USDA

United States
Department of
Agriculture

Forest
Service

May 2004

ALTERNATIVES

ALTERNATIVE 1 – NO ACTION
ALTERNATIVE 2 – PROPOSED ACTION
ALTERNATIVE 3

ALTERNATIVE 3 is the PREFERRED ALTERNATIVE

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SUMMARY

The Bend-Fort Rock Ranger District of the Deschutes National Forest, Oregon, proposes to improve and protect Forest Service managed lands within the Kelsey planning area. The proposed activities would occur within the following management areas: Deer Habitat, General Forest, Scenic Views, Wild and Scenic Rivers, and the Newberry National Volcanic Monument (NNVM). The proposed activities would occur within:

- The Bend southern urban growth boundary Wildland/Urban Interface and Sunriver Wildland/Urban Interface.
- The western one-third of Newberry National Volcanic Monument (NNVM).
- A portion of the Upper Deschutes Wild and Scenic River Corridor.
- The Ryan Ranch Key Elk Habitat east of the Deschutes River.
- Critical deer winter range.

The proposed activities are needed to: 1) provide an environment of reduced fire risk for forest users and adjacent landowners; 2) transition toward a more stable forest ecosystem by creating forest conditions that are more resilient and resistant to disturbance; 3) protect and enhance wildlife habitat; and 4) maintain or enhance scenic views in areas proposed for treatment.

The proposed vegetative and fuel reduction activities presented in Alternative 2 (Modified Proposed Action) and Alternative 3 would focus on and treat those areas identified at high risk to disturbance. Treatments are intended to sustain, enhance, and protect long-term productivity and resiliency of the forested ecosystem while developing, enhancing, maintaining, and/or protecting wildlife and fish habitat. The proposed treatments would reduce the risk of high intensity fires, disease pathogens, and insect vectors to levels likely encountered in the historic past.

Alternative 3, the Preferred Alternative, would include vegetative and/or fuel treatments on approximately 11,080 acres. Proposed treatments may overlap within proposed units**:**

- Mechanically treat brush and/or prescribe burn on approximately 9,830 acres to reduce fire flame lengths and transition towards a more historic low intensity and frequent fire regime. .
- Reduce tree stocking on approximately 6,585 acres through non-commercial and commercial thinning.
- Treat approximately 3,225 acres of Wildland/Urban Interface to protect .
- Treat approximately 4,430 acres with severe infection of dwarf mistletoe to improve stand resiliency.
- Treat approximately 4,430 acres to reduce imminent susceptibility to bark beetle attack.

In addition to the modified proposed action, the Forest Service also evaluated the following alternatives:

- Alternative 1 (No Action): Management activities would continue as are presently occurring and/or allowed.
- Alternative 2: This is the Modified Proposed Action and is similar to Alternative 3, the Preferred Alternative. This alternative was originally presented during public scoping during October 2001. This alternative proposes approximately 1,330 fewer acres of vegetation management activities than Alternative 3.

Based upon the effects of the alternatives and public input, the responsible official (District Ranger) will decide whether or not to initiate non-commercial thinning, commercial thinning, prescribed burning, mechanical shrub treatment, aspen enhancement, seasonal road closures, and road closures and decomissioning.

FIGURE 1

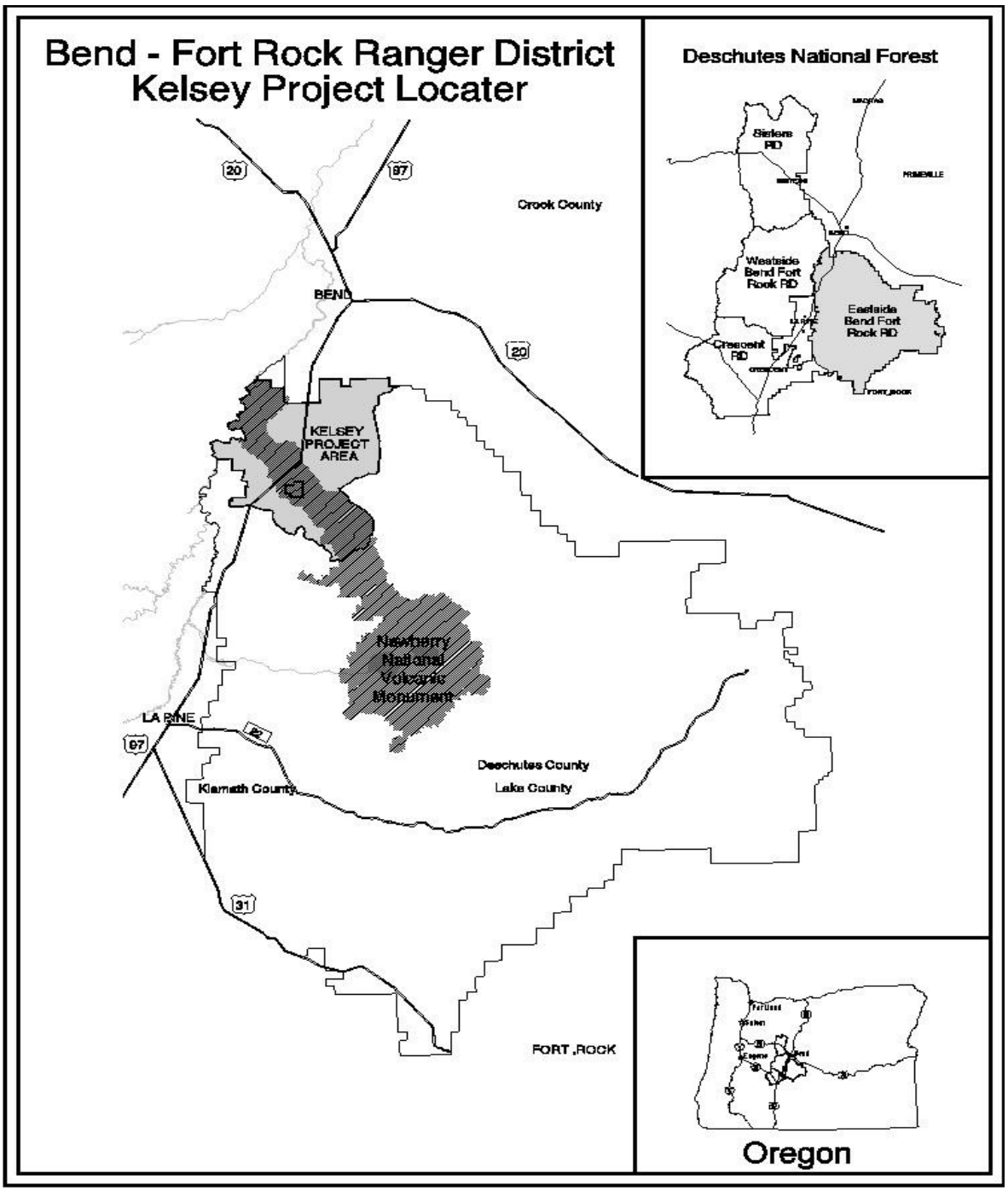
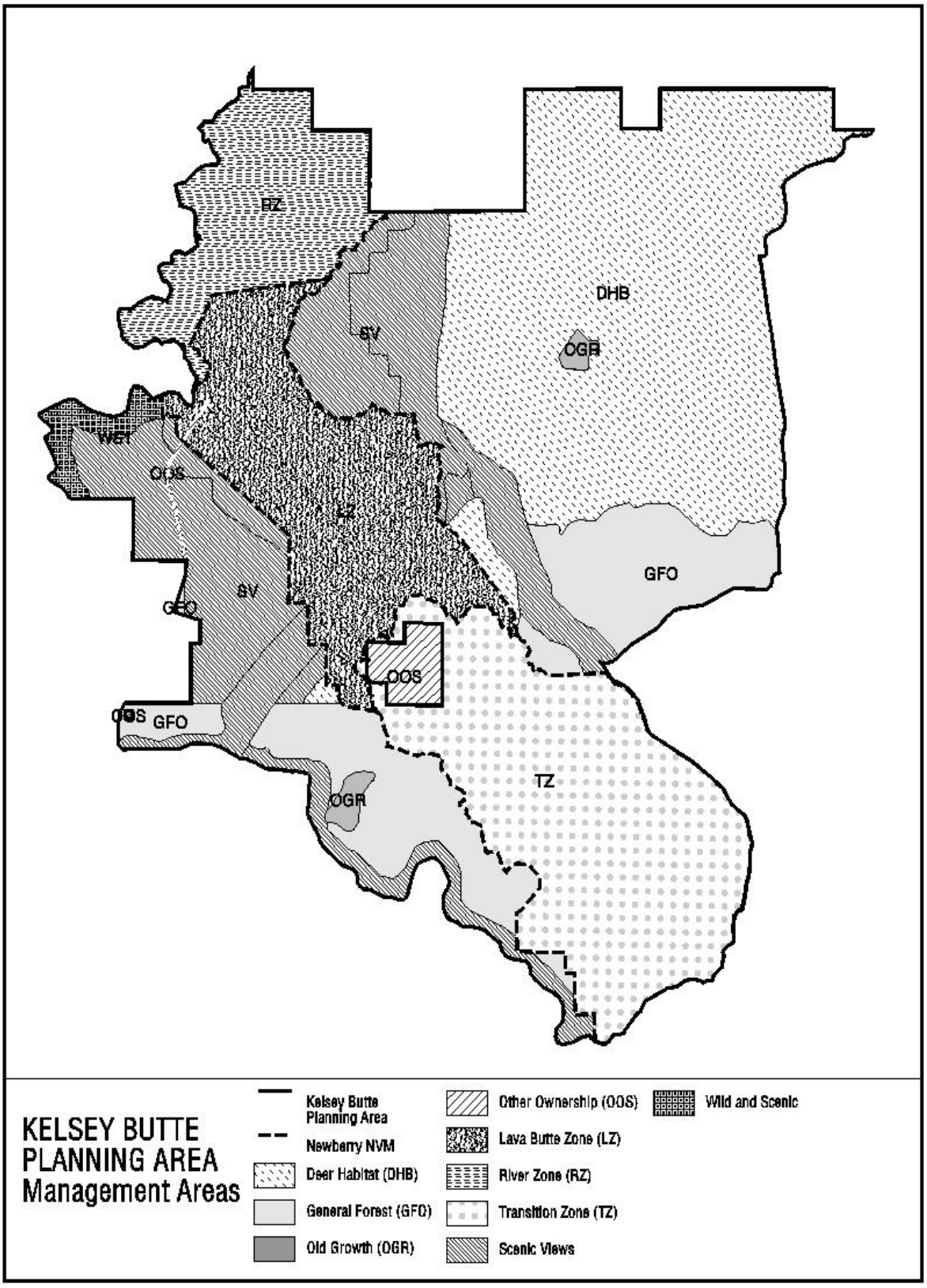

Bend - Fort Rock Ranger District
Kelsey Project Locater
Deschutes National Forest
Sisters RD
Westside Bend Fort Rock RD
Eastside Bend Fort Rock RD
Crescent RD
20
97
Crook County
BEND
KELSEY PROJECT AREA
Newberry National Volcanic Monument
LA PINE
Deschutes County
Lake County
Klamath County
31
FORT ,ROCK
Oregon

FIGURE 2


BZ
DHB
OGB
SV
WET
OOS
LZ
GFO
SV
GFO
OOS
OOS
GFO
TZ
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DOCUMENT STRUCTURE

The Forest Service has prepared this Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into FIVE parts:

- ***Introduction:*** Includes information on the history of the project proposal, the purpose of and need for the project, the agency's proposal for achieving that purpose and need, and public involvement.
- ***Alternative Discussion:*** Provides a detailed description of the alternatives for achieving the stated purpose. Alternatives were developed based on significant issues raised by the public and Forest Service. A comparison table of the activities of each alternative is included. Mitigation measures that would prevent adverse effects to the environment, through alternative implementation, are listed.
- ***Affected Environmental and Environmental Consequences:*** Describes the existing condition of each resource and the effects each alternative would have on the environment. The effects of the No Action Alternative provide a baseline for evaluation and comparison of the other alternatives.
- ***Agencies and Persons Consulted:*** Provides a list of preparers and agencies consulted during the development of the environmental assessment.
- ***Appendices:*** The appendices provide more detailed information to support the analyses presented in the environmental assessment.

