITH STATE AND LOCAL LAWS

Implementation of all alternatives would be consistent with State and local laws, land use, and environmental policies.

Action alternatives follow State of Oregon requirements in accordance with the Clean Water Act for protection of waters. Application of Best Management Practices (BMPs) are selected and designed on site-specific conditions for waters potentially impacted in the Kelsey project area. Applicable BMP water quality objectives in the design of alternatives and their mitigation measures have been incorporated. Standards and Guidelines for the Inland Native Fish Strategy where developed (in part) to maintain and restore aquatic ecosystems for dependent species. These standards and guidelines afford the same or greater protection of stream courses as direction found in the 1988 USDA publication “General Water Quality – Best Management Practices”. Protection of water quality is also provided by incorporation of BMPs in timber sale contract provisions and direction for road maintenance and reconstruction.

Chapter 4

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AND

CONSULTATION AND COORDINATION

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Kelsey Vegetation Management Project NEPA Mailing List, March 25, 2005

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APPENDICES

APPENDIX A

Alternative 2 (Proposed Action)

And

Alternative 3

Unit Summaries

Table A-1: Alternative 2 (Proposed Action) Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary[38]**	**Objectives[39]**
7	80	Scenic Views, General Forest	HSL, SPC, GPR, MST	2,5
8	46	General Forest	HSL, SPC, GPR, MST	2,4
9	47	Transition Zone	UB	2,7,8
10	15	Transition Zone	UB	7,8
11	54	Transition Zone	HTH, UB	1,2,7,8
12	102	General Forest	HTH, MST/UB	5
13	218	General Forest, Deer Habitat	HTH, MST/UB	5
20	198	Deer Habitat, Scenic Views	MST/UB	5,7
21	112	Deer Habitat, General Forest	HSL, SPC, GPR, MST	1,4,12a
22	172	Scenic Views, General Forest, Deer Habitat	HSL, SPC, MST	1,5,12b
23	96	Scenic Views, Deer Habitat, General Forest	HTH, MST/UB	5
24	13	Deer Habitat, General Forest	MST/UB	5
25	85	Lava Zone, Transition zone	MST/UB	5,7,8
26	102	Scenic Views, General Forest	HSL, SPC, GPR, MST	2,6
27	47	General Forest	HSL, SPC, GPR, MST	2,6
29	9	Scenic Views, General Forest	GPR, MST	2,6
30	64	General Forest, Scenic Views	MST	6
31	1	General Forest	GPR, MST	2,6
33	14	Scenic Views, General Forest	HCR	1,2,5
34	52	Scenic Views, General Forest	HSL, SPC	1,5,11b
35	19	Scenic Views	HSL, SPC, MST/UB	1,5,11b
36	14	Scenic Views	HSL, SPC, GPR, UB	5,10
37	36	Scenic Views	HTH, SPC, UB	1,5,11a
38	24	Transition Zone	HSL, SPC, MST/UB	1,5,7,8,11b
39	66	General Forest	HTH, UB	2,5
40	22	Scenic Views, General Forest	SPC, MST	3,4
41	54	Scenic Views	HTH, MST/UB	1,5
42	41	Scenic Views, General Forest	HTH, UB	5,10
45	155	Scenic Views, General Forest	HTH, MST/UB	1,5,6
46	22	General Forest	SPC, MST	3,4
47	224	General Forest, Scenic Views	HTH	1,11a
48	43	Scenic Views, General Forest	SPC, MST	3,4,5
49	10	Scenic Views	HTH, MST/UB	5
50	108	Scenic Views, General Forest	HTH, MST/UB	1,5
52	1	Scenic Views	HTH, MST/UB	1,2,5
53	3	Scenic Views	SPC, GPR, MST	2,5
54	4	General Forest, Scenic Views	HTH, MST/UB	1,2,5
55	5	General Forest	SPC, GPR, MST	2,5
56	69	General Forest, Transition Zone	HTH, MST/UB	2,5,7,10
57	17	General Forest	SPC, GPR, MST	2,5

[38] **Treatment Summary: HSL** = Uneven-aged Management, **HTH** = Commercial Thin, **HCR** = Seed Tree Removal, **HSA** = Sanitation Cut, **HPR** = Partial Removal, **SPC** = Noncommercial Thin, **MST** = Mechanical Shrub Treatment, **UB** = Burn Under Trees, **SRL** = Release, **GPR** = Prune, **RPL** = Plant, **RSH** = Research (Oregon State University).

[39] **Objectives: 1)** Reduce beetle risk; **2)** Reduce mistletoe infection; **3)** Maintain/improve plantation growth; **4)** Protect wildlife habitat; **5)** Create: **a** - Fuels break/safety corridor; **b** - strategic fuel breaks; **6)** Reduce wildfire risk: **a** – wildland/urban interface, **b** – spotting/crown fire, **c** - Old Growth Management Area, **d** – Benham Falls day use area, **e** – Lava Lands/Lava River Cave; **7)** Reintroduce fire; **8)** Maintain/accelerate ponderosa pine development/growth in Monument; **9)** Reduce ice on Cottonwood Road; **10)** Maintain/increase ponderosa pine dominance; **11)** Accelerate: **a** – single-story, late and old structure; **b** – multi-story, late and old structure; **12)** Enhance: **a** – deer habitat; **b** – goshawk habitat; **13)** Promote open, park-like stands..

Table A-1: Alternative 2 (Proposed Action) Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary**[38]	**Objectives**[39]
58	41	General Forest	HSA, SPC, GPR, MST	2,4
59	15	General Forest	HSL, SPC, GPR, UB	2,4,11b
60	35	General Forest	HSL, SPC, MST/UB	1,4,11b
61	45	Transition Zone	HSL, SPC, MST/UB	1,8,11b
62	11	General Forest, Scenic Views	SPC, MST	3,4
63	10	Scenic Views	SPC, MST	3,4
64	9	Scenic Views	HSL, SPC, MST	1,5,11b
65	11	Transition Zone	HSL, SPC	1,5,8,11b
66	26	Transition Zone	HSL, SPC, MST/UB	1,5,8,11b
67	96	Scenic Views	HTH, UB	7,11a
68	46	Scenic Views, General Forest	HSL, SPC, GPR, MST/UB	1,5,6,10
69	22	Scenic Views	HSL, SPC, MST/UB	1,5,6
70	21	Scenic Views	HSL, SPC, MST/UB	1,5
71	36	Scenic Views	HSL, SPC, MST/UB	1,5
73	11	Scenic Views	HTH, SPC, MST/UB	5,9
74	12	Scenic Views	HTH, SPC, MST/UB	5,9
75	3	Scenic Views	HTH, SPC, MST/UB	5,9
77	46	Scenic Views	MST/UB	5
78	29	Wild & Scenic, Scenic Views	HTH, SPC, MST	6
79	124	Scenic Views	MST/UB	4,5
80	26	Scenic Views	HTH, SPC, MST	5,6
81	75	Scenic Views, General Forest	MST	6
82	87	Lava Zone	MST/UB	5,7,8
83	53	Scenic Views	SPC, MST/UB	5
84	27	Lava Zone, Wild & Scenic	MST/UB	6,7,8
85	10	Lava Zone	MST	5
86	5	Scenic Views	MST	5
87	11	Lava Zone, Wild and Scenic	HPR, SPC, UB	6,7,8,10,13
88	79	Lava Zone	HTH, SPC, MST/UB	1,7,8
89	19	Lava Zone	HTH, SPC, MST/UB	1,5,7,8
90	53	Lava Zone	MST/UB	8
94	17	Lava Zone	HTH, MST	1,5,6,8
95	5	Lava Zone	MST	6
96	94	Lava Zone	HTH, SPC, MST/UB	1,5,7,8
97	9	Lava Zone	HTH, SPC	1,2,6,13
98	8	Lava Zone	HTH, SPC, MST/UB	1,2,6,7,13
99	5	Lava Zone	HSA, SPC, MST/UB	2,6,7,13
100	4	Lava Zone	HSL, SPC, MST/UB	2,6,7,13
101	11	Lava Zone	MST/UB	3,6,7
102	126	Lava Zone, Transition Zone	HTH, SPC, MST/UB	1,7,8
104	119	Lava Zone	HTH, MST/UB	5,7,8,12a
105	170	Scenic Views	HTH, UB/MST	4,5,12a
106	223	Scenic Views	SPC, MST/UB	3,4
107	10	Scenic Views	MST	5
108	32	Scenic Views	SPC, MST/UB	3,4
109	60	Scenic Views	SPC, MST/UB	3,4
110	98	Scenic Views	SPC, MST/UB	3,4
111	75	Scenic Views	HTH, SPC, UB	1,6,7,11a
112	25	Scenic Views	HTH, SPC, MST/UB	1,5
113	61	Scenic Views	HTH, SPC	1
114	47	Scenic Views	SPC, MST	3,4
115	53	Scenic Views	SPC, MST	1,4
116	28	Scenic Views	MST	4
117	51	Scenic Views	HTH, SPC, MST/UB	1,5
119	70	Deer Habitat	HTH	1,12a
120	36	Deer Habitat	HTH	1,12a

Table A-1: Alternative 2 (Proposed Action) Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary[38]**	**Objectives[39]**
121	93	Deer Habitat	HSL, SPC	1,12a
123	405	Deer Habitat	UB	5,7
124	35	Scenic Views	HTH, UB/MST	1,4,5,12a
125	8	Deer Habitat	HSL, SPC	1,11b
126	30	Deer Habitat	HSL, SPC, UB	1,4,11b
129	54	Scenic Views	HTH, SPC, MST/UB	1,5
130	99	Scenic Views	HTH, SPC, MST/UB	5
131	37	Scenic Views	SPC, MST	3,4
132	94	Deer Habitat	MST/UB	5,6
133	63	Deer Habitat	MST/UB	5,6
134	231	Deer Habitat	MST/UB	5,6
135	110	Deer Habitat	MST/UB	5,6
136	213	Deer Habitat	MST/UB	5,6
137	239	Deer Habitat	MST/UB	5,6
138	113	Deer Habitat	MST/UB	5,6
139	224	Deer Habitat	MST/UB	5,6
140	12	Deer Habitat	MST	5
141	326	Deer Habitat	MST/UB	5
142	112	Deer Habitat	MST/UB	5,7
143	69	Deer Habitat	MST/UB	5
145	247	Deer Habitat	MST/UB	5
146	121	Deer Habitat	HTH, MST/UB	5
147	135	Scenic Views	HTH, MST/UB	5
148	5	Scenic Views	HTH, SPC, MST/UB	5,9
149	5	Scenic Views	HTH, SPC, MST/UB	5,9
150	4	Scenic Views	HTH, SPC, MST/UB	5,9
151	238	Deer Habitat	UB	5,7
152	89	Scenic Views	HTH, MST/UB	5,11a
153	44	Deer Habitat	UB	5,7
154	68	Deer Habitat	UB	5,7
155	38	Deer Habitat	UB	5,7
156	18	Deer Habitat	HTH, UB	1,5,7
157	21	Deer Habitat	UB	5,7
158	10	Deer Habitat	UB	5,7
251	37	Deer Habitat, Scenic Views	MST/UB	6,7
254	49	Deer Habitat	HSA, SPC,GPR, MST/UB	2,6,7
256	33	Deer Habitat	HTH, MST/UB	RSH, 4,11a,12a
257	(58)	Deer Habitat	NO TREATMENT (control)	RSH, 4,11a,12a
258	46	Deer Habitat	HSL, MST, GPR, RPL	RSH, 4,11a,12a
259	27	Deer Habitat	HSL, UB, GPR, RPL	RSH, 4,11a,12a
260	(54)	General Forest	NO TREATMENT (control)	RSH, 6,11a
261	44	General Forest	HSL, MST, GPR	RSH, 6,11a
262	69	General Forest	HSL, UB, GPR	RSH, 6,11a
263	58	General Forest, Scenic Views	HTH, MST/UB	RSH, 6,11a
264	55	General Forest, Scenic Views	HTH, MST/UB	RSH, 6,11a
265	90	General Forest, Scenic Views	HTH, MST/UB	RSH, 5
266	(58)	General Forest, Scenic Views	NO TREATMENT (control)	RSH, 5
267	69	General Forest, Scenic Views	HSL, UB, GPR	RSH, 5
268	84	Scenic Views	HSL, MST, GPR	RSH, 5
269	62	Scenic Views	HTH, MST/UB	5
TOTAL	**9,330 Acres**			

Table A-2: Alternative 3 Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary[40]**	**Objectives[41]**
9	47	Transition Zone	UB	2,7,8
11	54	Transition Zone	HTH, UB	1,2,7,8
20	198	Deer Habitat, Scenic Views	MST/UB	5,7
21	112	Deer Habitat, General Forest	HSL, MST, GPR	1,4,12a
22	172	Scenic Views, General Forest, Deer Habitat	HSL, SPC, MST	1,5,12b
23	96	Scenic Views, Deer Habitat, General Forest	HTH, MST/UB	5
24	13	Deer Habitat, General Forest	MST/UB	5
26	102	Scenic Views, General Forest	HSL, MST, GPR	2,6
29	9	Scenic Views, General Forest	MST, GPR	2,6
31	1	General Forest	MST, GPR	2,6
33	14	Scenic Views, General Forest	HCR	1,2,5
37	36	Scenic Views	HTH, SPC, UB	1,5,11a
39	66	General Forest	HTH, UB	2,5
41	54	Scenic Views	HTH, MST/UB	1,5
42	41	Scenic Views, General Forest	HTH, UB	5,10
45	155	Scenic Views, General Forest	HTH, MST/UB	1,5,6
48	43	Scenic Views, General Forest	SPC, MST	3,4,5
49	10	Scenic Views	HTH, MST/UB	5
53	3	Scenic Views	SPC, GPR, MST	2,5
55	5	General Forest	SPC, GPR, MST	2,5
57	17	General Forest	SPC, GPR, MST	2,5
61	45	Transition Zone	HSL, SPC, UB	1,8,11b
62	11	General Forest, Scenic Views	SPC, MST	3,4
63	10	Scenic Views	SPC, MST	3,4
65	11	Transition Zone	HSL, SPC	1,5,8,11b
73	11	Scenic Views	HTH, SPC, MST/UB	5,9
74	12	Scenic Views	HTH, SPC, MST/UB	5,9
75	3	Scenic Views	HTH, SPC, MST/UB	5,9
77	46	Scenic Views	MST/UB	5
78	29	Wild & Scenic, Scenic Views	HTH, SPC, MST	6
81	75	Scenic Views, General Forest	MST	6
82	87	Lava Zone	MST/UB	5,7,8
83	53	Scenic Views	SPC, MST/UB	5
87	11	Lava Zone, Wild and Scenic	HPR, SPC, UB	6,7,8,10,13
88	79	Lava Zone	HTH, SPC, MST/UB	1,7,8
89	19	Lava Zone	HTH, SPC, MST/UB	1,5,7,8
90	53	Lava Zone	MST/UB	8
96	94	Lava Zone	HTH, SPC, UB	1,5,7,8
97	9	Lava Zone	HTH, SPC	1,2,6,13

[40] **Treatment Summary: HSL** = Uneven-aged Management, **HTH** = Commercial Thin, **HCR** = Seed Tree Removal, **HSA** = Sanitation Cut, **HPR** = Partial Removal, **SPC** = Noncommercial Thin, **MST** = Mechanical Shrub Treatment, **UB** = Burn Under Trees, **SRL** = Release, **GPR** = Prune, **RPL** = Plant, **RSH** = Research (Oregon State University).

[41] **Objectives: 1)** Reduce beetle risk; **2)** Reduce mistletoe infection; **3)** Maintain/improve plantation growth; **4)** Protect wildlife habitat; **5)** Create: **a** - Fuels break/safety corridor; **b** - strategic fuel breaks; **6)** Reduce wildfire risk: **a** – wildland/urban interface, **b** – spotting/crown fire, **c** - Old Growth Management Area, **d** – Benham Falls day use area, **e** – Lava Lands/Lava River Cave; **7)** Reintroduce fire; **8)** Maintain/accelerate ponderosa pine development/growth in Monument; **9)** Reduce ice on Cottonwood Road; **10)** Maintain/increase ponderosa pine dominance; **11)** Accelerate: **a** – single-story, late and old structure; **b** – multi-story, late and old structure; **12)** Enhance: **a** – deer habitat; **b** – goshawk habitat; **13)** Promote open, park-like stands: **14)** Aspen Enhancement.

Table A-2: Alternative 3 Vegetation and Fuels Treatment Summary				
Unit #	Gross Acres	Management Area	Treatment Summary[40]	Objectives[41]
98	8	Lava Zone	HTH, SPC, MST/UB	1,2,6,7,13
99	5	Lava Zone	HSA, SPC, MST/UB	2,6,7,13
100	4	Lava Zone	HSL, SPC, MST/UB	2,6,7,13
102	126	Lava Zone, Transition Zone	HTH, SPC, UB	1,7,8
106	223	Scenic Views	SPC, MST/UB	3,4
107	10	Scenic Views	MST	5
108	32	Scenic Views	SPC, MST/UB	3,4
109	60	Scenic Views	SPC, MST/UB	3,4
110	98	Scenic Views	SPC, MST/UB	3,4
113	61	Scenic Views	HTH, SPC	1
114	47	Scenic Views	SPC, MST	3,4
115	53	Scenic Views	SPC, MST	1,4
116	28	Scenic Views	MST	4
119	70	Deer Habitat	HTH	1,12a
120	36	Deer Habitat	HTH	1,12a
121	93	Deer Habitat	HSL, SPC	1,12a
123	405	Deer Habitat	UB	5,7
125	8	Deer Habitat	HSL, SPC	1,11b
126	30	Deer Habitat	HSL, SPC, UB	1,4,11b
129	54	Scenic Views	HTH, SPC, MST/UB	1,5
131	37	Scenic Views	SPC, MST	3,4
132	94	Deer Habitat	MST/UB	5,6
133	63	Deer Habitat	MST/UB	5,6
134	231	Deer Habitat	MST/UB	5,6
135	110	Deer Habitat	MST/UB	5,6
136	213	Deer Habitat	MST/UB	5,6
137	239	Deer Habitat	MST/UB	5,6
138	113	Deer Habitat	MST/UB	5,6
139	224	Deer Habitat	MST/UB	5,6
141	326	Deer Habitat	MST/UB	5
143	69	Deer Habitat	MST/UB	5
145	247	Deer Habitat	MST/UB	5
148	5	Scenic Views	HTH, SPC, MST/UB	5,9
149	5	Scenic Views	HTH, SPC, MST/UB	5,9
150	4	Scenic Views	HTH, SPC, MST/UB	5,9
152	89	Scenic Views	HTH, MST/UB	5,11a
153	44	Deer Habitat	UB	5,7
200	20	Lava Zone, Wild and Scenic	HTH, UB, SPC	1
201	20	Wild and Scenic	HTH, UB, SPC	1
202	8	Wild and Scenic	HTH, SPC	1
203	9	Wild and Scenic	HTH, SPC	1
204	12	Wild and Scenic	HTH, SPC	1
206	7	Wild and Scenic	HTH, MST, SPC	6
207	75	Scenic Views	MST/UB	5
208	110	Scenic Views	MST/UB	4, 5
209	44	Scenic Views, General Forest	HTH, MST/UB	1
210	34	Scenic Views	HTH, MST/UB	1, 5, 13
211	71	General Forest	HTH, MST	1
213	40	Scenic Views, General Forest	HTH	1
218	32	Scenic Views	HTH, MST	1
220	48	Scenic Views	HTH, UB	1, 5, 13
221	16	Scenic Views	MST, SPC	6
222	61	Scenic Views	MST	6
223	164	Scenic Views	MST	6,7
224	4	Scenic Views	HTH, MST, SPC	6
225	10	General Forest	HTH, MST	1,6

Table A-2: Alternative 3 Vegetation and Fuels Treatment Summary				
Unit #	Gross Acres	Management Area	Treatment Summary[40]	Objectives[41]
226	30	General Forest	MST	6
227	24	Scenic Views, General Forest	HTH, MST	1,6
229	19	Scenic Views	HTH, SPC	1
230	10	Scenic Views	HTH	1
231	9	Scenic Views	HTH	1
234	71	Lava Zone	MST/UB	7
237	103	Lava Zone	MST/UB	7
238	57	Lava Zone	MST/UB	7
239	61	General Forest	HTH, MST	EC,1
240	15	General Forest	HTH	EC,1
241	52	General Forest, Scenic Views	HTH	EC,1
242	62	General Forest	HTH	1
243	19	General Forest	HTH	1,12B
244	61	General Forest	HTH	1,12B
245	99	Scenic Views, General Forest	UB	7
246	60	General Forest	HTH	1
247	62	Scenic Views, General Forest	HSL, SPC	1,4,11B
248	42	General Forest	HTH, MST	1
251	37	Deer Habitat, Scenic Views	MST/UB	6,7
252	34	Deer Habitat, Scenic Views	UB	6,7
253	32	Deer Habitat	HTH, UB	1,6,7
254	49	Deer Habitat	HSA, MST, SPC, GPR, MST/UB	2,6,7
255	99	Deer Habitat	UB	6,7
256	33	Deer Habitat	HTH, MST/UB	RSH,4,11a,12a
257	(58)	Deer Habitat	NO TREATMENT (control)	RSH,4,11a,12a
258	46	Deer Habitat	HSL, MST, GPR, RPL	RSH,4,11a,12a
259	27	Deer Habitat	HSL, UB, GPR, RPL	RSH,4,11a,12a
260	(54)	General Forest	NO TREATMENT (control)	RSH, 6,11a
261	44	General Forest	HSL, MST, GPR	RSH, 6,11a
262	69	General Forest	HSL, UB, GPR	RSH, 6,11a
263	58	General Forest, Scenic Views	HTH, MST/UB	RSH, 6,11a
264	55	General Forest, Scenic Views	HTH, MST/UB	RSH,6,11a
265	90	General Forest, Scenic Views	HTH, MST/UB	RSH, 5
266	(58)	General Forest, Scenic Views	NO TREATMENT (control)	RSH, 5
267	69	General Forest, Scenic Views	HSL, UB, GPR	RSH, 5
268	84	Scenic Views	HSL, MST, GPR	RSH, 5
269	62	Scenic Views	HTH, MST/UB	5
270	16	Scenic Views	MST	5
271	19	Scenic Views	MST, SPC	5
272	3	Scenic Views	HTH, MST, SPC, GPR	PS,1
273	2	Scenic Views	HTH, MST, SPC, GPR	PS,1
274	25	Scenic Views	UB	4,5
275	20	Transition Zone	UB	7
276	1	Lava Zone	HTH, MST, SPC, GPR	PS,1
277	98	Scenic Views, general Forest	HTH, MST/UB	1
278	4	Lava Zone	HSA,SPC	1,2,6,13
307	80	Scenic Views, General Forest	HTH, MST/UB, SPC	2,5
308	46	General Forest	HTH, MST, SPC	2,4
312	102	General Forest	HTH, MST/UB	5
313	218	General Forest, Deer Habitat	HTH, MST/UB	5
325	85	Lava Zone, Transition zone	MST/UB	5,7
327	47	General Forest	HTH, MST, SPC	2,6
335	19	Scenic Views	HSL, SPC	1,5,11b
338	24	Transition Zone	HSL, UB, SPC	1,5,8,11b
340	22	Scenic Views, General Forest	MST, SPC, GPR	EC,3,4
346	22	General Forest	MST, SPC, GPR	EC,3,4

Table A-2: Alternative 3 Vegetation and Fuels Treatment Summary				
Unit #	Gross Acres	Management Area	Treatment Summary[40]	Objectives[41]
347	224	General Forest, Scenic Views	HTH	EC,1,11a
352	1	Scenic Views	HTH, MST	1,2,5
354	4	General Forest, Scenic Views	HTH, MST	1,2,5
356	69	General Forest, Transition Zone	HTH, MST	2,5
360	35	General Forest	HSL, SPC	1,11b
366	26	Transition Zone	HSL, SPC	1,5,8,11b
367	96	Scenic Views	HTH, UB	7,11a
368	46	Scenic Views, General Forest	HTH, MST, SPC	1,5,6
369	22	Scenic Views	HSL, MST/UB, SPC	1,5,6
404	119	Lava Zone	MST/UB	5,7,12a
405	170	Scenic Views	HTH, UB/MST	4,5,12a
411	75	Scenic Views	HTH, UB, SPC	1,6,7,11a
412	25	Scenic Views	HTH, MST, SPC	1,5
424	35	Scenic Views	HTH, UB/MST	1,4,5,12a
430	99	Scenic Views	HTH, MST/UB, SPC	5
442	112	Deer Habitat	HSL, MST/UB, GPR	5,7,12a
446	121	Deer Habitat	HTH, MST/UB	5
447	135	Scenic Views	HTH, MST/UB	5
451	238	Deer Habitat	MST	5,7
TOTAL	**10,505**			

APPENDIX B

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APPENDIX C

GLOSSARY OF

GLOSSARY OF ABBREVIATIONS

ATV	All Terrain Vehicle
BE	Biological Evaluation
BMP	Best Management Practice
CCF	Hundreds of Cubic feet
CE	Categorical Exclusion
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWM	Coarse Woody Material
CWPP	Community Wildfire Protection Plan
DBH	Diameter Breast Height
DEIS	Draft Environmental Impact Statement
DEQ	Department of Environmental Quality
DNF	Deschutes National Forest
EA	Environmental Analysis
ECA	Equivalent Clearcut Area
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FSH	Forest Service Handbook
FSM	Forest Service Manual
FY	Fiscal Year
GIS	Geographic Information System
GTR	Green Tree Replacement
HRV	Historic Range of Variability
IFMS	Integrated Fuels Management Strategy
INFISH	Inland Native Fish Strategy
IWMP	Integrated Weed Management Plan
KEA	Key Elk Area
LOS	Late Old Structure
LRMP	Land and Resource Management Plan
LSR	Late Successional Reserve
MA	Management Area
MBF	Thousand Board Feet
MIS	Management Indicator Species
MMBF	Million Board Feet
MMCF	Million Cubic Feet
MOU	Memorandum of Understanding
MST	Mechanical Shrub Treatment
NEPA	National Environmental Policy Act

NF	National Forest
NFMA	National Forest Management Act
NOI	Notice of Intent
NRHP	National Register of Historic Places
NWFP	Northwest Forest Plan
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
OGMA	Old Growth Management Area
OHV	Off Highway Vehicle
PAG	Plant Association Group
PCT	Pre-commercial Thinning, Non-commercial Thinning
PDC	Project Design Criteria
PFA	Post-fledgling Area
RD	Ranger District
RHCA	Riparian Habitat Conservation Area
RNA	Research Natural Area
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
RPA	Forest and Rangeland Renewable Resources Planning Act
S&G	Standard and Guideline
SHPO	State Historic Preservation Office
SRI	Soil Resource Inventory
TES	Threatened, Endangered or Sensitive
UB	Underburning: Spring Like Conditions
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WLTL	Wildlife Tree and Log Implementation Strategy, 1994
WRHU	Winter Range Habitat Unit
WTY	Whole Tree Yarding
WUI	Wildland Urban Interface

GLOSSARY OF TERMS

A

ACCESS – Usually refers to a road or trail route over which a public agency claims a right-of-way for public use; a way of approach.