INTRODUCTION

The Bend-Ft. Rock Ranger District of the Deschutes National Forest has analyzed vegetation and natural fuel reduction treatments within the Kelsey planning area. The Kelsey Vegetation Management Environmental Assessment was scoped for public comment during October 2001. Analysis has continued since that time. This EA was originally scoped, and was to be analyzed in the same EA, with other Kelsey activities (Kelsey Fish Habitat Improvement CE and Kelsey Non-motorized Trail EA) that were later analyzed separately. The special order prohibiting OHV use along the southern urban growth boundary Wildland/Urban Interface, signed by Forest Supervisor, Leslie A.C. Weldon, December 21, 2001, will continue to be enforced. Overall off highway vehicle (OHV) use is expected to be analyzed at a later date, although use on Forest Roads is discussed on Page 9.

A wildfire in July 2003 burned approximately 3,520 acres within the planning area along the northeast boundary, with an additional 290 acres burned in the adjacent Fuzzy planning area. The planning area boundary, the purpose and need, and the decision to be made have remained the same as before the fire. Approximately 1,085 acres that were proposed for vegetation treatments within the fire perimeter have been removed from this analysis. The changes are reflected in the renamed Alternative 2 (Modified Proposed Action). The area within the fire perimeter is being analyzed separately from this environmental assessment.

The planning area, 46,175 acres (Figure 1, page 4), including 570 acres of private land, is located adjacent to Bends south urban growth boundary and borders the Deschutes River and Sunriver to the west and southwest. It includes a portion of the Newberry National Volcanic Monument (18,140 acres of the planning area), and is adjacent to the High Desert Museum. Elevations range from 3,900 to 6,000 feet. The planning area is located in Townships 18, 19, and 20 South, Ranges 11 and 12 East.

The planning area lies outside the range of the Northwest Forest Plan (NFP) boundaries. There are no inventoried (RARE II) roadless areas or known Threatened or Endangered species. Within the planning area there are 1) bufflehead ducks and redband trout, both listed as sensitive on the Region 6, Regional Forester's Sensitive Species List; 2) cultural resources; 3) populations of noxious weeds; and 4) five management area (MA) allocations (figure 2, page 5 and page 10).

PURPOSE OF AND NEED FOR ACTION

Changes in forest density, forest composition, and public use have occurred across the Kelsey planning area since the early 1900's when wildfire suppression activities began. Historical low intensity fires maintained and thinned ponderosa pine stands by reducing fuels on an 8 to 15 year cycle (**Agee 1993**). Unmanaged ecological succession is not practical in areas near the wildland/urban interface and intervention using thinning and fire/fuel hazard reduction treatments is necessary. Diversity in stand structure and thermal and hiding cover in critical winter mule deer habitat is below what may be considered optimum. Much of the wildland/urban interface **(WUI)** is adjacent to developed residential communities. Along the WUI, population density has increased substantially with an associated increase in various forest recreational uses. The planning area encompasses approximately 10 miles of the east bank of Deschutes River, within the Upper Deschutes Wild and Scenic River boundary, from Sunriver to the southern urban growth boundary of Bend. The Upper Deschutes Wild and Scenic River Management Plan is designated as Scenic with the intent of protecting its largely undeveloped character. A portion of Newberry National Volcanic Monument is a part of and bisects the planning area. The Monument plan guides management and restoration activities within its boundary.

The purpose and need for action of the Kelsey Vegetation Management EA is to analyze the effects of the proposed treatments. The need for action is to: 1) provide an environment of reduced fire risk for forest users and adjacent landowners; 2) transition toward a more stable forest ecosystem by creating forest conditions that are more resilient and resistant to disturbance; 3) protect and enhance wildlife habitat; and 4) maintain or enhance scenic views.

Fuels and Vegetation: The planning area is comprised primarily of single-story, immature ponderosa pine. Little published information exists comparing short- and long-term effects (20-years or more) of various vegetative treatments on stand/forest attributes, other than tree growth, in even-age, second growth ponderosa pine forests. An opportunity is being provided for analysis of long-term study plots and add to existing scientific data through data collection while meeting the purpose and need for action. The planning area has areas of severe infestations of dwarf mistletoe or is susceptible to bark beetle. Large, contiguous areas of well-developed and highly flammable shrubs, high stand densities, and other natural fuels increase the risk of high intensity wildfire. There is a need to: 1) reduce the risk of high-intensity, stand replacement wildfire; 2) protect developments adjacent to the wildland/urban interface and other resources, improvements, and investments; 3) improve long-term forest productivity and resiliency to disturbance; and 4) accelerate ponderosa pine dominance and growth of young forests.

Wildlife Habitat: Wildlife species associated with historical large, single-story ponderosa pine, are probably less abundant than prior to suppression of natural fire. The primary habitat is presently single-story, immature (50-80 years) ponderosa pine with low numbers of snags and down woody debris. A diversity of productive grasses, forbs, shrubs, and tree age classes are necessary for the vitality, resiliency, and continuation of deer habitat. There is a need to: 1) increase the amount of late and old structure ponderosa pine; 2) enhance horizontal and vertical tree diversity and deer hiding and thermal cover; and 3) improve deer forage diversity and productivity.

Scenic Quality: High-density vegetation blocks views of areas with high natural scenic quality, particularly distant views and along designated scenic corridors including the Deschutes River. There is a need to promote the inherent scenic qualities of open park-like stands of ponderosa pine, views of the Cascade Range, and the Outstandingly Remarkable Values of the Wild and Scenic River corridor.

ALTERNATIVE 2 (MODIFIED PROPOSED ACTION)

This alternative was developed prior to public scoping in October 2001. The Kelsey planning area was assessed to identify and prioritize specific areas across the landscape that have a high risk of disturbance, including natural and human caused wildfire, insect infestation, and disease vectors. The proposed vegetative and fuel reduction activities would focus on and treat those areas identified at high risk to disturbance. Treatments are intended to sustain, enhance, and protect long-term productivity and resiliency of the forested ecosystem while developing,

enhancing, maintaining, and/or protecting wildlife and fish habitat. The proposed treatments would reduce the risk of high intensity fires, disease pathogens, and insect vectors to levels likely encountered in the historic past.

Proposed actions include vegetative and/or fuel treatments on approximately 9,750 acres across the planning area that address forest conditions within the planning area **(**Table 1 and Table 2, page 15**)**. These treatments would: 1) reduce tree stocking on approximately 5,665 acres through non-commercial thinning, commercial thinning, and prescribed burn; 2) protect and enhance wildlife habitat on approximately 4,740 acres; 3) treat approximately 3,980 acres with severe infection of dwarf mistletoe to improve stand resiliency; and 4) mechanically treat brush and/or prescribe burn on approximately 9,005 acres to reduce fire flame lengths and transition towards a more historic low intensity and frequent fire regime. Proposed treatments may overlap within proposed units. **All measurements in this document are approximate**.

Table 1: Alternative 2 (Proposed Action) – Vegetation, Fuels, and Associated Treatments

Treatment Type	Acres	Description
Mechanical Shrub Treatment and/or Prescribed Fire	4,035	Mechanical Shrub Treatment – Mechanical Mowing of Shrubs Prescribed Fire – Burn under late and old structure ponderosa pine or underburn to reduce shrub and tree density Thinning – Cutting conifers to reduce tree density – Both commercial and non-commercial Tree planting – Reforestation of thinned acres Sub-soiling – Tilling soil for reforestation or road rehabilitation Pruning – Hand removing tree limbs
With Non-commercial Thinning and/or Pruning	745	
Commercial Thinning and Mechanical Shrub Treatment and/or Prescribed Fire	2,220	
With Non-commercial Thinning and/or Pruning	2,000	
With Tree Planting	280*	
With Sub-soiling	740*	
Commercial Thinning	505	
With Non-commercial Thinning and/or Pruning	245	
With sub-soiling	15*	
Total Acres	**9,755**	

*: Acres are overlap acres and not counted in total acres. Refer to Table 2, page 15.

Road Management: Approximately 56.4 miles of 250 miles of open system roads are proposed for closure or decommissioning. Road miles would be reduced from approximately 4.0 miles per square mile to approximately 2.9 miles per square mile. Refer to Figure 7, page 23 and Figure 8, page 26 for proposed road closures.

Off Highway Vehicle (OHV) Management: Use of OHVs off Forest system roads would be prohibited unless designated open to off-road travel.

DECISION TO BE MADE

Based on this Environmental Assessment, resource specialists reports and biological evaluations, the Forest Supervisor, Deschutes National Forest, will decide whether to:

- Use mechanical shrub treatments, prescribed burning, non-commercial thinning, and/or commercial thinning, and pruning to 1) improve forest health; 2) reduce natural fuels and wildfire risk; 3) improve/protect wildlife habitat; and 4) improve scenic views.
- Plant tree seedlings, following group thinning, in units within deer habitat to provide structural diversity for deer habitat.
- Apply herbicides around planted seedlings to reduce competition from grasses and shrubs.
- Reconstruct roads associated with proposed commercial thinning units to provide safe access for vehicular traffic.
- Close and decommission roads to mitigate reductions in vegetation within deer and elk thermal and hiding cover habitats, improving habitat effectiveness.
- Prohibit Off Highway Vehicle use off Forest system roads unless areas are designated open to mitigate reductions in vegetation within deer and elk thermal and hiding cover habitats, improving habitat effectiveness.
- Implement a seasonal road closure within Deer Habitat (MA-7) to reduce intentional /unintentional harassment in mule deer winter range during critical times of feeding and fawning.

DOCUMENTS TIERED TO

This section lists signed documents that are tiered to and provides a discussion of each document regarding management allocations and direction**.**

- **1990 Deschutes National Forest Land and Resource Management Plan** (***Forest Plan***) and its accompanying Final Environmental Impact Statement as amended by the Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales (Eastside Screens): "The National Forest Land and Resource Management Plan (Forest Plan or Plan) was developed to guide all natural resource management activities and establish standards/guidelines for the Deschutes National Forest. The Purpose of the Plan is to provide form the use and protection of Forest resources, fulfill legislative requirements, and address local, regional, and national issues and concerns." Following is a brief summary of the goals in each Management Allocation (MA) (Figure 2, page 6) located within the planning area:
  - Deer Habitat (MA-7): 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.
  - General Forest (MA-8): Emphasize timber production while providing forage production, visual quality, wildlife habitat and recreation opportunities for public use and enjoyment.
  - Scenic Views (MA-9): Provide Forest visitors with high quality scenery that represents the natural character of Central Oregon.
  - Old Growth (MA-15): 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.
  - Wild and Scenic Rivers (MA-17): To protect the outstandingly remarkable values identified and maintaining the free flowing nature of the river.