ACTIVITY – An action, measure or treatment undertaken that directly or indirectly produces, enhances, or maintains forest and rangeland outputs, or achieves administrative or environmental quality objectives. An activity can generate multiple outputs.

ACTIVITY FUELS – Fuels generated or altered by a management activity.

ADMINISTRATIVE UNIT – An area under the administration of one line officer, such as a District Ranger, Forest Supervisor, or Regional Forester.

ADMINISTRATIVE RECORD – The official project record file.

ADFLUVIAL – Fish that live in lakes and migrate to streams to spawn.

AFFECTED ENVIRONMENT – The natural and physical environment and the relationship of people to that environment that will or may be changed by proposed actions.

AGE CLASS -An interval, usually 10 to 20 years, into which the age ranges of vegetation are divided for classification or use.

AIRSHED - A geographic area that, because of topography, meteorology, and climate, shares the same air.

ALLOCATION - See Land Use allocation or Resource allocation.

ALLOTMENT - See Range allotment.

ALL TERRAIN VEHICLE (ATV) – A vehicle characterized by its ability to negotiate most kinds of terrain, by virtue of traction devices such as wide tracks, large, low-pressure rubber tires and/or four-wheel drive.

ALTERNATIVE – One of several policies, plans, or projects proposed for decision-making.

AMENITY – An object, feature, quality, or experience that gives pleasure or is pleasing to the mind or senses. The terms “amenity values” or “amenity resources” are typically used in land management planning to describe those resources for which monetary values are not or cannot be established (such as clean air and water, or scenic quality).

ANALYSIS AREA – The basic land unit of analysis that is used to allocate and schedule management prescriptions.

AQUATIC ECOSYSTEMS - Stream channels, lakes, marshes or ponds, and the plant and animal communities they support.

ARTERIAL ROAD - Primary traffic route serving a large area and providing travel efficiency for many activities. Arterial roads are non-project roads, usually built with Agency funds.

ARTIFACT - An object made or modified by humans.

B

BARK BEETLE – An insect that bores through the bark of forest trees to eat the inner bark and lay its eggs.

BASAL AREA - The area of the cross-section of a tree stem near the base, generally at breast height and inclusive of bark.

BENEFIT - The value of the expected outputs.

BEST MANAGEMENT PRACTICES (BMP) - A practice or combination of practices that is the most effective and practical means (including technological, economic, and institutional considerations) of preventing or reducing negative environmental impacts that may result from resource management activities. For example, Best Management Practices are used to reduce the amount of pollution generated by non-point sources to a level compatible with water quality goals.

BIG GAME - Large mammals hunted for sport. On the Fremont National Forest these include animals such as deer, elk, antelope, and bear.

BIG GAME SUMMER RANGE - A range, usually at higher elevation, used by deer and elk during the summer. Summer ranges are usually much more extensive than winter ranges.

BIG GAME WINTER RANGE - A range, usually at lower elevation, used by migratory deer and elk during the winter months; usually more clearly defined and smaller than summer ranges.

BIOLOGICAL DIVERSITY – The number and abundance of species found within a common environment. This includes the variety of genes, species, ecosystems, and the ecological processes that connect everything in a common environment. The variety of life and its processes within communities and ecosystems.

BIOLOGICAL EVALUATION (BE) – Describes and displays the effects to Proposed, Endangered, Threatened, and Sensitive (PETS) flora and fauna species.

BOARD FOOT (BF) - The amount of wood equivalent to a piece of wood one foot by one foot by one inch thick.

BOARD FOOT/CUBIC FOOT CONVERSION RATIO - Both board foot and cubic foot volumes can be determined for timber stands. The number of board feet per cubic foot of volume varies with tree species, diameter, height, and form factors.

BROWSE - Twigs, leaves, and young shoots of trees and shrubs on which animals feed; in particular, those shrubs that are used by big game animals for food.

BUREAU OF LAND MANAGEMENT (BLM) - An agency within the Department of the Interior, with land management responsibility for the Public Domain lands.

C

CABLE LOGGING – Refers to methods used to skid or pull logs to a central landing or collection area by a cable connected to a remote power source.

CANOPY – The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

CANOPY CLOSURE – The progressive reduction of space between crowns as they spread laterally, increasing canopy cover.

CANOPY COVER – The percentage of a fixed area covered by crowns of plants delimited by a vertical projection of the outermost perimeter of the spread of the foliage.

CAVITY - The hollow excavated in trees by birds or other natural phenomena, used for roosting and reproduction by many birds and mammals.

CHARACTERISTIC LANDSCAPE - In reference to the U.S.D.A. Forest Service visual management system; the overall impression created by a landscape's unique combination of visual features (land, vegetation, water, structures), as seen in terms of form, line, color, and texture; synonymous with "visual landscape character."

CLEARCUTTING - The cutting method that describes the silviculture system in which the old crop is cleared over a considerable area at one time. Regeneration then occurs from (a) natural seeding from adjacent stands, (b) seed contained in the slash or logging debris, (c) advance growth, or (d) planting or direct seeding. An even-aged forest usually results.

CLOSURE - An administrative order restricting either location, timing, or type of use in a specific area.

COARSE WOODY MATERIAL (CWM) – Dead and down material greater than 10 inches DBH at the small end.

CODE OF FEDERAL REGULATIONS (CFR) - A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the federal government.

COLLECTOR ROADS - Roads constructed to serve two or more elements but which do not fit into the other two categories (arterial or local). These roads serve smaller land areas, are usually connected to a Forest arterial or public highway, and are operated for constant service. They collect traffic from Forest roads or terminal facilities.

COMMERCIAL HARVEST – The removal of commercial wood fiber through commercial thinning and regeneration cuts (small clearcuts that leave all trees greater than or equal to 21 inches dbh).

COMMERCIAL THINNING - Any type of tree thinning that produces merchantable material at least equal in value to the direct costs of harvesting.

COMMODITIES – Transportable resources with commercial value; all resource products that are articles of commerce.

COMMUNITY STABILITY - A community's capacity to handle change without major hardships or disruptions to component groups or institutions. Measurement of community stability requires identification of the type and rate of proposed change and an assessment of the community's capacity to accommodate that level of change.

COMPACTION – The packing together of soil particles by forces exerted at the soil surface, resulting in increased soil density.

COMPETING VEGETATION – Vegetation that seeks and uses the limited common resources (space, light, water, and nutrients) of a forest site needed by preferred trees for survival and growth.

CONDITION CLASS - **1)** Timber: a grouping of timber strata into size-age-stocking classes for Forest planning. **2)** Range: one of a series of arbitrary categories used to classify range conditions, usually expressed as excellent, good, fair, or poor.

CORRIDOR - A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries.

COST EFFECTIVENESS - Achieving specified outputs or objectives under given conditions for the least cost.

COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) - An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

COVER/FORAGE RATIO - The mixture of cover and forage areas on a unit of land, expressed as a ratio. The optimum cover/forage mix for deer on summer range is 60:40.

CREATED OPENING - An opening in the forest created by the silvicultural practices of: final removal harvest of shelterwood; clearcutting; seed tree cutting; or group selection cutting.

CRITICAL HABITAT – That portion of a wild animal's habitat that is critical for the continued survival of the species. Areas designated for the survival and recovery of federally listed threatened or endangered species.

CROWN – The part of a tree, or other woody plant, bearing live branches and foliage.

CROWN HEIGHT - In a standing tree, the vertical distance from ground level to the base of the crown, measured either to the lowest live branch whorl, or to the lowest live branch (excluding shoots arising spontaneously from buds on the stem of a woody plant), or to a point halfway between.

CUBIC FOOT (CF) - The amount of timber equivalent to a piece of wood one foot by one foot by one foot.

CULTURAL RESOURCE - The remains of sites, structures, or objects used by humans in the past-historic or prehistoric.

CUMULATIVE EFFECTS OR IMPACTS - Cumulative effect or impact is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

CUMULATIVE EFFECTS AREA (CEA) – The portion of a study area on which the effects from implementing project activities are expected to occur (and may occur outside the project analysis area).

D

DATA - Any recorded measurements, facts, evidence, or observations reduced to written, graphical, tabular, or computer form. The term implies reliability, and therefore provides an explanation of source, type, precision and accuracy.

DecAID – An advisory tool that has been developed to replace the biological potential models for species that utilize dead and partially dead trees and down wood. It is an internet-based summary, synthesis, and integration of published scientific literature, research data, wildlife databases, forest inventory databases, and expert judgment and experience. It offers a way of estimating or evaluating levels of dead wood habitat that provide for a wide array of species and ecological processes. The DecAID Repository is located on the Internet at http://www.fs.fed.us/wildecology/decaid/decaid_background/decaid_home.htm.

DECOMMISSION - Activity that results in the stabilization and restoration of unneeded roads to a more natural state.

DEER WINTER RANGE - See BIG GAME WINTER RANGE.

DEPENDENT COMMUNITIES - Communities whose social, economic, or political life would change in important respects if market or non-market outputs from the National Forests were substantially decreased.

DESIGN STANDARD - Approved design and construction specifications used mainly for recreation facilities and roads-includes specified materials, colors, dimensions, etc.

DESIRED CONDITION – A description of the desired human dimension, production, and physical/biological characteristics to be achieved on an area.

DEVELOPED RECREATION - Recreation that requires facilities that, in turn, result in concentrated use of an area. Examples of developed recreation areas are campgrounds and ski areas; facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings.

DEVELOPED RECREATION SITE - Relatively small, distinctly defined areas where facilities are provided for concentrated public use; e.g. campgrounds, picnic areas, swimming areas, and downhill ski areas.

DIAMETER AT BREAST HEIGHT (dbh) - The diameter of a tree measured 4 feet 6 inches above the ground.

DISPERSED RECREATION - A general term referring to recreation use outside developed recreation sites; this includes activities such as scenic driving, hiking, backpacking, hunting, fishing, snowmobiling, horseback riding, cross-country skiing, and recreation in primitive environments.

DISTANCE ZONE - One of three categories used in the Visual Management System to divide a view into near and far components. The three categories are: **(1)** foreground, **(2)** middleground, and **(3)** background.

DISTURBANCE (Ecosystem) – Refers to events (either natural or human caused) that alter the structure, composition, or function of terrestrial or aquatic habitants.

DIVERSITY - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

DOMINANT – Trees with crowns extending above the general level of the canopy and receiving full light from above and partly from the side; taller than the average trees in the stand with crowns well developed.

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) - The draft statement of environmental effects that is required for major federal actions under Section 102 of the National Environmental Policy Act, and released to the public and other agencies for comment and review.

DUFF - Organic matter in various stages of decomposition on the floor of the forest.

E

EARLY FOREST SUCCESSION - The early stage or condition of a plant community that occurs during its development from bare ground to climax.

ECONOMIC EFFICIENCY ANALYSIS - An analytical method in which discounted benefits are compared with discounted costs.

ECONOMIC GROWTH - Increased economic output in real terms over time.

ECOSYSTEM - An interacting system of organisms considered together with their environment; for example, marsh, watershed, and lake ecosystems.

ECO-TYPE – Groupings of soil and potential vegetation. Areas that have similar site potentials and are expected to have similar responses to treatments.

EFFECTS - Environmental changes resulting from a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Effects and impacts as used in this DEIS are synonymous. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic quality, historic, cultural, economic, social, or healthy effects, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial.

ENDANGERED SPECIES - Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

ENHANCEMENT - See VISUAL QUALITY OBJECTIVE.

ENVIRONMENTAL ASSESSMENT (EA) - The concise public document required by the regulations for implementing the procedural requirements of the National Environmental Policy Act.

ENVIRONMENTAL IMPACT STATEMENT (EIS) - A statement of the environmental effects of a proposed action and alternatives to it. It is required for major federal actions under Section 102 of the National Environmental Policy Act (NEPA), and released to the public and other agencies for comment and review. It is a formal document that must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) guidelines, and directives of the agency responsible for the project proposal.

ENVIRONMENTAL JUSTICE - The pursuit of equal justice and equal protection under the law for all environmental statutes and regulations, without discrimination based on race, ethnicity, or socioeconomic status.

ENVIRONMENTAL PROTECTION AGENCY (EPA) - An agency of the Executive Branch of the Federal Government which has the responsibility for environmental matters of national concern.

EPHEMERAL DRAW - A drainage-way that conveys surface water for short periods of time in direct response to snowmelt or rainfall runoff.

EQUIVALENT CLEARCUT AREA - Watershed index of snowmelt and evapotranspiration rates relative to baseline condition where tree stands are considered fully canopied.

EROSION - **(1)** The wearing away of the land surface by running water, wind, ice, or other geologic agents, including such processes as gravitation creep; or **(2)** detachment and movement of soil or rock fragments by water, wind, ice, or gravity. The following terms are used to describe different types of erosion:

> Accelerated erosion - Erosion which is much more rapid than natural erosion, with the increase in erosion rate resulting primarily from the influence of human activities, or, in some cases, of other events that expose mineral soil surfaces, such as wildfire.
>
> Gully erosion - The erosion process whereby water accumulates in narrow channels, and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 4 inches to as much as 75 to 100 feet.

Rill erosion - An erosion process in which numerous small channels less than 4 inches deep and 6 inches wide are formed.

Sheet erosion - The removal of a fairly uniform layer of soil from the land surface by runoff water.

EXISTING CONDITION – A description of present-day human dimensions, production, physical/biological characteristics of an area.

EXTREME FIRE BEHAVIOR – "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong convection column. Predictability is difficult because such fire often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

F

FINAL ENVIRONMENTAL IMPACT STATEMENT - The final version of the statement of environmental effects required for major federal actions under section 102 of the National Environmental Policy Act. It is a revision of the draft environmental impact statement to include public and agency responses to the draft.

FIRE INTENSITY – The nature of a fire in terms of its rate of energy release. These are physical descriptions of the fires, rather than ecological effects. "Fire intensity is a term that is used to describe the rate at which a fire produces thermal energy. Fire intensity is influenced by the amount of fuel available for burning, local weather conditions before and at the time of the fire, and the topography of the burning site. The limiting factor in fire intensity is the amount of energy stored in the fuel. As a consequence, the greater the fuel loading, the more intensely a fire is likely to burn" (DeBano et al 1998 p. 56-57.).

FIRE MANAGEMENT - All activities required for protection of resources from fire and for the use of fire to meet land management goals and objectives.

FIRE FREQUENCY - Refers to the number of fires in a specified time an area.

FIRE SEVERITY or BURN SEVERITY - Refers to the degree which a site has been altered or the successional process disrupted by fire. Fire severity is a product of fire time and intensity (DeBano et al., 1998). Severity also describes the fire-caused damage to the soil. The severity ratings are based on the following standards (BAER Handbook, FSH 2509.13):

High severity – More than 40 percent of the area exhibits soil features likely to significantly increase runoff and erosion (such as., absence of duff layer, hydrophobic soils, soil discoloration).

Moderate severity – Less than 40 percent of the area exhibits high severity indicators. Duff layers may be absent or mostly absent.

Low severity – Duff layers are burned but intact. Unburned areas are intermingled with lightly burned areas.

FISHERIES HABITATS - Streams, lakes, and reservoirs that support fish populations.

FIXED COSTS - Costs incurred that are not expected to change significantly with the production of outputs, or over the range of alternatives. They are not tied to specific management activities and are usually a small component of the overall budget.

FLOOD PLAIN - The lowland and relatively flat area adjoining inland waters, including, at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

FORAGE - All browse and non-woody plants that are available to livestock or game animals and used for grazing or harvested for feeding.

FORB - Any herb other than grass.

FOREGROUND - A term used in visual management to describe the portions of a view between the observer and up to 1/4 to 1/2 mile distant.

FOREST HEALTH – A measure of the robustness of forest ecosystems. Aspects of forest health include biological diversity; soil, air, and water productivity; natural disturbances; and the capacity of the forest to provide a sustaining flow of goods and services for people.

FOREST LAND - Land at least 10 percent occupied by forest trees or formerly having had such tree cover and not currently developed for non-forest use. Lands developed for non-forest use include areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearings and powerline clearings of any width.

FOREST SERVICE HANDBOOK (FSH) - For Forest Service use, directives that provide detailed instructions on how to proceed with a specialized phase of a program or activity.

FOREST SERVICE MANUAL (FSM) - A system of manuals that provides direction for Forest Service activities.

FOREST SYSTEM ROADS - Roads that are part of the Forest development transportation system, which includes all existing and planned roads as well as other special and terminal facilities designated as Forest development transportation facilities. See ARTERIAL ROADS, COLLECTOR ROADS, and LOCAL ROADS.

FRAGMENTATION – Breaking up of a continuous area into progressively smaller patches of increasing degrees of isolation.

FUEL BREAK - A zone in which fuel quantity has been reduced or altered to provide a position for suppression forces to make a stand against wildfire. Fuel breaks are designated or constructed before the outbreak of a fire. Fuel breaks may consist of one or a combination of the following: natural barriers, constructed fuel breaks, constructed barriers.

FUEL MANAGEMENT - The practice of planning and executing the treatment or control of living or dead vegetative material in accordance with fire management direction.

FUEL TREATMENT - The rearrangement or disposal of natural or activity fuels (generated by management activity, such as slash left from logging) to reduce fire hazard. Fuels are defined as both living and dead vegetative materials consumable by fire (See Fire and Fuels, Chapter 3, for a definition of various fuel treatment methods).

FUELS - Combustible wildland vegetative materials. While usually applied to above-ground living and dead surface vegetation, this definition also includes roots and organic soils such as peat.

G

GEOGRAPHIC INFORMATION SYSTEMS (GIS) – Computer software that provides database and spatial analytic capabilities.

GEOMORPHOLOGY - The science that deals with land and submarine relief features of the earth's surface and seeks a genetic interpretation of them, using the principles of physiography in its descriptive aspects and dynamic and structural geology in its explanatory phases.

GOAL - A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed.

GOODS AND SERVICES - The various outputs, including on-site uses, produced from forest and rangeland resources.

GOSHAWK FORAGING AREA – Areas where prey are searched for and captured by goshawks. Desired size of foraging areas is approximately 5400 acres (not including nest stand and post fledgling area).

GOSHAWK NEST AREA – The nest tree and stand surrounding the nest that contains prey handling areas, perches and roosts. Often referred to as the nest stand, usually approximately 30 acres in area.

GRASS/FORB - An early forest successional stage where grasses and forbs are the dominant vegetation.

GREEN TREE REPLACEMENT (GTR) – Trees retained, or managed through time, to provide snags or CWM habitat at some point in the future.

GROUND FUELS – All combustible materials below the surface litter layer. These fuels may be partially decomposed, such as forest soil organic layers (duff), dead mosses and lichen layers, punky wood, and deep organic layers (peat), or may be living plant material, such as tree and shrub roots.

GROUND-BASED HARVESTING SYSTEMS – Logging systems that employ ground-based equipment such as feller-bunchers, skidders, and forwarders.

GROUP SELECTION CUTTING - See UNEVEN-AGED SILVICULTURAL SYSTEMS.

GROWING SEASON - That part of the year when temperature and moisture are favorable for vegetation growth.

GUIDELINE - An indication or outline of policy or conduct; i.e. any issuance that assists in determining the course of direction to be taken in any planned action to accomplish a specific objective.

GUZZLER - A device for collecting and storing precipitation for use by wildlife or livestock. Consists of an impenetrable water collection area, a storage facility, and a trough from which animals may drink.

H

HABITAT - The place where a plant or animal naturally or normally lives or grows.

HABITAT DIVERSITY - The distribution and abundance of different plant and animal communities and species within a specific area.

HABITAT TYPE – An aggregation of all land areas potentially capable of producing similar plant communities at climax.

HAND PILE – A fuels treatment where unwanted fuels are manually stacked by hand. Piles are then burned when conditions are safe to do so.

HAZARD – Any real or potential condition that can cause injury, illness, or death of personnel, or damage to or loss of equipment or property.

HEADWATERS - The upper tributaries of a river.

HIDING COVER - Vegetation that will hide 90 percent of a deer from the view of a human at a distance of 200 feet or less. The distance at which the animal is essentially hidden is called a "sight distance."

HISTORIC RANGE OF VARIABILITY (HRV) – The historical pattern and abundance of structural stages within watersheds, using pre-settlement (1800-1900) conditions as a reference point.

HISTORIC SITE - Site associated with the history, tradition, or cultural heritage of national, state, or local interest, and of enough significance to merit preservation or restoration.

HYDROLOGIC UNIT CODE (HUC) - an area of land upstream from a specific point on a stream (designated as the mouth) that defines a hydrologic boundary and includes all of the source areas that could contribute surface water runoff directly and indirectly to the designated outlet point.

I

ID TEAM - See INTERDISCIPLINARY TEAM.

IMPACTS - See EFFECTS**.**

INCREMENT – The increase in diameter, basal area, height, volume, quality or value of individual trees or stands during a given period.

INDICATOR SPECIES - See MANAGEMENT INDICATOR SPECIES**.**

INDIRECT OUTPUTS -Outputs caused by an action, but which are later in time or farther removed in distance, although still reasonably foreseeable. See EFFECTS.

INLAND NATIVE FISH STRATEGY (INFISH) – Interim Strategies for Managing Fish-Producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana and Portions of Nevada.

INTEGRATED PEST MANAGEMENT - A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated population on various resource values, alternative regulation tactics and strategies, and benefit/cost estimates of those alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pest-host system, and consist of a combination of tactics such as timber stand improvement plus selective use of pesticides.

INTENSIVE MANAGEMENT (INTENSIVE FOREST MANAGEMENT) - A high investment level of timber management that includes use of precommercial thinnings, commercial thinnings, genetically improved stock, and control of competing vegetation.

INTERDISCIPLINARY TEAM (ID TEAM) - A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem.

INTERMEDIATE CUTTING - Any removal of trees from a stand between the time of its formation and the regeneration cut. Most commonly applied intermediate cuttings are release, thinning, improvement, and salvage.

INTERMITTENT STREAMS - A stream which flows only at certain times of the year when it receives water from some surface source, such as melting snow in mountainous areas.

INVENTORY DATA AND INFORMATION COLLECTION - The process of obtaining, storing, and using current inventory data appropriate for planning and managing the Forest.

IRRETRIEVABLE - Applies to losses of production, harvest, or commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

IRREVERSIBLE - Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

ISSUE - A point, matter, or question of public discussion or interest to be addressed or decided through the planning process. See also PUBLIC ISSUE.

L

LADDER FUELS – Fuels that provide vertical continuity between the surface fuels and crown fuels in a forest stand, thus contributing to the ease of torching and crowning.

LAND MANAGEMENT - The intentional process of planning, organizing, programming, coordinating, directing, and controlling land use actions.

LANDING - Any place where round timber is assembled for further transport, commonly with a change of method.

LANDOWNERSHIP PATTERN - The National Forest System resource land base in relation to other land ownerships within given boundaries.

LANDSCAPE LEVEL – A watershed, or series of interacting watersheds or other natural biophysical (ecological) units, within the larger Land and Resource Management Planning areas. This term is used for conservation planning and is not associated with visual landscape management and viewscape management.

LAND USE ALLOCATION - The commitment of a given area of land or a resource to one or more specific uses, for example, to campgrounds or wilderness.

LATE FOREST SUCCESSION – A stage of forest succession where the majority of trees are mature or over-mature.

LOGGING RESIDUES - See SLASH.

LONG-TERM SUSTAINED YIELD TIMBER CAPACITY (LTSY) - The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity, consistent with multiple-use objectives.

LOPPING AND SCATTERING – Lopping the slash created after felling and spreading it more or less evenly over the ground.
LATE AND OLD STRUCTURE (LOS) – Late and old structural stages are defined by the Eastside Screens as multi-strata stands with large trees and single strata stands with large trees.