- **1994 Newberry National Volcanic Monument Comprehensive Management Plan** (***Monument Plan***): guides all management and restoration activities within the Monument and is consistent with the intent of the Wild and Scenic Rivers Act within the river corridor. The Monument Plan takes precedence over the Forest Plan. The Monument legislation requires for natural ecological succession of vegetation to the maximum extent practical. It also requires the management plan to consider a program to reestablish old-growth ponderosa pine ecosystems. Three Monument (3) management zones are within the Kelsey planning area:
  - River Zone: Minimize disturbance to wildlife habitats, while ensuring their long-term sustainability and diversity. Direct recreation use away from this zone.
  - Lava Butte Zone: Serve a large number of day-use visitors with a variety of short-term, day oriented interpretive programs and recreation opportunities. Manage facilities to support a comprehensive theme-based interpretive program. 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: Serve visitors interested in day-use recreational and interpretive opportunities, with emphasis on trail opportunities, both recreational and interpretive. Work to reduce fuel loads enough to allow safe reintroduction of fire (prescribed) without endangering large, old growth ponderosa pine.

- **1996 Upper Deschutes Wild and Scenic River and State Scenic Waterway Comprehensive Management Plan** (***River Plan***): 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 to be within section 4a and 4b of the Recreational Opportunity Spectrum. Sections 4a and 4b are designated as "Scenic." Scenic is defined as "Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads."

- Section 4a – Roaded Natural: A small portion of land may be privately owned. 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: About half of the land may be privately owned. Facilities (shelters, buildings, roads, campgrounds, parking lots, etc.) are present and visitors are likely to encounter many other people. Parts of the landscape have been modified, and the sights and sounds of other people will be readily evident. Aquatic, riparian, and upland vegetation all have a significant effect on all other river values and is an outstandingly remarkable river value. Page 29 within the River Plan describes the standards for vegetation. 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.

• **1995 Inland Native Fish Strategy (*INFISH*):** delineated Riparian Habitat Conservation Areas (**RHCAs**) for riparian-dependent resources to receive primary emphasis. 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.

DOCUMENTS INCORPORATED BY REFERENCE

• 1998 Deschutes National Forest Integrated Fuels Management Strategy (**IFMS**): "The IFMS provides guiddance for prescribed fire, mechanical brush mowing, and small diameter tree thinning and release.." "The IFMS Recommended Strategic Actions are not required to implement the natural fuels activities, but were developed to assist the Forest with program development towards meeting long term goals in an integrated, adaptable and effective manner."

• 1998 Deschutes National Forest Noxious Weed EA: "Together, the EA and Integrated Weed Management Plan (**IWMP**) represent an effort to manage noxious weeds on the Deschutes National Forest in a manner consistent with direction provided in the Regional Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation, its Record of Decision, and the associated Mediated Agreement."

PUBLIC INVOLVEMENT/SCOPING PROCESS USED

Announcement of the proposed Kelsey project was included in the Central Oregon Schedule of Projects in the 1999 summer edition. This notification, through quarterly mailings, reaches approximately 3,200 interested individuals and groups. A Forest Service letter requesting public involvement was provided in October of 2001 to approximately 220 individuals, businesses, and organizations that have expressed an interest in the project development process. Included in the mailing was The Bulletin, the local newspaper that reported on the original Proposed Actions. The scoping letter was also placed on the United States Forest Service (**USFS**) web site.

COMMENTS RECEIVED FROM THE PUBLIC

Scoping responses were received from 35 groups or individuals. The comments are grouped and summarized in the following discussion, used as issues used in alternative design (Page 13), or are addressed under alternatives considered but eliminated from detailed analysis (Page 14).

Thinning and Fuels Reduction Treatments

• Encourage more emphasis on commercial thinning – widen tree spacing and reduce fuel loading for prescribed burning, restore vigor to suppressed trees, enhance opportunity for more forage. Seedlings to old growth should be

managed together. Dense stands of ponderosa and lodgepole pine are creating forest health hazards. Overall forest health should be your priority. ***Response:*** *These comments are addressed within the alternatives.*

- Size and age should not be the factors you base management decisions on. ***Response:*** *Tree size and age are only two of the factors that have been used in developing proposed treatments. The goals of the various resources include size and age in determining the moving toward the desired condition of each resource.*
- Do salvage sales in areas where beetle kill has occurred. ***Response:*** *Salvage sales have occurred in areas of substantioal beetle kill. Within the planning area, beetle kill is presently low within a high risk forest. Proposed activities include reducing beetle kill risk through tree density reduction.*
- There is agreement for the need to transition toward an increase in late and old structure, however, commercial logging has never resulted in such a transition. It hasn't been shown that commercial harvest will promote late and old structure ***Response:*** *Commercial thinning is a component of a transition toward an increase in late and old structure. Thinning to reduce density to improve individual tree growth, reduce the risk of insects and disease to trees, reduce the risk of fire, and improve wildlife habitat for both big game and species dependent on late and old structure ponderosa pine would be done through both commercial and non-commercial thinning. A reduction in density generally favors increased tree growth, in both diameter and height, with the potential to reach large tree status quicker than without thinning..*
- Do not support scientific studies that provide for the destruction of forests. ***Response:*** *The proposed Oregon State University research project is intended to analyze results of tree responses to proposed treatments. Results would benefit all natural resource specialties including the development of late and old structure ponderosa pine for wildlife needs, scenic views, and commercial harvest when and where appropriate. Results would also add to known existing publications regarding the growth/regeneration response that could occur with similar proposed activities.*
- Timber management in Newberry National Volcanic Monument should be designed to be consistent with the goal of returning the area to natural ecological processes. Thinning to allow prescribed burns should not have a commercial orientation to timber prescriptions. Substantial work needs to be done to return the National Monument to a condition where natural ecological processes can proceed. ***Response:*** *Prescribed burning is, ultimately, the preferred method to reduce natural fuels and maintain a low wildfire risk within Newberry National Volcanic Monument. Initially, mechanical treatments are necessary to reduce the risk of a high intensity prescribed burn that could result in large tree mortality.*
- Support vegetation thinning to increase the winter sun on Cottonwood Road. ***Response:*** *This comment is addressed within the alternatives. Thinning is proposed to improve public safety on Cottonwood Road by increasing the winter sun to reduce road ice.*
- High levels of natural fuels are creating risks to stands of timber, winter habitat of mule deer, private property and power lines. ***Response:*** *This comment is addressed within the alternatives. The proposed action alternatives address natural fuels reduction through a variety of treatments.*

Wildlife and Habitat

- Stand density lacking mosaic of openings for big game and sharp-shinned and Coopers hawks. Lacks open, park like stands for other species such as white-headed woodpecker. ***Response:*** *An alternative has been developed with a ratio of 60:40 forage:cover ratio in wetter sites and 70:30 forage:cover ratio in drier sites with cover in 5-30 acre patches less than 1200 feet apart. Thinned areas would encourage development of shrubs, forbs, and late and old structure habitat that would benefit species that appear to require open, park like stands. It is proposed to create small openings of two (2) to 12 acres in two (2) units that would be planted with seedlings to create structural diversity in deer habitat. Connectivity and old structure corridors would be identified. Summer, transition, and winter range forage would be enhanced.*

Riparian

- Encourage wide riparian buffers through fencing and signing and even minimal amounts of overstory removal if no negative impacts will occur to aquatic species. ***Response:*** *A narrow width of riparian vegetation exists along the Deschutes River that is the western boundary of the planning area. Most of the proposed treatments would be*

located outside of those areas that are considered riparian. Proposed treatments are primarily located within upland vegetation although some of the units would be within the Riparian Habitat Conservation Area (RHCA) that extends 300 feet from the rivers edge. No negative impacts would be expected to occur to aquatic species as a result of the proposed treatments. The proposed treatments would improve vegetative conditions and reduce the risk of a high intensity wildfire within the RHCA. Fencing and signing this area would not be necessary.

Socio-Economic

- An assessment of the social structure over the next 50-100 years is just as important as the desire to restore natural functions/processes. Manage the forest for existing and future values (out 50 years) instead of historic conditions. ***Response:*** *The short- and long-term strategy of proposed vegetative treatments are designed to: provide continued deer winter range; reduce the wildfire risk along the Wildland Urban Interface and within the overal planning area; provide and enhance late and old structure ponderosa pine for wildlife and human aesthetic pleasure; improve overall scenic views; and reduce the risk of insect vectors and disease pathogens.*

Other Comments

- An EIS is the appropriate analysis for this project. Request a full EIS due to potential environmental effects and size of area involved. ***Response:*** *It has been determined through an in-depth analysis of resources and the associated effects on the human environment, that a significant impact would not occur and an environmental assessment is the appropriate document for the Kelsey planning area.*

ISSUES USED IN ALTERNATIVE DESIGN

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 Modified Proposed Action, alternative development, and analysis of the effects of actions. These comments were used to formulate issues and to design alternative activities and/or mitigations. Some comments were used to explore alternatives that were not further developed. Internal Forest Service comments and analysis were also used in the development of alternatives.

The following issues were the basis for designing Alternative 3. Each issue statement is followed by a more detailed explanation. Each issue 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 (Table 10) is located on page 27.

- ***Issue #1:*** Following proposed treatments, 30 to 80 percent of several management allocations within the planning area would remain imminently susceptible to bark beetles. In the event of a bark beetle outbreak, the goals and objectives of the management areas may be compromised.
- ***Discussion:*** A relatively high percent of the following allocations would continue to be imminently susceptible to bark beetle attack: General Forest (51%), Deer Habitat (35%), Scenic Views (Foreground, Partial Retention (43%) and Middleground, Retention (34%)), Old Growth (80%), and Deschutes River, Scenic Section (78%). Imminently susceptible areas would likely experience significant change in structure or character as a result of a bark beetle attack.
- ***Unit of Measure:*** Acres imminently susceptible to bark beetle attack proposed for treatment.

- ***Issue #2:*** Previously pruned areas are in need of thinning so that growth and commodity value are not lost.
- ***Discussion:*** Several areas have been previously pruned within the General Forest Management Area. As described on page eight (8), General Forest emphasizes timber production. Thinning these areas is needed to optimize growth and commodity value.
- ***Unit of Measure:*** Acres of previously pruned stands proposed for thinning.

- ***Issue #3:*** Following proposed fuel reduction activities, areas of highly flammable shrubs would remain untreated in the Wildland/Urban Interface and adjacent to defensible space corridors.
- ***Discussion:*** Further analysis and field reconnaissance following development of the Modified Proposed Action identified a need to provide additional acres of fuels treatments along Forest Road 9710, Forest Road 9720 within the Monument, and along the Wildland/Urban Interface of Lava Lands Visitor Center, Sunriver, Deschutes River Woods, Sunset View, and Woodside Ranch. The risk of high intensity wildfire without additional fuels treatments would remain adjacent to these areas.
- ***Unit of Measure:*** Acres proposed for fuels treatment adjacent to the Wildland/Urban Interface and along defensible space corridors.

- ***Issue #4:*** More emphasis should be placed on the use of fire and less on the use of mechanical (mowing) treatments within Newberry National Volcanic Monument.
- ***Discussion:*** Treatments are proposed to reduce fire hazard and reestablish historic ponderosa pine fire regimes within Newberry National Volcanic Monument. It may be possible to safely use fire without the use mechanical treatments in proposed units. Planned or natural prescribed fire is the preferred treatment (Monument Plan), although mechanical treatment (mowing and thinning) may be needed prior to safely introducing fire.
- ***Unit of Measure:*** **A**cres proposed for prescribed fire and/or mechanical treatment within the Monument.

- ***Issue #5:*** Proposed reforestation treatments would be expensive, costing approximately $500 per acre.
- ***Discussion:*** Approximately 280 acres in Alternative 2 are proposed for thinning with harvest methods that will necessitate reforestation treatments. Thinning treatments are proposed to: 1) promote deer hiding cover; 2) reduce level of dwarf mistletoe infection; 3) increase ponderosa pine stocking; or 4) create uneven-aged stand structures for scientific study. Different harvest methods may meet or partially meet treatment objectives while incurring no reforestation costs. Varying reforestation treatments may reduce reforestation costs.
- ***Units of Measure:*** 1) Total proposed reforestation acres; 2) Estimated reforestation costs.

- ***Issue #6:*** Stands thinned to relatively wide spacing (30-35 feet) would not fully utilize site growth potential.
- ***Discussion:*** Within the general forest management area, thinning to a wide spacing is proposed to meet wildlife and fuels objectives (Appendix C, page 115). A general forest management objective is to have all stands utilizing site growth potential. Thinning to a tighter spacing may more fully optimize site growth potential and also meet wildlife and fuels objectives.
- ***Unit of Measure:*** Acres within general forest proposed for thinning to 30 to 35 foot spacing.

- ***Issue #7:*** There is a need to promote or restore quaking aspen.
- ***Discussion:*** Small populations of quaking aspen are present within the planning area. Unit activities would not preclude encouraging the enhancement of incidental populations of quaking aspen. One unit would be designated for this objective. Incidental populations may be treated to provide habitat for various wildlife species.
- ***Unit of Measure:*** 1) Acres of quaking aspen to be treated.

ALTERNATIVE DISCUSSION

This section provides discussion of a no action alternative and two (2) action alternatives. It also includes a brief discussion of alternatives that were considered and responds to why they were eliminated from further analysis.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

An alternative was considered that would have had fewer acres with thinning and MST and more acres with prescribed burning within NNVM than was proposed in Alternative 2 (Modified Proposed Action). It would not be feasible to protect large trees without first completing MST prior to the introduction of prescribed fire.

ALTERNATIVES CONSIDERED IN DETAIL

This section provides a description of the alternatives responding to the "Purpose and Need" that are considered to be reasonable and viable by the Decision Maker (the Deschutes National Forest Supervisor). Alternatives, other than the no action alternative, are designed to move towards the desired condition that is consistent with the standards and guidelines of the Forest Plan. **All measurements are approximate.**

Alternative 1 (No Action)

This alternative provides a baseline that compares relative changes and their effects that would occur with implementation of proposed activities in either Alternative 2 (Modified Proposed Action) or Alternative 3. Under this alternative, the acres of high-density stands would continue to present an elevated risk of crown fire, insect infestations, and the spread of disease vectors. High-density stands, ground vegetation, and dead vegetation and other ground debris would continue to present a high-risk of a high intensity wildfire. Fires would continue to be responded to and suppressed by fire suppression crews. No vegetation or fuels reduction treatments, wildlife habitat or scenic view enhancement activities, or activities to restore natural processes to soil would occur.

Alternative 2 (Modified Proposed Action)

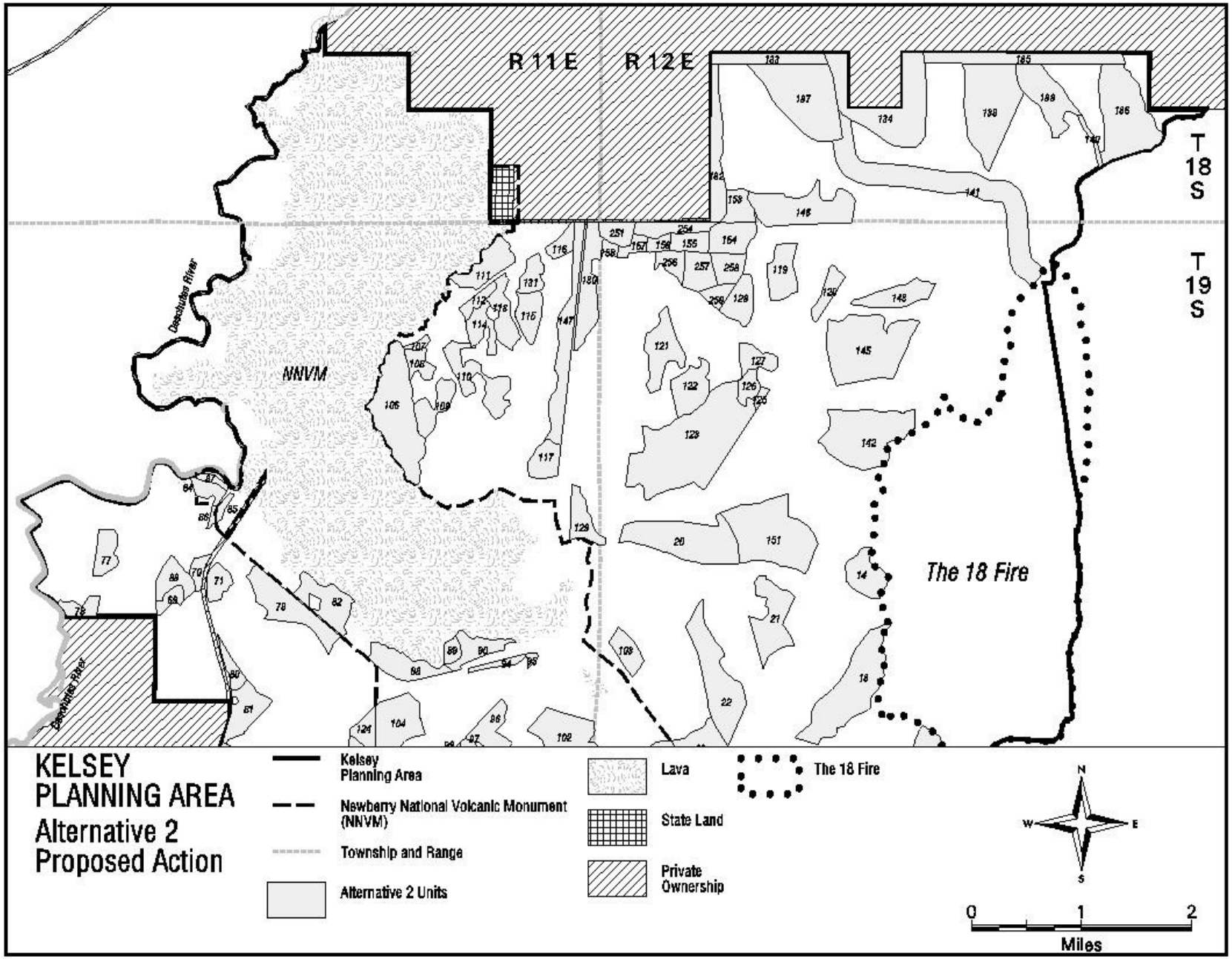
Fuels and Vegetation: 9,755 acres are proposed for treatment. This acreage figure is slightly different from the Modified Proposed Action that was presented in the public scoping letter. Thirty-eight acres were treated under the Lava Lands Non-Commercial Thinning Categorical Exclusion. Figures 3a (Page 16) and 3b (Page 17) identify proposed units and treatment type. Table 2, Table 10, page 22 and Appendix C, page 87 provide proposed activity summaries for Alternative 2. Proposed fuels treatments would treat approximately 40 percent to 70 percent of the acreage, dependent upon site-specific needs. Proposed commercial harvest is outside the Riparian Habitat Conservation Area (**RHCA**). Total fiber volume from vegetative treatments is estimated to be between 20.9 to 31.3 CCF (10.9 to 16.3 MMBF).

Table 2: Alternative 2 (Modified Proposed Action) – Commercial Thinning, Prescribed Fire, Mechanical Shrub Treatment (MST), and Associated Treatments

TREATMENT TYPE	UNIT NUMBER	ACRES
Mechanical Shrub Treatment (MST) and/or Prescribed Fire Only:	9,10,20,24,25,30,77,79,81,82,84-86,90,95,101,104,107,116 123,132-143,145,151,153-155,157,158, 251	4,035
• **With Non-commercial Thinning and/or Pruning:**	29,31,40,46,48,53,55,57,62,63,83,106,108-110,114,115,131	745
Sub-Total		**4,780**
Commercial Thinning and MST and/or Prescribed Fire Only:	11-13,22,23,39,41,42,45,50,52,54,56,67,73-75,94,105,124 126,146-149,152,156,256,263-265,269	2,220
• **With Non-commercial Thinning and/or Pruning:**	7,8,14,21,26,27,35-38,49,58-61,64,66,68-71,78,80,87-89,96,98-100 102 103,111,112,117,129,130,150,254,258,259,261,262,267,268	2,000
• **With Reforestation:**	7,8,14,21,26,27,36,58,59,68,258,259,261,262,267,268	279*
• **With Sub-soiling:**	7,8,14,21,26,27,36,58,59,68,259,262,267	740
Sub-Total		**4,220**
Commercial Thinning Only:	47,119-122,125	505
• **With Non-commercial Thinning and/or Pruning:**	33,34,65,97,113,127,128	245
• **With Sub-soiling:**	33	15
Sub-Total		**750**
Total		**9,750**

* Identified units total 763 acres. Of the 763 acres identified for treatment, 279 acres would be reforested.

FIGURE 3a


R 11 E
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T 18 S
T 19 S
NNVM
Deschutes River
Deschutes River
The 18 Fire
KELSEY
PLANNING AREA
Alternative 2
Proposed Action
Kelsey Planning Area
Newberry National Volcanic Monument (NNVM)
Township and Range
Alternative 2 Units
Lava
State Land
Private Ownership
The 18 Fire
N
W
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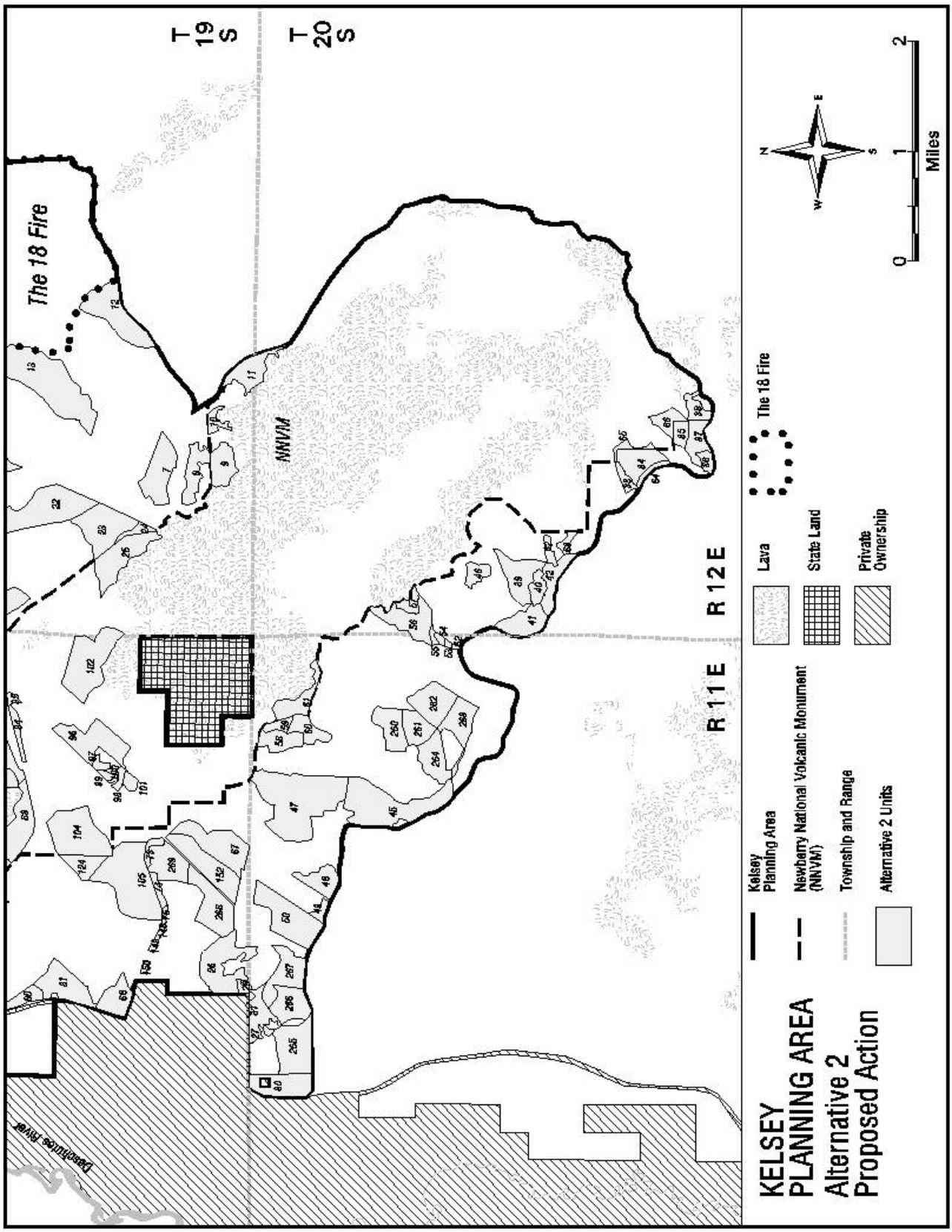
2
Miles