M

MANAGEMENT AREA - Tracts of land grouped into one category having a particular management emphasis.

MANAGEMENT CONCERN - An issue, problem, or condition that influences the range of management practices identified by the Forest Service in the planning process.

MANAGEMENT DIRECTION - A statement of multiple use and other goals and objectives, and the associated management prescriptions, and standards and guidelines for attaining them.

MANAGEMENT EMPHASIS - That portion of a management scheme that receives the most stress or is of the greatest significance or importance. It may be the resources being produced, or it may be the way in which they are produced.

MANAGEMENT INDICATOR SPECIES - A species selected because its welfare is presumed to be an indicator of the welfare of other species using the same habitat. A species whose condition can be used to assess the impacts of management actions on a particular area.

MANAGEMENT PRACTICE - A specific activity, measure, course of action, or treatment.

MANAGEMENT PRESCRIPTION - The management practices and intensity selected and scheduled for application on a specific area to attain multiple use and other goals and objectives.

MANAGEMENT REQUIREMENT (MR) - Minimum standards for resource protection, vegetation manipulation, silvicultural practices, even-aged management, riparian areas, soil and water diversity that are to be met to accomplish National Forest System goals and objectives.

MASS MOVEMENT - A general term for any of the variety of processes by which large masses of earth material are moved downslope by gravitational forces - either slowly or quickly.

MATURE TIMBER - Trees that have attained full development, particularly height, and are in full seed production.

MEAN ANNUAL INCREMENT OF GROWTH - The total volume of a tree or stand of trees up to a given age divided by that age.

MECHANICAL SHRUB TREATMENT (MST) – Use of mechanized equipment to mow, cut, chop, grind or otherwise reduce shrub or ground fuel vertical structure. Equipment and attachments would be chosen based on soils (compaction and displacement potential), terrain, other resource concerns, cost and availability.

MIDDLEGROUND - A term used in visual management to describe the portions of a view extending from the foreground zone out to 3 to 5 miles from the observer.

MINERAL MATERLALS - Deposits such as sand, stone, gravel, and clay.

MINERAL SOIL - Weathered rock materials, usually containing less than 20 percent organic matter.

MINIMUM STREAMFLOWS - A specified level of flow through a channel that must be maintained by the users of streams for biological, physical, or other purposes.

MITIGATION MEASURES - Actions to avoid, minimize, reduce, eliminate, or rectify adverse impacts of management practices.

MODEL - A representation of reality used to describe, analyze, or understand a particular concept. A “model” may be a relatively simple qualitative description of a system or organization, or a highly abstract set of mathematical equations.

MODIFICATION - See VISUAL QUALITY OBJECTIVE**.**

MONITORING AND EVALUATION - The periodic evaluation of LRMP management practices on a sample basis to determine how well objectives have been met.

MORTALITY - In wildlife management, the loss in a population from any cause, including hunter kill, poaching, predation, accident, and disease. In forestry, trees in a stand that die of natural causes.

MOUNTAIN PINE BEETLE - A tiny black insect, ranging in size from 1/8 to 3/4 inch, which bores its way into a tree's cambium and cuts off its supply of nutrients, thus killing the tree.

MULTIPLE USE - The management of all the various renewable surface resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some lands will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land and with consideration being given to the relative values of the various resources; and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

N

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) OF 1969 - An Act to declare a National policy that will encourage productive and enjoyable harmony between humankind and the environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality.

NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN - A Plan which " . . . shall provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long-term net public benefits in an environmentally sound manner."

NATIONAL FOREST MANAGEMENT ACT (NFMA) - A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of Regional Guides and Forest Plans and the preparation of regulations to guide that development.

NATIONAL FOREST SYSTEM (NFS) - A nationally significant system of federally owned units of forest, range, and related land consisting of National Forest, Purchase Units, National Grasslands, and other lands, waters, and interest in lands which are administered by the Forest Service or designated for administration through the Forest Service.

NATIONAL FOREST SYSTEM (NFS) LANDS – National Forests, National Grasslands, or Purchase Units and other federal lands, that have been designated by Executive Order or statute as lands under the management of the Forest Service, including experimental areas and Bankhead-Jones Title 111 lands.

NATIONAL REGISTER OF HISTORIC PLACES - A listing (maintained by the U.S. National Park Service) of areas that have been designated as being of historical significance. The Register includes places of local and state significance as well as those of value to the Nation.

NATURAL BARRIER - A natural feature that restricts livestock or wildlife movements, such as a dense stand of trees or a cliff.

NATURAL DISTURBANCE REGIMES – The historic patterns (frequency and extent) of fire, insects, wind, landslides and other natural processes in an area.

NATURAL REGENERATION - Reforestation of a site by natural seeding from the surrounding trees. Natural regeneration may or may not be preceded by site preparation.

NET PUBLIC BENEFITS - An expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs), whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of units of the National Forest System is consistent with the principles of multiple use and sustained yield.

NON-FOREST LAND - Lands that never have had or that are incapable of having 10 percent or more of the area occupied by forest trees; or lands previously having such cover and currently developed for non-forest use.

NON-GAME SPECIES – Animal species that are not hunted, fished, or trapped.

NONPOINT SOURCE POLLUTION – Pollution whose source is general rather than specific in location. It is widely used in reference to agricultural and related pollutants; for example, production of sediments by logging operations, agricultural pesticide applications, or automobile exhaust pollution.

NOXIOUS WEEDS – Undesirable plant species that are unwholesome to the range or to animals. The Forest Service Manual describes a noxious weed as a plant that is aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier of host of serious insects or disease, and being native or new to, or not common to the United States or parts thereof (USDA, Forest Service, 1995c).

O

OBJECTIVE – A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.

OFF-HIGHWAY VEHICLE (OHV) – Vehicle such as motorcycles, all-terrain vehicles, four-wheel drive vehicles, and snowmobiles, synonymous with Off-road vehicle (ORV).

OLD-GROWTH ATTRIBUTES – Structural features and other characteristics of old-growth forests, including: large trees for the species and site; wide variation in tree sizes and spacing; accumulations of large dead standing and fallen trees; multiple canopy layers; canopy gaps and understory patchiness; elements of decay such as broken or deformed tops or trunks and root decay; and the presence of species characteristic of old growth.

OLD-GROWTH HABITAT – Habitat for certain wildlife that is characterized by overmature coniferous forest stands with large snags and decaying logs.

OPPORTUNITY – A statement of general actions, measure, or treatments that addresses a public issue or management concern in a favorable way.

OUTPUTS – The goods, services, products, and concerns that are measurable and capable of being used to determine the effectiveness of programs and activities in meeting objectives. Goods, end products, or services that are purchased, consumed, or utilized directly by people. A broad term for describing any result, product, or service that a process or activity actually produces.

OVERSTORY – That portion of the trees, in a forest or in a stand of more than one story, forming the upper or uppermost canopy.

P

PARTIAL RETENTION – See VISUAL QUALITY OBJECTIVE.

PARTICULATES – Small particles suspended in the air and generally considered pollutants. See TOTAL SUSPENDED PARTICULATES.

PERENNIAL STREAM – A stream that flows year round.

PERMITTEE – Any person or business formally allowed to graze livestock on the land of another person or business (e.g.; on state or federal land).

PERSONAL USE – Normally used to describe the type of permit issued for removal of wood products (firewood, post, poles, and Christmas trees) from National Forest Land when the product is for home use and not to be resold for profit.

PLANNED IGNITION - A fire started deliberately, and controlled to accomplish a resource management objective

PLANNING AREA - The contiguous area within defined boundaries that is determined to be logical for analysis of the existing condition and proposed activities.

PLANNING CRITERIA - Criteria prepared to guide the planning process. Criteria applied to collection and use of inventory data and information, analysis of the management situation, and the design, formulation, and evaluation of alternatives.

PLANNING RECORDS - The body of information documenting the decisions and activities that result from the process of developing an EIS, Forest Plan, or significant amendment (also referred to as the Project Record).

PLANT ASSOCIATION GROUP (PAG) – Combine plant associations by climax species, site potential, and temperature and moisture similarities.

POLE/SAPLING – A Forest successional stage in which trees between five and nine inches in diameter are the dominant vegetation. See also SIZE CLASS.

POLE TIMBER - Trees of at least five inches in diameter at breast height, but smaller than the minimum utilization standard for sawtimber. See also SIZE CLASS.

POLICY - A definite course or method of action selected by a governmental agency, institution, group, or individual from among alternatives and, in the light of given conditions, to guide and usually determine present and future decisions. A specified decision or set of decisions designed to carry out such a chosen course of action.

POST-FLEDGLING AREA (PFA) – The area of concentrated use by the goshawk family after the young leave their nest. The desired area is approximately 420 acres.

PRACTICES - Those management activities that are proposed or expected to occur.

PRECOMMERCIAL THINNING - The practice of removing some of the trees less than marketable size from a stand so that the remaining trees will grow faster.

PREHISTORIC SITE - An area that contains important evidence and remains of the life and activities of early societies that did not record their history.

PRESCRIBED FIRE - A fire burning under specified conditions that will accomplish certain planned objectives.

PRESCRIPTION - A written direction for various Forest management activities, such as tree harvest and fuels reduction activities.

PRESERVATION - A visual quality objective that allows only for ecological changes.

PROGRAM - When spelled with a capital, the Renewable Resource Program required by the RPA. In the general sense, sets of activities or projects with specific objectives, defined in terms of specific results and responsibilities for accomplishment.

PROGRAMMATIC MEMORANDUM OF AGREEMENT - An agreement between the U.S.D.A. Forest Service, Pacific Northwest Region, the Oregon State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation on the management of two types of cultural resource sites found on the Forest: Depression-era administrative structures and prehistoric lithic scatters.

PROJECT RECORD - The body of information documenting the decisions and activities that result from the process of developing an EIS, Forest Plan, or significant amendment (also referred to as the Planning Record).

PROJECTS - Work schedules prescribed for a project area to accomplish management prescriptions. Projects can be for operation, maintenance, and protection (OMP), or for investment purposes. OMP projects are for ongoing work and are generally considered one year at a time. Investments can be of multi-year duration. A project is organized for managerial convenience, and is described by location, activities, outputs, effects, work force, dollars, time, and responsibility for execution.

PUBLIC ACCESS – Refer to Access

PUBLIC ISSUE - A subject or question of widespread public interest relating to management of the National Forest System.

PUBLIC PARTICIPATION - Meetings, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities designed and held to obtain comments from the public about Forest Service planning.

R

RAPTORS – Predatory birds such as falcons, hawks, eagles, and owls.

RANGER DISTRICT – A sub-unit of a National Forest for management and administration purposes.

RECORD OF DECISION - A document separate from but associated with an Environmental Impact Statement which states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not.

RECREATION OPPORTUNITY SPECTRUM (ROS) - A land classification system of seven categories, each being defined by its setting and by the probable recreation experiences and activities it affords. The seven management classes are: Urban, Rural, Roaded-natural, Roaded-modified, Semi-primitive motorized, Semi-primitive non-motorized, and Primitive. The Fremont Forest Plan allocated land into each category except urban and rural.

All of the trails, developed recreation sites, and dispersed recreation sites within the Toolbox Fire Recovery Project area are located within “Roaded-natural” and “Roaded-modified” ROS setting classifications.

REFORESTATION - The natural or artificial restocking of an area with forest trees.

REGENERATION - The renewal of a tree crop, whether by natural or artificial means. Also, the young crop itself, which is commonly referred to as reproduction.

REGULATIONS - Generally refers to the Code of Federal Regulations, Title 36, Chapter II, which covers management of the Forest Service.

REHABILITATION - Action taken to restore, protect, or enhance site productivity, water quality, or other resource values over a period of time.

RELEASE CUTTING – Removal of competing vegetation to allow a desired tree species to grow.

RESEARCH NATURAL AREA (RNA) - An area set aside by a public or private agency specifically to preserve a representative sample of an ecological community, primarily for scientific and educational purposes. In U.S.D.A. Forest Service usage, Research Natural Areas are areas designated to ensure representative samples of as many of the major naturally occurring plant communities as possible.

RESERVED LANDS - Lands reserved from the public domain for National Forest purposes, and lands that are added to the National Forest System by exchange for reserved National Forest lands. See PROCLAIMED LAND.

RESIDUAL STAND - The trees remaining standing after some activity such as selection cutting.

RESOURCE - Anything which is beneficial or useful, be it animal, vegetable, mineral, a location, a labor force, a view, an experience, etc. Resources, in the context of land use planning, thus vary from such commodities as timber and minerals to such amenities as scenery, scenic viewpoints, or recreation opportunities.

RESOURCE MANAGEMENT PLAN - A Plan developed prior to the LRMP that outlined the activities and projects for a particular resource element independently of considerations for other resources. Such Plans are superseded by the LRMP.

RESOURCE PLANNLNG ACT (RPA) - The Forest and Rangeland Renewable Resources Planning Act of 1974**.** Also refers to the National Assessment and Recommended Program developed to fulfill the requirements of the act.

RESPONSIBLE OFFICIAL - The Forest Service employee who has been delegated the authority to carry out a specific planning action.

RETENTION - See VISUAL QUALITY OBJECTIVE.

RIGHT-OF-WAY (R/W) - An accurately located strip of land with defined width, point of beginning, and point of ending; the area within which the user has authority to conduct operations approved or granted by the landowner in an authorizing document, such as a permit, easement, lease, license, or Memorandum of Understanding.

RIPARIAN - Pertaining to areas of land directly influenced by water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Stream sides, lake borders, or marshes are typical riparian areas.

RIPARIAN AREA - Geographically delineated areas, with distinctive resource values and characteristics, that are comprised of aquatic and riparian ecosystems.

RIPARIAN ECOSYSTEM - A transition between the aquatic ecosystem, and the adjacent upland terrestrial ecosystem. Identified by soil characteristics and distinctive vegetation communities that require free or unbound water.

RIPARIAN HABITAT CONSERVATION AREA (RHCA) – INFISH Allocation: portions of watersheds where riparian-dependent resources receive primary emphasis, and management activities are subject to specific standards and guidelines.

RIPARIAN RESERVE – Northwest Forest Plan Allocation: lands along streams and unstable areas where special standards and guidelines direct land use.

ROADED MODIFIED (RM) - A classification of the Recreation Opportunity Spectrum that characterizes a predominately altered environment, allowing for noticeable to strongly-evident management activity.

ROADED NATURAL (RN) - A classification of the Recreation Opportunity Spectrum that characterizes a predominately natural environment with evidence of moderate permanent alterations and resource utilization. Evidence of the sights and sounds of people is moderate, but in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from the sights and sounds of people.

RURAL - A Recreation Opportunity Spectrum classification for areas characterized by a substantially modified natural environment. Sights and sounds of people are evident. Renewable resource modification and utilization practices enhance specific recreation activities or provide soil and vegetative cover protection.

S

SALE PREPARATION COSTS - Costs associated with preparing a timber harvest on Forest Service lands for sale to the public; usually include all administrative costs for developing sale layout, writing an Environmental Assessment and selling the timber sale.

SCARIFIED - Land in which the topsoil has been broken up or loosened in preparation for regenerating by direct seeding or natural seedfall. Also refers to ripping or loosening road surfaces to a specified depth for obliteration or "putting a road to bed."

SCOPING PROCESS -A part of the National Environmental Policy Act (NEPA) process; early and open activities used to determine the scope and significance of the issues, and the range of actions, alternatives, and impacts to be considered in an Environmental Impact Statement.

SECOND GROWTH – Forest growth that has become established following some interference, such as cutting, serious fire, or insect attack, with the previous Forest crop.

SEDIMENT – Earth material transported, suspended, or deposited by water.

SEEDLINGS AND SAPLINGS – Live trees less than five inches in diameter at breast height. See also SIZE CLASS.

SENSITIVE SPECIES – Plant or animal species that are susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on an official State list, or that are recognized by the Regional Forester as needing special management to prevent placement on Federal or State lists.

SERAL – A biotic community which is a developmental, transitory stage in an ecological succession.

SHOAL – Area of shallow water.

SILVICULTURAL EXAMINATION – The process used to gather the detailed in-place field data needed to determine management opportunities and direction for the forest resource within a small subdivision of a Forest area, such as a stand. Also, Stand Exam.

SIVICULTURAL SYSTEM – A management process whereby Forests are tended, harvested, and replaced, resulting in a Forest of distinctive form. Systems are classified according to: 1) the method of carrying out the fellings that remove the mature crop and provide for regeneration, and 2) the type of forest thereby produced.

SILVICULTURE – The art and science of controlling the established, composition, and growth of forests.

SITE INDEX – A numerical evaluation of the quality of land for plant productivity, based on the height of dominant trees in a stand at an arbitrarily chosen age.

SITE PREPARATION – An activity (such as prescribed burning, disking, and tilling) performed on a reforestation area, before introduction of reforestation, to ensure adequate survival and growth of the future crop.

SITE PRODUCTIVITY – Production capability of specific areas of land.

SIZE CLASS – For the purposes of Forest planning, size class refers to the intervals of tree stem diameter used for classification of timber in the LRMP database.

Seedling/sapling = less than five-inch diameter
pole/sapling or pole timber = five-inch to nine-inch diameter
sawtimber = greater than nine-inch diameter

SKIDDING – A general term for hauling loads by sliding, not on wheels, as developed originally from stump to roadside, deck, skidway, or other landing.

SLASH – The residue left on the ground after tree felling and tending, and/or accumulating there as a result of storm, fire, girdling, or poisoning. It includes unutilized logs, uprooted stumps, broken or uprooted stems, the heavier branchwood, etc.

SMALL GAME – Birds and small mammals normally hunted or trapped.

SNAG – A standing dead tree.

SOCIO-ECONOMIC – Pertaining to, or signifying the combination or interaction of social and economic factors.

SOIL – The portion of the earth's surface consisting of disintegrated rock and humus.

SOIL PRODUCTIVITY – The capacity of a soil to produce a specific crop such as fiber or forage under defined levels of management. Productivity is generally dependent on available soil moisture and nutrients, and length of growing season.

SOIL RESOURCE INVENTORY - See SOIL SURVEYS.

SOIL SURVEYS - Systematic examinations of soils in the field and in laboratories, their description and classification; the mapping of kinds of soil; the interpretation according to their adaptability for various crops, grasses, and trees, their behavior under use or treatment for plant production or for other purposes, and their productivity under different management systems.

SOIL TEXTURE - The relative proportions of the various soil separates in a soil, described by the classes of soil texture. Twelve basic soil texture classes are recognized, such as "loam." The textural classes may be modified by the addition of suitable adjectives when coarse fragments are present in substantial amounts; for example, "stony loam."

STAND (TREE STAND, TIMBER STAND) - An aggregation of trees or other vegetation occupying a specific area and sufficiently uniform in species composition, age arrangement, and condition as to be distinguishable from the forest or other vegetation or land cover on adjoining areas.

STAND COMPOSITION – The proportion of each tree species in a stand expressed as a percentage of either the total number, basal area or volume of all tree species in the stand.

STAND DENSITY – A relative measure of the amount of stocking on a forest area. Often described in terms of stems per acre, basal area, or stand density index.

STAND DENSITY INDEX (SDI) – The number of trees per acre that a stand would have at a quadratic mean diameter of 10 inches. $SDI=(trees/acre)*(Dq/10)^{1.66}$ where Dq is the quadratic mean diameter for the stand or portion thereof. (See SDImax)

STAND DIVERSITY - Any attribute that makes one timber stand biologically or physically different from other stands. This difference can be measured by, but not limited to: different age classes; species; densities; or non-tree floristic composition.

STAND EXAMINATION SURVEYS - Procedures to collect data on Forest stands.

STAND STRUCTURE – The distribution of trees in a stand, which can be described by species, vertical or horizontal spatial patterns, size of trees or tree parts, age, or a combination of these.

STANDARD - A statement that describes a condition when a job is done properly. Standards show how well something should be done, rather than what should be done.

STANDARDS AND GUIDELINES - Principles specifying conditions or levels of environmental quality to be achieved.

STREAMFLOW - The flow of water, generally with its suspended load, down a well-defined water course.

SUITABILITY - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

SUITABLE FOREST LAND - Land to be managed for timber production on a regulated basis.

SUPPRESSED VEGETATION – Trees or shrubs with crowns receiving no direct light either from above or from the sides, and that will not respond to release. Usually crowns are entirely below the general level of the canopy.

SUPPRESSION - The process of extinguishing or confining fire.

SURFACE FUELS - Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.

SUSTAINABILTY - The ability of forested systems to withstand or resist rapid and widespread structural change due to fire, insects, and disease.

T

TEMPORARY ROAD - 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 (36CFR 212.1).

THERMAL COVER - Cover used by animals to ameliorate effects of weather; for deer, a stand of coniferous trees 5 feet or taller with an average crown closure of 75 percent or more, or a pole-size or larger stand with 60 percent or more closure.

THERMONEUTRAL – The range of effective ambient temperatures in which an animal does not have to increase normal metabolic heat production to offset heat loss to the environment.

THINNING - A felling made in an immature stand primarily to maintain or accelerate diameter increment and also to improve the average form of the remaining trees without permanently breaking the canopy. An intermediate cutting.

THREATENED AND ENDANGERED (T&E) SPECIES - See THREATENED; see ENDANGERED

THREATENED SPECIES - Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. See also ENDANGERED SPECIES.

TIERING - Refers to the coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as Regional or Forest program statements, or ultimately, site-specific statements) incorporating, by reference, the general discussions and concentrating solely on the issues specific to the statement subsequently prepared.

TIMBER PRODUCTION - The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For purposes of Forest planning, the term “timber production” does not include production of fuelwood or harvest of unsuitable lands.

TIMBER STAND IMPROVEMENT (TSI) - Measures such as thinning, pruning, release cutting, prescribed fire, girdling, weeding, or poisoning of unwanted trees aimed at improving the growing condition of the remaining trees.

TOPOGRAPHY - The configuration of a surface including its relief, elevation, and the position of its natural and human-created features

TOTAL SUSPENDED PARTICULATES (TSP) - Any finely divided material (solid or liquid) that is airborne with an aerodynamic diameter smaller than a few hundred micrometers.

TRACTOR LOGGING - Any logging method that uses a tractor as the motive power for transporting logs from the stumps to a collecting point, whether by dragging or carrying the logs.

TRADE-OFF -The combination of benefits and costs that are gained and lost in switching between alternative courses of action. Trade-offs include only those portions of benefits and costs that are not common to all alternative courses of action under consideration.

TREATMENTS – Any planned manipulation of plant materials. Prescribed burning, thinning, logging, lopping are all examples of vegetation treatments.

TURBIDITY - The quantification of suspended particulates or opacity in water.

U

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 authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1).
UNDERBURNING (UB) – Use of prescribed fire under a stand of trees to decrease or remove accumulated ground fuels during periods of spring like moisture to reduce risk of wildfire

UNDERSTORY - The trees and other woody species growing under a more-or-less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

UNPLANNED IGNITION - A fire started at random by either natural or human causes, or a deliberate incendiary fire.

UNROADED AREA - Any area, without the presence of a classified road, of a size and configuration sufficient to protect the inherent characteristics associated with its roadless condition. Unroaded areas do not overlap with inventoried roadless areas.

UTILITY CORRIDOR - A strip of land, up to approximately 600 feet in width, designated for the transportation of people, energy, commodities, and communications by: railroad, state highway, electrical power transmission (66 KV and above), and/or oil, gas, and coal slurry pipelines 10 inches in diameter and larger; and telecommunication cable and electronic sites for interstate use

V

VARIABLE COSTS - Costs that vary according to the activity or output level. They may be expressed as a cost per acre or cost per unit of output.

VEGETATIVE MANAGEMENT - Activities designed primarily to promote the health of the crop forest cover for multiple-use purposes.

VIABLE POPULATIONS - That number of individuals of a species sufficient to ensure the long-term existence of the species in natural self-sustaining populations adequately distributed throughout the planning area.

VISUAL QUALITY OBJECTIVE (VQO) - Categories of acceptable landscape alteration measured in degrees of deviation from the natural-appearing landscape.

Preservation (P) - Ecological changes only.
Retention (R) - Management activities should not be evident to the casual Forest visitor.
Partial Retention (PR) - Management activities remain visually subordinate to the characteristic landscape.
Modification (M) - Management activities may dominate the characteristic landscape but must, at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.
Maximum Modification (MM) - Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.
Enhancement - A short-term management alternative that is done with the express purpose of increasing positive visual variety where little variety now exists.

VISUAL RESOURCE - The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

W

WATER YIELD - The measured output of the Forest's streams.

WATERSHED - The entire land area that contributes water to a drainage system or stream.

WETLANDS - Areas that are inundated by surface or ground water often enough to support, and usually do support, primarily plants and animals that require saturated or seasonally saturated soil conditions for growth and reproduction.

WILDERNESS - Areas designated by congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wildernesses are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or a primitive and unconfined type of recreation; are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition, and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest.

WILDFIRE - Any wildland fire that is not a prescribed fire. See also PRESCRIBED FIRE.

WILDLAND/URBAN INTERFACE (WUI) – The property line between Forest Service and private lands.

WILDLIFE – All non-domesticated mammals, birds, reptiles, and amphibians living within a natural environment, and include both game species and non-game species. Animals, or their progeny, which one were domesticated but escaped captivity and are running wild (i.e., feral animals), such as horses, burros, and hogs, are not considered wildlife.

WILDLIFE HABITAT DIVERSITY – The distribution and abundance of different plant and animal communities and species within a specified area.