FIGURE 3b


T 19 S
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The 18 Fire
NNVM
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R 12 E
Deschutes River
KELSEY
PLANNING AREA
Alternative 2
Proposed Action
Kelsey Planning Area
Newberry National Volcanic Monument (NNVM)
Township and Range
Alternative 2 Units
Lava
The 18 Fire
State Land
Private Ownership
N
E
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0
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2
Miles

Alternative 3

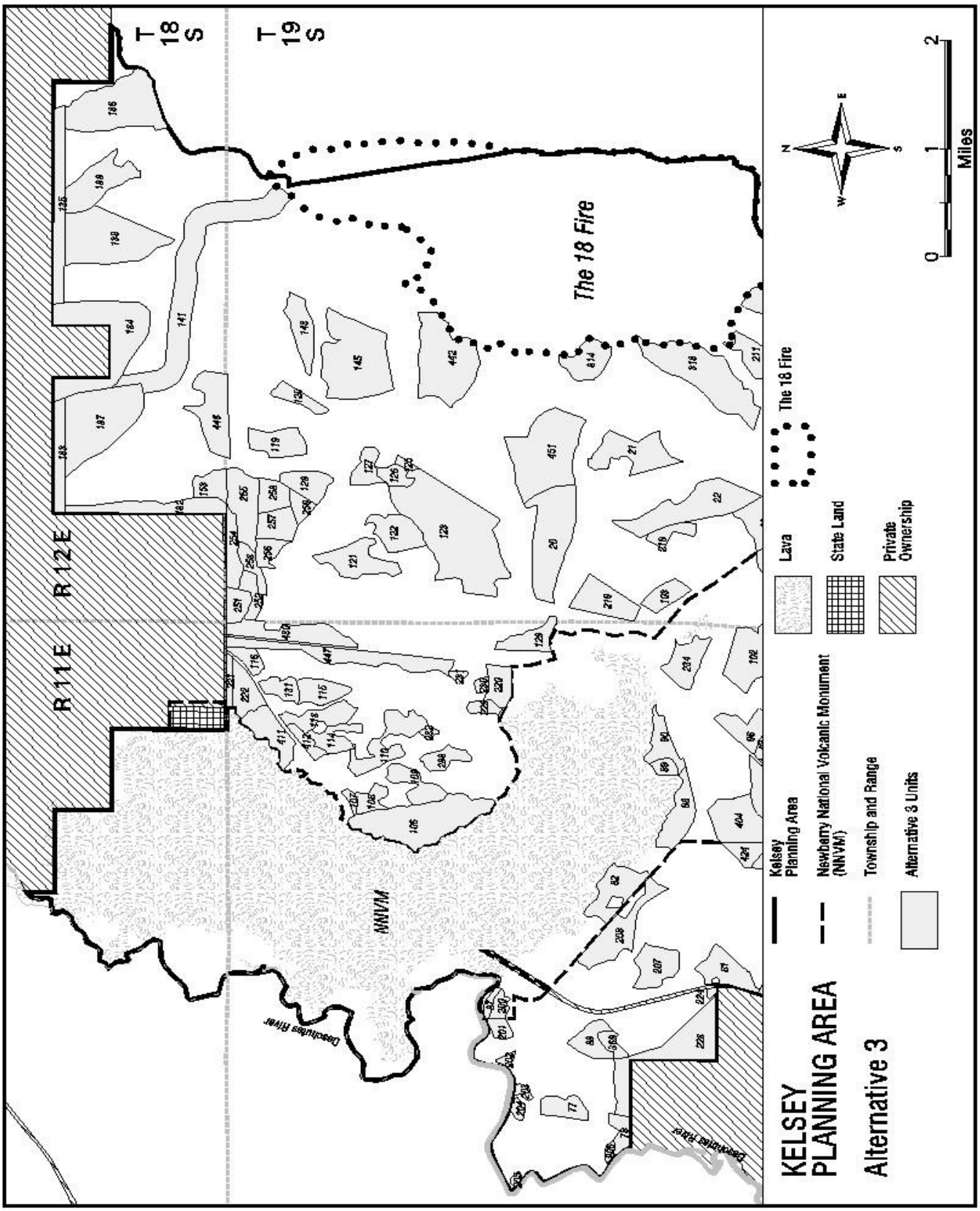
Fuels and Vegetation: Approximately 11,076 acres are proposed for treatment. Figures 4a (Page 21) and 4b (Page 22) identify proposed units and treatment type. Table 3 and Table 10, page 22 and Appendix C, pages 87 provide proposed activity summaries for Alternative 3. Proposed fuels treatments would treat approximately 40 percent to 70 percent of the acreage, dependent upon site-specific needs. Proposed commercial harvest is outside the Riparian Habitat Conservation Area (**RHCA**). Total fiber volume from vegetative treatments is estimated to be between 24,200 and 36,400 CCF (12.6 to 19.0 MMBF).

Table 3: Alternative 3 – Commercial Thinning, Prescribed Fire, Mechanical Shrub Treatment (MST), and Associated Treatments

TREATMENT TYPE	UNIT NUMBER	ACRES
Prescribed Fire and/or MST:	9,20,24,77,81-83,90,107,116,123,132-139,141,143,145,153, 207, 208 222,223,226,234,236-238,245,251,252,255,270,274, 275,325 404,451	4,495
• **With Non-commercial Thinning and/or Pruning:**	29,31,48,53,55,57,62,63,106,108-110,114,115,131,221,271,281,340 346	735
Total		**5,230**
Commercial Thinning and MST and/or Prescribed Fire:	11,22,23,39,41,42,45,73-75,126,148,149,152,209-211,218-220, 225 227,239,248,253,256,263-265,269,277,312-314,352,354 356,367,405 424,446,447	2,700
• **With Non-commercial Thinning and/or Pruning:**	21,26,37,49,61,78,87-89,96,98-100,102,103,129,150,200,201,206 224,254,258,259,261,262,267,268,272,273,276,307,308,327,338,368 369,411,412,430,442	1,900
• **With Reforestation:**	21,26,258,259,261,262,267,268,442	212
• **With Sub-soiling:**	21,26,259,262,267,442	505
Total		**4,600**
Commercial Thinning:	119-122,125,213,230,231,240-244,246,347	835
• **With Non-commercial Thinning and/or Pruning:**	33,65,97,113,127,128,202-205,229,232,233,247,278,335,360	415
• **With Sub-soiling:**	33	15
Total		**1,250**
Total Acres		**11,080**

Figure 4a, Page 20
Figure 4b, Page 21

FIGURE 4a


R 11 E
R 12 E
T 18 S
T 19 S
The 18 Fire
NNVM
Deschutes River
KELSEY
PLANNING AREA
Alternative 3
Kelsey Planning Area
Newberry National Volcanic Monument (NNVM)
Township and Range
Alternative 3 Units
Lava
The 18 Fire
State Land
Private Ownership
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0
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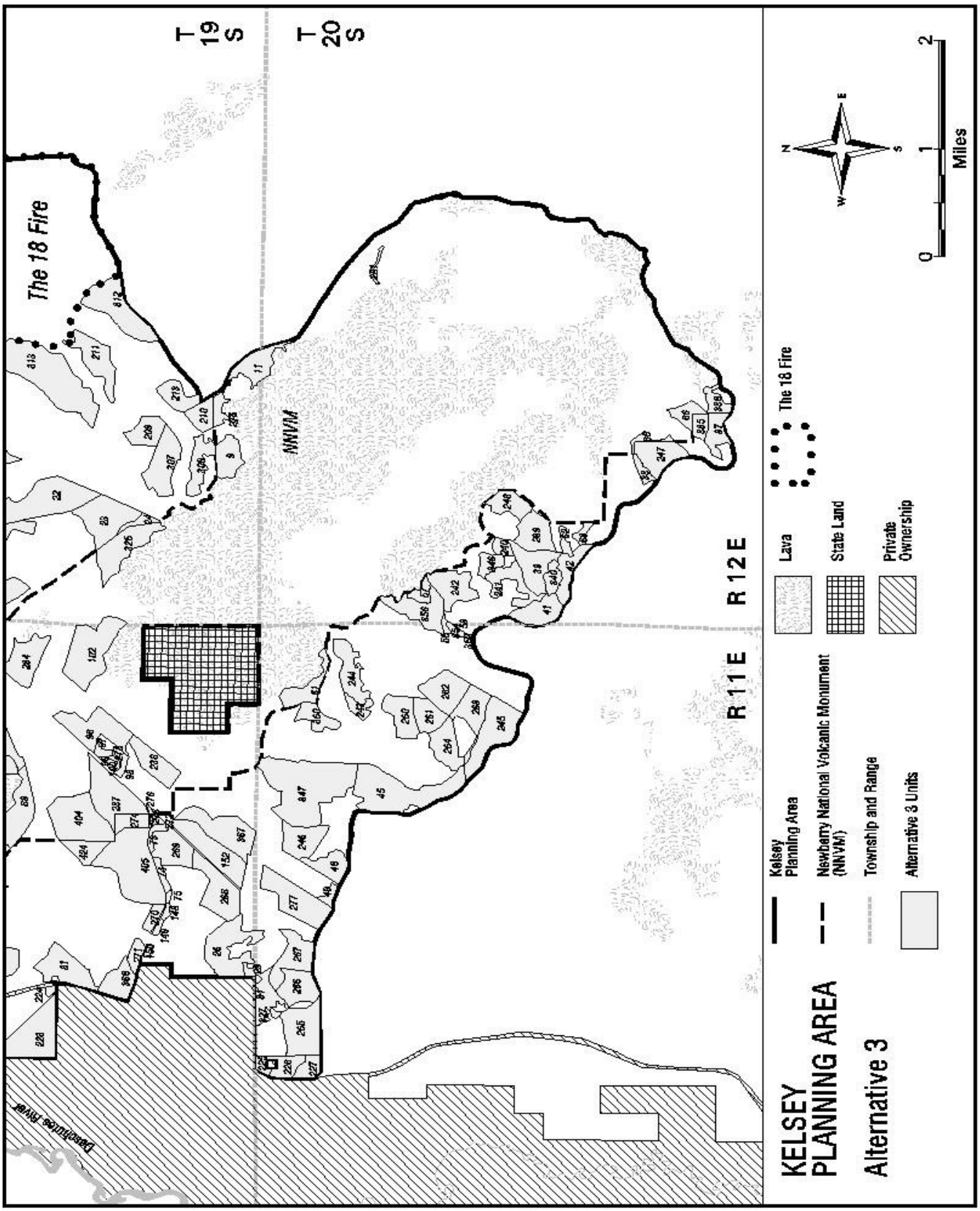
Miles

FIGURE 4b


T 19 S
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The 18 Fire
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Deschutes River
KELSEY PLANNING AREA
Alternative 3
Kelsey Planning Area
Newberry National Volcanic Monument (NNVM)
Township and Range
Alternative 3 Units
Lava
State Land
Private Ownership
The 18 Fire
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Monument activities: The proposed treatments would reduce stand density, natural fuels, and associated insects and disease. The proposed activities displayed in Table 4 are consistent with Monument direction regarding acres of treatment allowed per year and/or decade.