WINTER RANGE HABITAT UNIT (WRHU) – Areas in the biological winter range of mule deer ranging from 15,000 to 20,000 acres.

WOOD FIBER PRODUCTION - The growing, tending, harvesting, and regeneration of harvestable trees.

X, Y, Z

YARDING - Hauling timber from the stump to a collection point.

YARDING TOPS ATTACHED – This refers to hauling the tops and limbs left attached to the last log of each tree as it is yarded to the landing for processing and is done to reduce accumulations of logging fuels within the harvest unit.

APPENDIX D

DESCRIPTION OF

TREATMENT PRESCRIPTIONS (D-2)

TREATMENT OBJECTIVES (D-4)

Description of Treatment Prescriptions

Prescription 0 – Plantation thinning – Intermediate Cutting Method
Thin from below to approximately 90 to 170 trees per acre (approximately 16 to 22 foot spacing). Wider spacing would be used in plantations with larger diameter trees.

Prescription 1 – Thin to moderate spacing – Intermediate Cutting Method
Thin from below to approximately 60 square feet of basal area per acre (approximately 40 to 90 trees per acre). Retain lodgepole pine as needed to meet desired stocking levels. Depending on existing stand condition, treatment would either be even-aged (HTH) or uneven-aged (HSL) management.

Prescription 2 – Thin to wide spacing – Intermediate Cutting Method
Thin from below to approximately 40 square feet of basal area per acre (approximately 30 to 50 trees per acre). Depending on existing stand condition, treatment would be even-aged (HTH) or uneven-aged (HSL) management.

Prescription 4 – Thin to variable spacing (Mistletoe) – Intermediate Cutting Method
Thin from below to approximately 60 square feet of basal area per acre. Where mistletoe is present, reduce mistletoe infection by removing trees with heavy dwarf mistletoe infection (DMTR $\geq$4). Regardless of level of mistletoe infection, do not reduce stocking below minimum levels (approximately 20 BA/AC or 40 SDI). Retain lodgepole pine as needed to meet desired stocking levels. Treatment would be considered even-aged management (HTH).

Prescription 6 – Uneven-aged Management – Single Tree Selection (Mistletoe) – Regeneration Cutting Method
Remove all ponderosa pine less than 21 inches dbh with moderate to high levels of dwarf mistletoe infection (DMTR >=3). Thin remaining ponderosa pine from below to approximately 60 square feet of basal area per acre. Plant ponderosa pine seedlings in areas less than minimally stocked (100 trees per acre or 40 Stand Density Index). Prune mistletoe infected trees within 65 feet of planted trees. Treatment would be considered uneven-aged management (HSL).

Prescription 7 – Uneven-aged Management – Single Tree Selection – Ponderosa Pine Restoration – Regeneration Cutting Method
Remove all lodgepole pine less than 21 inches dbh. Remove ponderosa pine less than 21 inches dbh with moderate to high levels of dwarf mistletoe (DMTR >=3). Thin remaining ponderosa pine from below to approximately 60 square feet of basal area per acre. Underburn. Plant ponderosa pine seedlings in areas less than minimally stocked (100 trees per acre or 40 Stand Density Index). Prune mistletoe infected trees within 65 feet of planted trees. Treatment would be considered uneven-aged management (HSL).

Prescription 8 – Clearcut – Regeneration Cutting Method
Over 30 to 40% of the stand, create openings 6 to 12 acres in size. Within these openings, all trees less than 21 inches dbh would be removed. Openings would be reforested by planting ponderosa pine. If mistletoe is present along the edge of the openings, no planting would be done within 65 feet of the edge to minimize potential for mistletoe to infect planted trees. Treatment would be considered uneven-aged management (HSL).

Next entry in this stand would occur within approximately 15 to 20 years. Thinning would occur outside of the created openings (at the time of the next entry it's projected that these openings would be providing hiding cover) to reduce beetle risk and maintain/improve forage.

Prescription 10 – Seed Tree Harvest – Regeneration Cutting Method
Regenerate lodgepole pine using seed tree harvest method. To provide seed, retain approximately 27 lodgepole pine per acre (approximately 40 foot spacing). Remove lodgepole pine excess to seed tree needs. Remove ponderosa pine and white fir that have poor vigor (ie: live crown ratios less than 40% or moderate to high levels of dwarf mistletoe infection (DMTR $\geq$4)).

Prescription 11 – Thin to variable spacing – Goshawk foraging – Intermediate Cutting Method
Desired condition: Primarily single-story stand structure with a mosaic of conditions present. The following are desired within portions of the stand: 1) Large trees, 2) dense stocking, 3) open understory, 4) habitat for goshawk prey (down wood/shrubs), 5) small (1/3 to 2 acres) to medium (2 to 4 acres) openings, and 6) patches of mid-age forest scattered throughout the stand.

Treatment: Over approximately 13% of the unit, thin to approximately 20 trees per acre (approximately 47 foot spacing). Generally leave the largest trees available, while leaving the best, most vigorous trees with the least amount of dwarf mistletoe. Even spacing is not required. Retain approximately 10% of the area in dense tree cover. In remaining 77% of area, thin from below to approximately 60 square feet of basal area per acre.

Prescription 12 – Thin to variable spacing – Scenic Views – Intermediate Cutting Method
Thinning by Lava River Cave and Benham Falls Picnic Area. Thinning to done to meet scenic views objectives. Around Lava River Cave, thin from below to 60 square feet of basal area per acre. Mistletoe infected trees priority for removal. Thin additional trees as needed to open up view of Cascades. By Benham Falls Picnic Area, thin to highlight large diameter ponderosa. Remove lodgepole pine within 1 to 3 times the crown radius of ponderosa pine to be featured.

Prescription 13 – Thin to variable spacing – Value added to pruned trees – Intermediate Cutting Method
Around pruned trees, thin from below to 40 square feet of basal area per acre. Away from pruned trees, denser stocking can be retained. Thin from below to 60 square feet of basal area per acre.

Prescription 14 – Sanitation cut for mistletoe - Pruning
Remove ponderosa pine with moderate to heavy levels of dwarf mistletoe (DMTR $\geq$3). Regardless of level of mistletoe infection, do not reduce stocking below minimum levels (approximately 20 BA/AC or 40 SDI). Thin remaining ponderosa pine from below to approximately 60 square feet of basal area per acre. Prune residual overstory infected with mistletoe.

Second Growth Ponderosa Pine Study

Prescription 90 – No treatment – Control
No vegetation treatment (harvest or natural fuels treatment) is planned.

Prescription 91 – Even-aged management – Thin to wide spacing – Intermediate Cutting Method
Trees will be thinned to a relatively wide spacing (30 to 40 trees per acre). The residual Stand Density Index (SDI) will be relatively low (60-90). The best dominant and codominant trees will be retained, with an emphasis on retaining trees with the least amount of dwarf mistletoe and that have been previously pruned. Leave trees not previously pruned would be pruned to 18 to 20 feet. All trees greater than 21 inches dbh would be retained.

Prescription 92 – Uneven-aged Management – Single Tree Selection – Regeneration Cutting Method
Trees will be thinned wide enough to allow ponderosa pine regeneration (natural or planted) to develop and grow. Thinning will retain 70 to 100 trees per acre (saplings size and larger). The residual Stand Density Index (SDI) will range from 75 to 110. A variety of size class trees will be removed, however all trees greater than 21 inches dbh would be retained. Emphasis will be on retaining trees with the least amount of dwarf mistletoe and trees that have been previously pruned.

Stand will be regenerated using natural regeneration. Some small patches within the openings will be planted (micro-planting) to compare natural regeneration to planting. Minimal application of herbicides will be done. Tubes would be used to protect planted seedlings from big game browse.

Prescription 93 – Uneven-aged Management – Group Selection – Regeneration Cutting Method
Across 25% of the stand, approximately 4 acre openings would be created. Within these openings, all trees less than 21 inches dbh would be harvested. In the remaining 75% of the stand, thinning will occur to levels that maximize stand growth while maintaining low to moderate beetle risk for the next 10 to 20 years.

Unit	Acres	25% of Area	Number of 4 acre openings
259	27	6.8	1
262	69	17.2	4
267	69	17.2	4

Openings will be regenerated primarily using natural regeneration. Some small patches within the openings will be planted (micro-planting) to compare natural regeneration to planting. Minimal application of herbicide will be done. Planted seedlings would be protected using either big game repellent or tubes. Plant if natural regeneration is not present within three (3) years.

Kelsey Treatment Objectives

FH: Forest Health.
- FH-1: Reduce risk of mountain pine beetle outbreak.
- FH-2: Reduce level of dwarf mistletoe infection.
- FH-3: Maintain/improve plantation growth.

NF: Natural fuels.
- NF-1: Reduce risk of high intensity/stand replacing wildfire.
- NF-2: Create defensible/safe egress route.
- NF-3: Reduce wildfire risk within urban interface zone.
- NF-4: Long term study plot protection – Reduce risk of spotting/Crown fire.
- NF-5: Reduce risk of wildfire burning into Forest Plan Allocated Old Growth Areas.
- NF-6: Maintain low fuel loadings. Reduce fine fuels (duff/needle layer/bark slough/grass/limb cast).
- NF-7: Reduce wildfire risk adjacent to Benham Falls Picnic Area.
- NF-8: Reduce wildfire risk adjacent to Lava Lands/Lava River Cave.
- NF-9: Create strategic fuel breaks.

NVM: Newberry National Volcanic Monument.
- NVM-1: Maintain/accelerate development of ponderosa pine old growth.
- NVM-2: Reintroduce fire into fire associated ecosystems.

PS: Public Safety. Increase amount of sunlight on Cottonwood Road to reduce ice.

PPR: Ponderosa pine restoration. Maintain or increase ponderosa pine dominance.

WL: Wildlife.
- WL-1: Accelerate development of single-story late or old structure (LOS).
- WL-2: Accelerate development of multi-story late or old structure (LOS).
- WL-3: Enhance bitterbrush vigor within deer habitat.
- WL-4: Maintain or enhance goshawk habitat (foraging).
- WL-5: Promote deer hiding cover and vertical stand diversity within deer habitat.
- WL-6: Increase herbaceous and forb species; reduce duff/liter layer.

SV: Scenic Views. Maintain or enhance scenic views.
- SV-1: Promote open, park-like stands.

EC: Economic. Maintain or increase potential value gain on pruned trees.

RSH: Research. Evaluate alternative silvicultural treatments in even-aged, second growth ponderosa pine.

WSR: Wild and Scenic River: Manage vegetation to protect and enhance Outstandingly Remarkable Values

APPENDIX E

IMPLEMENTATION GUIDELINES

Implementation Guidelines

Fuels

1. Retain untreated wildlife buffers and islands no closer than one quarter (0.25) mile from the boundary with private/urban land.

Forest Vegetation – Trees

1. No more than 50 percent of the live crown ratio of dominant and co-dominant ponderosa pine should be scorched during proposed underburns. *Moderate*

Herbicides

1. All applicable state and federal laws, including the labeling instructions of the Environmental Protection Agency, will be strictly followed.
2. Herbicides will be applied within the prescribed environmental conditions stated on the label, in this environmental assessment, and in issued permits.
3. Use herbicide formulations that contain only inerts recognized as generally safe by EPA, or which are of a low priority for testing by EPA (EPA Lists 3 and 4).
4. Precautions will be taken to assure that equipment used for storage, transport, or application will not leak herbicides into water or soil.
5. Both worker and public exposure monitoring is required for all herbicide application projects. Pertinent details will be documented, including herbicides used, land areas treated, dates and times of applications, people involved, and mitigation measures followed.
6. Herbicide use will be conducted in accordance with direction in Forest Service Manual 2150 (Pesticide-Use Management and Coordination). This directive includes the requirement for environmental documentation, safety planning, and training when pesticides are used.
7. Forest Service Handbook 2109.11 (Pesticide Project Handbook) will be used to direct project planning. This establishes procedures to guide managers in planning, organizing, conducting and reporting pesticide use projects. Also included is the requirement for a post-treatment evaluation report and pesticide-use report.
8. Standards and Guidelines in Forest Service Handbook 2109.12 (Pesticide Storage, Transportation, Spills, and Disposal Handbook) will be met. This defines standards for storage facilities, posting and handling, accountability, and transportation. It covers spill prevention, planning, cleanup, and container disposal requirements.
9. Project safety will be guided by Forest Service Handbook 6709.11 (Health and Safety Code Handbook, Chapter 9). This directive establishes the basic safety rules, as well as storage transportation, and disposal safety aspects. References and publications to aid worker safety training are also identified.
10. Pesticide Applicator Licensing and Training will be used as a quality control measure. The Pacific Northwest Region will continue to utilize the programs administered by the Departments of Agriculture in Washington and Oregon. Training and testing of applicators covers laws and safety, protection of the environment, handling and disposal, pesticide formulations and application methods, calibration of devices, use of labels and data sheets, first aid, symptoms of pesticide exposure, etc.