Table 4: 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%	502	42%
Mechanical Shrub Treatment (MST)	15	1%	0	0
MST/Underburn	263	27%	140	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	59	6%	368	32%
Total Acres of Treatment	985	100%	1,178	100%

Description of Treatments Common to Alternative 2 (Modified Proposed Action) and Alternative 3: Table 5 describes the treatments that are proposed and overall objectives for these treatments.

Table 5: Description of Thinning and Fuels Treatments		
TREATMENT TYPE	**TREATMENTS[1]**	**OBJECTIVES**
Fuel Treatment Only	Mechanical Shrub Treatment; Underburn	Reduce natural fuels to reduce risk of wildfire; Provide fuel break/safety corridor; Create strategic fuel breaks including along the wildland/urban interface; Reintroduce fire into fire-associated ecosystem.
Vegetation Treatment with Planting	Commercial Harvest[2]; Non-commercial Thin; Pruning; Mechanical Shrub Treatment; Underburn; Subsoil and Plant; Herbicide Treatment	Reduce natural fuels to reduce risk of wildfire; Promote deer hiding cover and vertical stand diversity; Reduce level of mistletoe infection; Maintain or increase ponderosa pine dominance.
Vegetation Treatment with no Planting	Commercial Harvest; Non-commercial Thinning; Pruning; Mechanical Shrub Treatment; Underburn; Whipfell; Subsoil	Reduce level of dwarf mistletoe infection and risk of insect infestation; Maintain/ accelerate ponderosa pine growth; Promote open, park-like stands; Increase winter sunlight on Cottonwood Road; Reduce natural fuels to reduce risk of wildfire; Provide fuel break/safety corridor; Create strategic fuel breaks.
Non-commercial Thinning and Pruning only	Non-commercial Thinning; Pruning; Mechanical Shrub Treatment; Underburn	Reduce natural fuels to reduce risk of wildfire; Provide fuel break/ safety corridor; Create strategic fuel breaks; Improve forest health.
OSU (Oregon State University) Study[3]	Commercial Harvest[4]; Non-commercial Thinning; Pruning; Mechanical Shrub Treatment; Underburn; Subsoil and Plant; Herbicide Treatment	Reduce natural fuels to reduce risk of wildfire; Provide fuel break/ safety corridor; Protect long-term study plot; Reduce level of dwarf mistletoe infection; Accelerate development of single-stratum late and old structure; Promote deer hiding cover and vertical stand diversity; Enhance deer forage.

[1] **Mechanical Shrub Treatment** and **Underburn:** used separately or in combination; **Non-commercial Thin:** removal of dead and/or live trees generally less than 5 inch diameter at breast height (4.5 feet above ground); **Commercial Harvest:** remove trees under 21inch diameter at breast height to desired stocking levels. Diseased and poor vigor trees are priority for removal.

[2] Commercial harvest in units 14 (205 acres) and 21 (112 acres) would create 8-21 openings, 6-12 acres in size, totaling 95-130 acres. Remaining units would have stocking level reduced below minimum without openings creating a need for planting.

[3] **OSU:** Evaluate short- and long-term effects of 4 silvicultural treatments on: 1) forest structure and 2) forest development, wildlife habitat, crown fire potential, overstory tree response, regeneration recruitment, and seedling development.

[4] Commercial harvest treatment in the OSU study would include creating 6-9 openings, 6-12 acres in size, totaling approximately 60 acres.

Proposed Activities Consistent Between Alternative 2 and Alternative 3

Road Access: Approximately 25.3 miles of roads would be reconstructed prior to thinning activities. In addition to road reconstruction work, other roads that would be used for timber haul would require some maintenance, primarily blading and shaping of the roadbed and brush removal. Reconstruction activities on FS 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 and/or realigned. Reconstruction activities on FS road 1810 would include a multi-layer bituminous surface treatment. Road 9702100 (Lava Butte Road) reconstruction would include cut slope stabilization, resurfacing, and guardrail replacement. Road 9710 would have drainage features restored where necessary. Road 9720 would be resurfaced with crushed aggregate, spot resurfaced, and have drainage restored.

Table 6: 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
1810	Milepost 0.0 (jct. 18) to Milepost 1.8 (jct. 1810200)	0.0	1.8
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		**0.0**	**23.8**

A roads analysis was completed for Forest roads within the Kelsey planning area, including those that were analyzed in the 18 Fire Environmental Impact Statement (EIS). Roads were analyzed for management necessity and impacts on resources. Roads proposed for closure are within the biological winter range of mule deer, key elk habitat, and NNVM, or were determined to be unnecessary for management objectives. Roads would be closed or decommissioned following proposed Forest activities. Approximately 56.4 miles of roads are proposed for closure (45.6 miles) or decommissioning (10.8 miles). Closed roads would be used for future forest management as needed. Decommissioned roads would no longer be accessible by motor vehicles. Figure 5a, page 24 and Figure 5b, page 25 display roads that are proposed for closure and decommissioning and those to remain open, including those analyzed in the 18 Fire EIS. Table 7 and Table 8 page 26 display roads proposed for closure and decommissioning within the analysis area.

Table 7: Proposed Road Closures Following Treatments Within the Kelsey Analysis Area

Road Number	Road Number	Road Number	Road Number
1800063	4001310	9702651	9720600
1801440	4001320	9702652	9720725
1810290	4001720	9702662	9720730
1815236	4001815	9702670	9720750
1815239	4001830	9710380	9721225
1815640	4001850	9710460	9721230
1815643	9700054	9710461	9721530
4001050	9701525	9711360	9721850
4001051	9702615	9711410	9723300
4001105	9702616	9711430	9723350
4001130	9702618	9711545	9723630
4001140	9702619	9711550	9723680
4001250	9702630	9711560	
4001270	9702631	9711860	
4001300	9702635	9720400	
Total Road Closures Within Kelsey Analysis Area – 45.6 Miles			

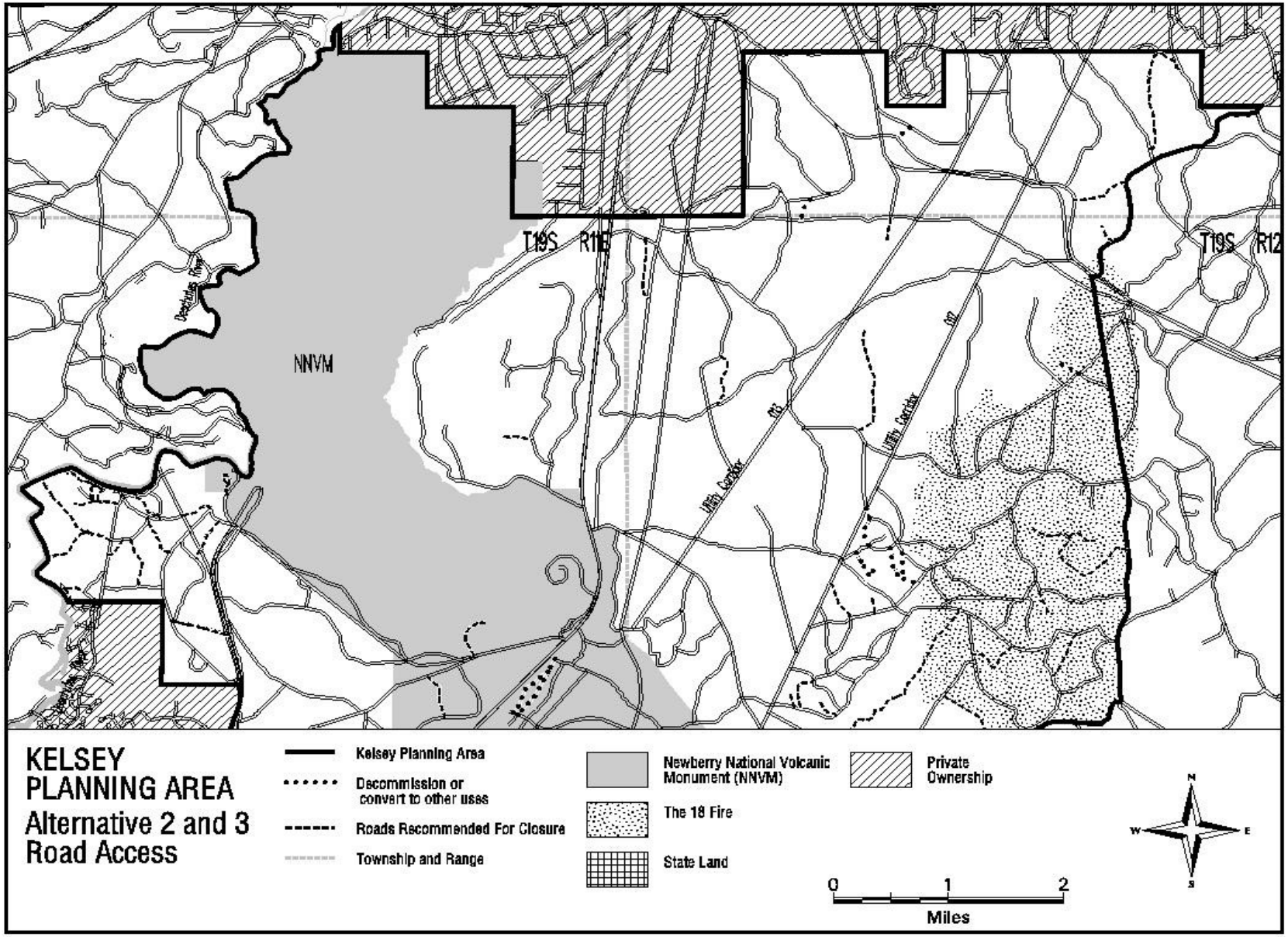
T19S R11E
T19S R12
NNVM
Deschutes River
Utility Corridor
Utility Corridor
KELSEY
PLANNING AREA
Alternative 2 and 3
Road Access
Kelsey Planning Area
Decommission or convert to other uses
Roads Recommended For Closure
Township and Range
Newberry National Volcanic Monument (NNVM)
The 18 Fire
State Land
Private Ownership
N
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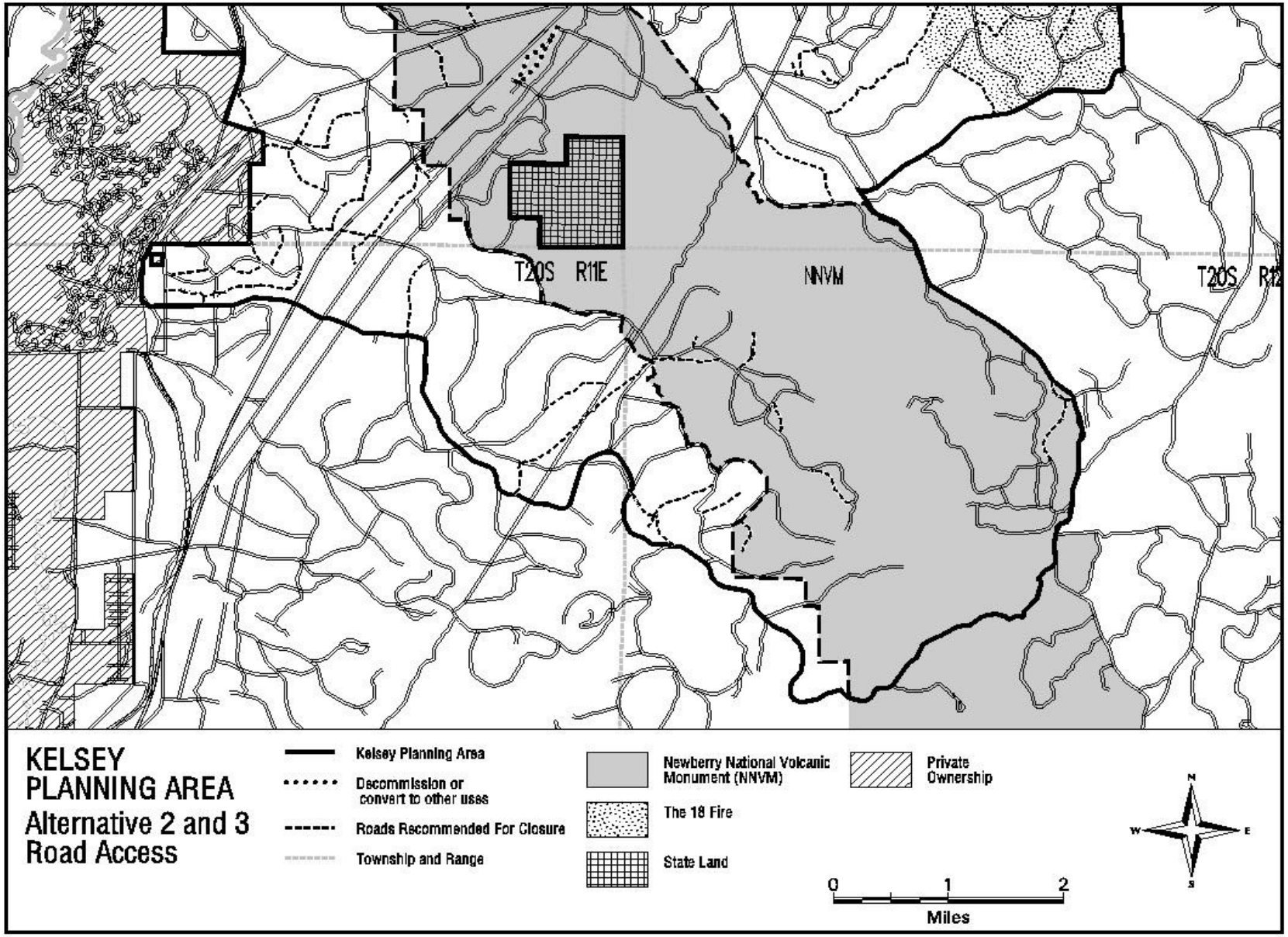
Figure 5a


T20S R11E
NNVM
T20S R12
KELSEY
PLANNING AREA
Alternative 2 and 3
Road Access
Kelsey Planning Area
Decommission or convert to other uses
Roads Recommended For Closure
Township and Range
Newberry National Volcanic Monument (NNVM)
The 18 Fire
State Land
Private Ownership
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Miles

Figure 5b

Table 8: Proposed Road Decommissioning Following Treatments Within the Kelsey Analysis Area	
Road Number	**Road Number**
1800022	9710290
1800050	9701170
1801850	9711410
1801390	9711412
1810280	9702640
9710280	9702645
Total Road Decommissioning Within Kelsey Analysis Area – 10.8 Miles	

Silviculture: Table 9 displays total acreage for units proposed for reforestation, reforestation acres within those acres, and proposed herbicide treatment acres within reforestation acres.

Table 9: Units and Acres Proposed for Reforestation and Herbicide Treatment					
Unit	**Unit Acreage (Gross)**	**Alternative 2**		**Alternative 3**	
		Reforestation Acres (Net[1])	**Herbicide Treatment on Reforestation Acres (Net[2])**	**Reforestation Acres (Net[1])**	**Herbicide Treatment on Reforestation Acres (Net[2])**
Group Regeneration Harvest					
14	205	72	11	0	0
21	112	39	6	39	6
259	27	7	1	7	1
262	69	17	2	17	2
267	69	17	2	17	2
442	269	0	0	94	14
Subtotal	**751**	**152**	**22**	**174**	**25**
Stand Regeneration Harvest					
7	80	32	5	0	0
8	46	18	3	0	0
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
261	44	11	3	11	3
268	84	21	3	21	3
Subtotal	**519**	**182**	**29**	**85**	**14**
Total Acres	**1270**	**334**	**51**	**259**	**39**

[1] **Group regeneration harvest:** net acreage is 25 to 35% of gross unit acreage; **Stand regeneration harvest:** net acreage is 40% of gross unit acreage.

COMPARISON OF THE ALTERNATIVES

Table 10 compares the alternatives in relation to the activities proposed in Alternatives 1 (No Action), 2 (Modified Proposed Action), and 3. Measurements are approximate.

Table 10: Comparison of Alternatives			
	Alternative 1 (No Action)	**Alternative 2 (Modified Proposed Action)**	**Alternative 3**
Mechanical Shrub Treatment (MST): Acres	0	7,500	8,045
MST – NNVM: Acres		934	750
Prescribed Fire: Acres	0	5,495	7,315
Prescribed Fire – NNVM: Acres		913	1126
Commercial and Non-commercial Thinning: Acres	0	5,660	6,635
Wildland Urban Interface: Acres to be Treated	0	2,965	3,225
Defensible Space: Miles to be Treated	0	20	20
LOS Development: Acres	0	3,580	4,320
Acres Treated to Reduce Imminent Susceptibility to Bark Beetle Attack	0	3,585	4,430
Acres Treated to Reduce Severe Dwarf Mistletoe	0	3,980	4,430
Thinning to 30-35 Foot Spacing: Acres	0	3,015	1,715
Pruning: Acres	0	1,000	900
Reforestation: Acres/Costs	0	279/$322,000	212/$212,000
Herbicide Treatment: Acres	0	50	40
Aspen Enhancement: Acres	0	0	5
Total Treatment Acres *	**0**	**9,750***	**11,080***
Estimated Commercial Thinning Volume	0	10.9 to 16.3 MMBF 20.9 to 31.3 CCF	12.6 to 19.0 MMBF 24.2 to 36.4 CCF
Road Reconstruction: Miles	0	25.3	25.3
Road Closure: Miles	0	45.6	45.6
Road Decommission: Miles	o	10.8	10.8

*** Total treatment acres**: Many units have multiple treatment types. The sum of specific treatment acres is greater than total treatment acres.

EXISTING CONDITION AND ENVIRONMENTAL CONSEQUENCES

The Existing Condition and Environmental Consequences (Effects) section provides the scientific and analytical basis for alternative comparison. This section describes the beneficial and/or adverse impacts to the environment that would occur if the various alternatives were implemented. Probable effects are discussed in terms of environmental changes from the current condition and include qualitative as well as quantitative assessments of direct, indirect, and cumulative effects. Mitigation measures for protection of the various resources can be found in Appendix B, Mitigation Measures and KV Projects, **pages 87 through 91.**

The Existing Condition and Environmental Consequences section provides the scientific and analytical basis for alternative comparison. Probable effects are discussed in terms of environmental changes from the current condition and include qualitative as well as quantitative assessments of direct, indirect, and cumulative effects. This section describes the beneficial and/or adverse impacts to the environment that would occur if the various alternatives were implemented.

For more detailed and supporting documentation, please refer to the specialist reports in the Appendices in the Official Record located at the Bend-Fort Rock District Office.

Appendix B: Wildlife Report and Biological Evaluation
Appendix C: Botany Biological Evaluation and Noxious Weed Risk Assessment
Appendix D: Fire and Fuels Report
Appendix E: Silviculture Report
Appendix F: Hydrology and Fisheries
Appendix G: Soils Report
Appendix H: Roads Analysis and Report
Appendix I: Recreation Report
Appendix J: Cultural Resources Report
Appendix K: Scenic Resources Report
Appendix L: Range Report

Refer to the Appendices, beginning on page 79 and listed in the Table of Contents of this report, for supplemental and/or supporting documentation.

Mitigation Measures – Common To Alternative 2 (Proposed Action) And Alternative 3

Mitigation measures are designed to reduce or prevent undesirable effects to resources. Mitigation measures by resource may be found in Appendix C, beginning on page 95.

FIRE AND FUELS

Existing Condition: Historically, fuel levels were kept low with frequent fire return intervals of 8-15 years, allowing fire to burn at lower intensities (Agee 1993). Fire suppression during the past 80-90 years has allowed naturally occurring fuels to increase above historic conditions within the planning area. Large sized, fire resistant ponderosa pine dominated stands with little ground vegetation has been converted to smaller sized ponderosa pine and heavy bitterbrush stands primarily as a result of timber harvest and the cessation of aboriginal burning. 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.

Recent large fire activity (past 7 years) within the general locale of the planning area has occurred in similar ponderosa pine and bitterbrush habitat. Stands of second growth ponderosa pine and plantations have been lost in recent wildfires. The 1996 Skeleton fire (17,789 acres) fire burned on both federally managed and private lands and 19 homes were destroyed. Other large recent wildfire fire activity occurring within the planning area were the Green Mountain (1995, 223 acres) and Bessie Butte (1995, 430 acres) fires and the Evans West (1996, 4,230 acres)

fire to the southeast. Between 1987 to present there have been 92 known fire occurrences (40 lightning, 15 arson and 37 other fires). 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 fire occurrences are predicted to increase.

Approximately 10 to 12 miles of private lands interface with National Forest land (Wildland/Urban Interface) within the planning area. Included in the Interface are Sunriver Resort and several subdivisions. Smaller private tracts of land are in close proximity to the analysis area and new home starts continue. The Wildland/Urban Interface 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.

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. 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. These plots are located in an area of natural fuels that is high risk for wildfire.

Thirteen (13) fire behavior fuel models (Rothermel 1972, Albini 1976) represent the Planning Area and interpret fire behavior potential. Predominant fuel models are short grasses in open pine stands, dormant shrubs, long-needle litter, and dead-down woody fuels. Fuel models for tall grasses, young or low green shrubs, and compact conifer litter layer with little to no undergrowth are also represented. A large area of the analysis area is occupied with non-vegetation (lava flows). Table 11 summarizes current fire behavior potential and acreage.

Table 11: Acreage[5] Totals for Fire Behavior[6] Potential (Current)

Fire Behavior Potential	Acres
Extreme/High	16,925
Moderate	12,335
Low	6,187
Non-vegetated (Lava)	10,728
Total	**46,175**

An estimated 37% 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.

Smoke generated particulate matter measuring 10 microns and less in size (PM-10) is small enough to affect human health. Estimates of high intensity wildfire smoke emission in the planning area could range from 240 pounds to

[5] 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).