Wildlife

14. **BG-3:** Deer Habitat Seasonal Operating Restriction – To minimize disturbance of big game during winter periods, when possible, activities associated with commercial harvest, precommercial thinning, and mechanical shrub treatment should not occur during the period of December 1 through March 31 of each year within the Lava River and Green Mountain WRHU (reference M7-23). *High*
15. **BG-6:** Protect the guzzler in Unit 264 (both Alternatives) from any potential damage during project implementation. *High*
16. **CWM-1:** Within all commercial harvest and fuels treatment units develop harvest and fuels treatment prescriptions to retain existing CWM in the following quantities, Table 6. *Moderate*
17. **CWM-2:** Develop prescribed burn prescriptions to minimize charring of logs (LRMP WL-72). Fire prescription parameters will ensure that consumption will not exceed 3 inches total (1.5 inches per side) of diameter reduction in featured logs (Eastside Screens). *Moderate*
18. **CWM-3** Retain all existing logs (greater than 9 inches dbh at the large end)) for denning and foraging except where impractical because of human safety, other resource protection (such as Wildland Urban Interface), or project logistics (Such as prescribed fire treatments) *Wildlife Tree and Log Implementation Strategy, LRMP WL-38*. *High*

Soils

6. In all proposed activity areas, locations for new yarding and transportation systems would be designated prior to the logging operations. This includes temporary roads, spur roads, log landings, and primary (main) skid trail networks. (LRMP SL-1 & SL-3; Timber Management BMP T-11, T-14 & T-16). *Moderate*
7. Surface Drainage on Temporary Roads: minimize erosive effects of concentrated water through the proper design and construction of temporary roads (Road BMP R-7). *Moderate*
8. Road Maintenance: conduct regular preventive maintenance to avoid deterioration of the road surface and minimize the effects of erosion (Road BMP R-18, R-19). *Moderate to High*
9. Coarse Woody Debris/Down Wood: Retain adequate supplies of large woody debris (greater than 3-inches in diameter) to provide organic matter reservoirs for nutrient cycling following completion of all project activities (LRMP SL-1). It is recommended that a minimum of 5 to 10 tons per acre of woody debris be retained on dry, ponderosa pine sites to help maintain long-term site productivity. *Moderate*
10. Maintain duff layer: Strive to maintain existing sources of unburned or partially consumed, fine organic matter (organic materials less than 3 inches in diameter; commonly referred to as the duff layer), wherever possible, within planned activity areas. (LRMP SL-6; Fuels Management BMP F-2; Timber Management BMP T-13). *Moderate*
11. Prevent additional soil impacts in random locations of activity areas, between skid trails and away from landings, by machine piling and burning logging slash on existing log landings and skid trails that already have detrimental soil conditions (LRMP Standards and Guidelines (SL-1 and SL-3); Timber Management BMPs T-2, T-4, T-9, T-11 and T-12; Forest Service Soil and Water Conservation Practices Handbook (FSH 2509.22); Froehlich et al 1981; Clayton, 1990; Garland, 1983; Fact; Experience). *High*
12. Use existing log landings and skid trail networks (whenever possible) or designate locations for new skid trails and landings. *High*
13. Maintain spacing of 100 to 150 feet for all primary (main) skid trail routes, except where converging at landings. The Timber Sale Administrator must approve closer spacing, due to complex terrain, in advance. Main skid trails spaced 100 feet apart limit soil impacts to 11 percent of the unit area. For the larger activity areas (greater than 40 acres) that can accommodate wider

spacing distances, it is recommended that distance between main skid trials be increased to 150 feet to reduce the amount of detrimentally disturbed soil to 7 percent of the unit area (Froehlich, 1981, Garland, 1983). This would reduce the amount of surface area where restoration treatments, such as subsoiling, would be required to mitigate impacts to achieve soil management objectives. *High*

14. Restrict grapple skidders to designated areas (such as, roads, landings, designated skid trails) at all times, and limit the amount of traffic from other specialized equipment off designated areas. The use of harvester machines will make no more than two (2) equipment passes on any site-specific area to accumulate materials. *High*
15. Operate equipment, including horse logging, over frozen ground or a sufficient amount of compacted snow to protect mineral soil. Equipment operations should be discontinued when frozen ground begins to thaw or when there is too little compacted snow and equipment begins to cause soil-puddling damage (rutting). *High*
16. On steep pitches (greater than 30 percent), less than 100 feet long one pass will be permitted to harvest trees. In other areas directional felling of trees to skid trails and /or line pulling should be utilized to harvest trees. *High*

Hydrology

10. Use old landings and skidding networks whenever possible.
11. In all units, skid trails would be designated prior to the logging operations. Designating yarding and transportation systems would ensure a minimum of 80 percent of an activity area would be left in a condition of acceptable productivity potential for trees. This includes system and temporary roads, landings, and spur roads and skid trails and trails. Skid trails, landings and temporary roads would be rehabilitated/stabilized after the sale. (LRMP SL-1 & SL-3); (Timber Management BMP T-11)

Range

1. Avoid and protect fences that are constructed with primarily wood materials. Reconstruct metal and wood fences damaged during treatments (Units 20, 67, 132-136, 141, 145, 146, 154). *High*
2. Prior to treatments, Current Trend (CT) Study Plots (Unit 45) will be measured and plots and transects will be flagged. Avoid flagged CT plots to protect stakes used to locate the plot and transects. *High*
3. Leave 25-foot buffer around the water set to prevent cheatgrass spread, if present. *High*
4. Flag and avoid Parker 3-step enclosures and surrounding study areas from prescribed fire or mechanical treatments. *High*
5. Range specialists will review contracts and burning plans prior to approval and implementation. *High*

Cultural

Project Design Criteria: *Where proposed activities may impact eligible or unevaluated heritage resources, the following avoidance procedures will avert potential effects to either or both historic and prehistoric properties. The Oregon State Historic Preservation Office has agreed that with these avoidance measures, this project will have no effect on significant or potentially significant heritage resources.*

1. In units to be underburned, avoid burning in eligible and unevaluated sites; and do not construct fireline or implement other ground disturbing activities in all eligible and unevaluated sites.

2. Do not locate slash piles for burning within either eligible or unevaluated sites.
3. Avoid mowing (MST) in eligible and unevaluated historic sites and minimize turning and maneuvering of the equipment in all eligible and unevaluated sites.
4. Mechanical thinning and machine piling should avoid all eligible and unevaluated sites.
5. Commercial thinning should avoid all eligible and unevaluated sites within treatment units, landings, temporary roads, and skid trails
6. Proposed road closure and decommissioning, or conversion to trails will avoid subsoiling, water barring, or other ground disturbance methods within the boundaries of eligible and unevaluated sites.

Scenic Resource

Project Design Criteria

1. Flush cut stump to within 6 inches above the ground within 100 feet (minimum) of road corridor within Foreground Scenic View. *High*
2. Paint on backsides of all leave trees (within 100 feet from road right-of-way). When possible, use cut tree marking to minimize painted trees left behind. Remove ribbons and other markers following completion of the project. *High*
3. Slash treatment will be completed within one year for Retention and two years for Partial Retention. *High*
4. Minimize ground disturbance within the foreground viewing areas to reduce soil contrast. Design and locate skid trail and landing area at least 300 feet away from primary travel corridors if possible. *Moderate*
5. Avoid fire scorch above 2/3 of live tree crown within the foreground landscape. Severely burned damaged trees shall be removed. *Moderate*

Air Quality

1. Warning signs will be posted at prominent road junctions to inform the public of prescribed burning operations, and will remain in place until there is no visible smoke. If feasible, roads may be temporarily closed for the protection of public safety. *Moderate*
2. As part of the plan to inform the public, notify local businesses prior to the burning season and on the day of planned prescribed burning operations. Also, notify adjacent landowners of burning operations conducted in units within ¼ mile of their property. *Moderate*
3. Reduce particulate emission, such as through pulling trees with limbs attached to landings and utilize biomass versus prescribed burning, to the extent practical. *Moderate*

Best Management Practice's (BMPs) for Soil and Water Mitigation

The following BMPs will be implemented to prevent water quality degradation, primarily from sediment delivery to aquatic ecosystems. BMPs should be selected and tailored for site-specific conditions to arrive at the project level BMPs for the protection of water quality. A complete explanation of the BMPs is found in *General Water Quality Best Management Practices* (USDA, 1988) and is available at the District Office or Supervisors Office.

Roads

R1- General guidelines for the location and design of roads minimize resource damage.
R2- Erosion control plan, to limit and mitigate erosion and sedimentation.
R3- Timing of construction activities, to minimize erosion by avoiding wet weather

conditions.
R6- Dispersion of subsurface drainage associated with roads to minimize road failure.
R7- Control of surface road drainage associated with roads to minimize erosion and sedimentation.
R8- Constraints related to pioneer road construction to minimize sedimentation.
R9- Timely erosion control measures on incomplete roads and stream crossing projects.
R11- Control of sidecast faterial where needed to minimize sedimentation.
R15- Disposal of right-of-way and roadside debris to prevent adverse effects to aquatics.
R19- Road surface treatment to prevent loss of materials.
R20- Traffic control during wet periods to minimize erosion and rutting.
R23- Obliteration of temporary roads and landings to reduce sedimentation.

Timber
T1- Timber sale planning to introduce water quality and hydrologic considerations into the sale planning process.
T2- Timber harvest unit design to ensure favorable conditions for aquatics.
T3- Use of erosion potential assessment for timber harvest unit design.
T5- Limiting the operating period of timber sale activities.
T6- Protection of unstable lands to minimize resource damage.
T7- Streamside management unit designation to protect aquatics.
T8- Streamcourse protection to protect the natural flow of streams.
T9- Determining tractor loggable ground.
T10- Log landing location to minimize effects to aquatics.
T11- Tractor skid trail location and design.
T13- Erosion prevention and control measures during timber sale operations.

Fire and Fuel Management Units
F2- Consideration of water quality in formulating prescribed fire prescriptions.
F3- Protection of water quality during prescribed fire operations.
F4- Minimizing watershed damage from fire suppression efforts.
F5- Repair or stabilization of fire suppression related watershed damage.

Watershed Management
W5- Cumulative watershed effects to protect beneficial uses.
W7- Water quality monitoring to establish trends and protect aquatics.

Vegetative Manipulations
VM2- Tractor operations excluded from wetlands and meadows.
VM4- Soil moisture limitations for tractor operation to avoid rutting and erosion.

APPENDIX F

PAST

PRESENT

AND

FORESEEABLE FUTURE ACTIONS

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

The following is a summary of past, ongoing, or reasonably foreseeable actions that, when relevant to the environmental analysis of each resource, were considered during the cumulative effects analysis.

18 Fire Hazard Tree Removal CE – Completed – 2004
18 Fire Salvage EIS – This project was analyzed for salvage of fire killed trees and for road closure and decommissioning – Completed – 2005

Lava Cast Planning Area – Vegetation Management – This project would include prescribed burning, mechanical shrub treatment, non-commercial thinning, commercial harvest, and associated activities – Expected Completion of Analysis, 2006
Opine Planning Area – Vegetation Management – This project would include prescribed burning, mechanical shrub treatment, non-commercial thinning, commercial harvest, and associated activities – Expected Completion of Analysis, 2006
East Tumbull Planning Area – Vegetation Management – This project would include prescribed burning, mechanical shrub treatment, non-commercial thinning, commercial harvest, and associated activities – Expected Completion of Analysis, 2006

Fuzzy Planning Area: Vegetation Management EA: Signed in 2001 – Implementation activities will be ongoing through 2010
Cinder Hill Range Allotment EA: Reauthorized grazing on three (3) grazing allotments totaling approximately 89,210 acres: Signed – 2004

Lava Lands Non-commercial Thinning CE: Completed – 2002
Lava River Caves Mistletoe Reduction CE: Completed – 2002
Highway 97 Barriers: Completed – 2004
Oregon Department of Transportation Weigh and Safety Station: Completed – 2004

Deschutes National Forest Access Management: This project would focus on motorized recreation including: 1) the development of a designated OHV trail system, staging areas, and play areas and 2) access on Forest roads.
Lava Lands Visitor Center Road Reconstruction: Reconstruction of Lava Butte road, completed 2005.
Project Specific Danger Tree Treatment associated with the use of the transportation system, and activities adjacent to the transportation system for public safety.

Oregon Department of Transportation:
- Development of Sunriver Interchange at Highway 97 and Forest Road 40 – 2005 through 2006;
- Widening of Highway 97 to four lanes, north from Sunriver Interchange to end of existing four lane highway;
- Upgrade Cottonwood Road Interchange;
- Change access to Lava Lands Visitor Center – Close Highway 97 access and develop road from Cottonwood Road to Benham Falls Road, location presently undetermined;

Change access to Lava River Cave – Close Highway 97 access and develop access from the Cottonwood Interchange to utilize old Highway 97 north to the cave.

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