[6] For a detailed explanation of the fire behavior fuel models, refer to the Kelsey Fire, Fuels, and Air Quality Report pages 2-6 located in Appendix *** of the Official Record located at the Bend/Fort Rock District Office.

2,000 pounds or more per acre of PM 10s, increasing the potential to negatively affect human health in areas affected by smoke.

Alternative 1 (No Action)
Direct and Indirect Effects: Existing stands and plantations would remain at high risk to loss from wildfire. No management activities would occur other than custodial duties such as wildfire suppression. More acres would transition towards increased fuel loadings, which would increase fire intensities and rates of spread. Fuels reduction would only occur during wildfires. An increase in fire intensity would likely be lethal to fire resistant species such as large ponderosa pine and high-density mixed species stands with ladder fuels (allow fire to reach crowns). Late and old structure ponderosa pine restoration, using prescribed fire, in the Newberry National Volcanic Monument would not occur. Fuels would continue to accumulate adjacent to or near high use/value recreation developments.

Improved safety areas for firefighter suppression activities and adequate public/firefighter evacuation routes would not be developed. The effectiveness of aerial delivered retardants into adjacent wildland/urban interface residential developments would be limited due to high fire intensity and long range spotting from airborne embers. The opportunity to expand fuel treatments to provide a more defensible Forest boundary would not occur. Heavy equipment would be required for fireline construction due to fire intensity and limited safe access.

Smoke from wildfires would likely have an adverse impact on Bend, other surrounding communities, and adjacent developments. Continued accumulations of surface fuels would contribute to a substantial decrease in air quality from associated smoke emissions from wildfire.

Alternative 2 (Modified Proposed Action)
Direct and Indirect Effects: The risk of large acreage (100+), high intensity wildfires would be reduced. Approximately 9,750[7] acres would have fuels treatment reduction treatments (MST, underburning, MST with underburning), including density reduction (tree thinning). A return to a low intensity fire regime using prescribed fire would be initiated on approximately 5,495 acres. Approximately 7,500 acres would have Mechanical shrub treatment (mowing, MST). Proposed vegetative and fuels treatments would help fragment continuous ground and tree crown fuels. To meet wildlife objectives in deer winter habitat, blocks of continuous high hazard fuels (shrubs and/dense tree stands) would remain untreated. These areas could support an intense wildfire of 100 acres and greater during average summer conditions. Overall, fire behavior potential would be reduced from high/extreme to moderate or low within treated units.

The risk of wildfire spreading to the Wildland Urban Interface (WUI) boundaries from private residential or commercial developments would be reduced. Approximately 2,965 acres of WUI (1,965 acres east of Highway 97 and 1,000 acres west of Highway 97) would be treated through mowing, prescribed fire, and/or thinning. Treatments on approximately 20 miles of forestland adjacent to primary and secondary roads would also reduce ground fuels and stand density. These fuel breaks/safety corridors would provide areas of opportunity to control wildfires and provide evacuation routes for the public and firefighters.

Elk habitat and critical mule deer winter range would be treated with prescribed burning, mechanical shrub treatments, and thinning. Fuels treatments would fragment the continuous high-risk ground fuels and dense stand structures. Wildlife objectives in deer winter habitat would be partially met by leaving untreated blocks shrubs and/or dense tree stands. These areas would be located away from the wildland/urban interface and could support a high intensity wildfire of 100 acres and greater during average summer conditions. Winter deer and/or key elk habitat would be reduced.

[7] Approximately 9,930 acres are the total acres proposed for fuels reduction treatments, including thinning. Prescribed fire is proposed on 5,495 acres and MST on 7,500 acres. The difference between 12,995 and 9.930 acres is 3,065 acres that are overlap acres (acres that are proposed for both prescribed fire and MST treatments).

Prescribed fire with no mechanical treatments (mowing) would exhibit longer flame lengths, increased tree scorch, tree mortality, smoke emissions, and operating costs, fewer opportunities that would allow prescribed burning, and potential fire control problems. Areas with initial high fuel loads would require slow reduction of existing accumulation, taking longer to achieve the desired condition.

Alternative 3

Direct and Indirect Effects: Proposed activities would be similar to Alternative 2 (Modified Proposed Action). Total number of acres proposed for fuels treatment would increase from approximately 9,780 acres to approximately 11,080 acres (approximately 13 percent) from Alternative 2. Approximately 7,315 acres would have prescribed burning and approximately 8,045 acres would have MST. 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 within the planning area in Alternative 3. Alternative 2 (Modified Proposed Action) would treat approximately 185 additional acres using MST than Alternative 3. Treatments within Newberry National Volcanic Monument (approximately 213 acres) would provide more emphasis on the reintroduction of fire with less use of mechanical treatments in reducing fuels buildup. Approximately 3,225 acres, 8 miles, of wildland/urban interface boundary would have fuels reduction treatments an increase of approximately 260 acres from Alternative 2.

Direct and Indirect Effects Common to Alternative 2 (Modified Proposed Action) and Alternative 3: Proposed treatments would reduce the risk of mountain pine beetle outbreak, maintain and accelerate development of ponderosa pine old growth, enhance fire suppression effectiveness and safety, and reintroduce fire into fire associated ecosystems. Within proposed units, wildfire intensity would be reduced and provide suppression forces an opportunity to successfully suppress a wildfire. Depending on shrub and other vegetative growth, wildfire risk reduction treatments could become less effective in 5-10 years in some areas and ineffective in 15-20 years in others. Proposed treatments would reduce fuel continuity across the planning area. 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.

Cumulative Effects Common to Alternative 2 (Modified Proposed Action) and Alternative 3: 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. The intensity of wildfire would be reduced within treatment areas. Treatments maintained through time would improve the likelihood for continued monitoring of Long-Term Site Productivity study plots through the life of the study. As shrubs and/or trees grow back over time, treatment benefits would gradually decrease and could become less effective in 5-10 years and ineffective in 15-20 years in some locations. 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. The risk of large acreage losses from wildfire would be reduced. Proposed treatments would create approximately two-miles of defensible space within the Wildland/Urban Interface, while meeting wildlife objectives. Only under extreme conditions would wildfire burn through treated areas. This would provide

a safer environment for firefighters, reduce the risk of wildfire entering private lands, and aid in the suppression of fires that start on private lands and move toward or onto federal ownership.

Approximately twenty-miles of defensible space (fuel break/safety corridor) would be created. The use of major roads in a defensible space strategy would especially be used near areas where public safety is of high concern.

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.

Approximately 56 miles of proposed road closure or decommissioning would occur. Road closures would potentially increase response time of ground based suppression resources to fire starts. The potential increase in response time could, under certain weather and fuel moisture conditions, allow fires to become larger.

The proposed fuels reduction activities are compared by alternative in Table 12. Estimated smoke emissions are compared by treatment and alternative in Table 13.

Table 12: Proposed Fuel Treatment Acres (gross)

Proposed Treatments*	Alternative 2 (Modified Proposed Action)	Alternative 3
Underburning	1,506	1,761
MST (Mowing) / Underburning	3,987	5,554
MST Only	3,514	2,491
Whole Tree Yarding	4,974	6,164
Hand Piling	1,602	1,448
Machine Piling	176	384

* More that one treatment may occur in designated units.

Table 13: Estimated Total Smoke Emissions* From Proposed activities

Proposed Treatments[8]	Alternative 2 (Modified Proposed Action)	Alternative 3
Landing Piles	62.1 Tons PM10	73.3 Tons PM10
Underburning	200.7 Tons PM10	267.4 Tons PM10
Machine Piles	23.2 Tons PM10	35.0 Tons PM10
Hand Piles	11.6 Tons PM10	13.0 Tons PM10
Total	**297.6 Tons PM10**	**388.7 Tons PM10**

* The total sum of tons of smoke emissions for each alternative would occur over a period no longer than 10 years.

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[8] **Underburning (UB)** - The use of prescribed fire under a stand of trees (usually ponderosa pine) to consume (remove) accumulated ground fuels (either naturally occurring or created through an activity); **Mechanical Shrub Treatment (MST)** - The use of mechanized equipment to cut, chop, grind or otherwise reduce shrub or ground fuel vertical structure; **Hand Piling** - The use of personnel to gather accumulated fuels (usually smaller fuels such as woodcutting slash or small thinning slash) and place it in a pile configuration to be burned or left for wildlife.

Existing Condition: The dominant plant association group within the planning Area is ponderosa pine (dry and wet). Plant association groups (PAGs) (Table 14) 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. Aspen is found in small, isolated areas, most commonly adjacent to lava outcrops.

Table 14: Vegetation And Non-Vegetation Types Within Kelsey Planning Area

Vegetation/Non-Forest Classification	Acres	% of Planning Area	% of Forest Area
Forest Plant Association Groups (PAGs)			
·Ponderosa pine (Dry and wet)	32,185	70%	91%
·Ponderosa/lodgepole pine *	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**	**46,167**	**100%**	**---**

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

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. Fire exclusion and conifer competition would limit the potential for aspen to mature or regenerate.

Alternative 2 (Modified Proposed Action) and Alternative 3
Direct and Indirect Effects: Thinning 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% of the residual basal area would be in lodgepole pine. Residual stocking of white fir could be as high as 60% in some units. Mortality of lodgepole pine and white fir would be expected following proposed underburns. Thinning 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.

Proposed treatment to increase aspen stocking would reduce amount of conifer (ponderosa and lodgepole pine) understory stocking. Proposed underburn would stimulate sprouting of aspen.

Cumulative Effects: Past harvest, precommercial thinning, and reforestation treatments within or adjacent to the project area would not have a cumulative effect on increasing or reducing species diversity.

TREE DENSITY AND STRUCTURAL STAGE
Existing Condition: Forest vegetation was classified using structural stages 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 (Table 13). 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, refer to Attachment 2 of the Kelsey Silviculturist Report (Official Record, Appendix E).

The majority (55%) of the forested portion of the planning area is within the understory reinitiation structural stage (Table 15**)**, 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 1920's and 1930's. 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 15**)**. Late and old structure ponderosa pine stands typically have 18 to 40 trees/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.

Table 15: 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 Modified Proposed Action		Alternative 3	
		Percent Forested Area	Relation to HRV	Percent Forested Area	Relation to HRV	Percent Forested Area	Relation to HRV
Stand Initiation	0 – 15%	15%	Within	15%	Within	16%	Above
Stem Exclusion, Closed Canopy	0 – 20%	17%	Within	13%	Within	13%	Within
Understory Reinitiation	10 – 30%	55%	Above	60%	Above	60%	Above
Multi-story without Large Trees	0 – 30%	12%	Within	11%	Within	10%	Within
Multi-story with Large Trees	10 – 35%	<1%	Below	<1%	Below	<1%	Below
Single-story with Large Trees	20 – 55%	None	Below	None	Below	None	Below

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**: Several to many cohorts of trees. Large trees (≥21" dbh) are common. **Multi-story without Large Trees**: One or more cohorts of trees. One dominant canopy stratum. Large trees (≥21" dbh) are common.

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. An addition of 2,380 acres would put the amount of stand initiation structural stage above HRV.

Approximately 12,460 acres of ponderosa pine stands currently have potential to develop into a late or old structural stage (Table 16). 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. At that time, the amount of late or old structure could be within the HRV.

Table 16: Ponderosa Pine Potential Development (Acres) Into LOS Compared to HRV LOS			
Alternative 1 (No Action)	**Alternative 2 (Modified Proposed Action)**	**Alternative 3**	**Late or Old Structural Stage (Historic Range of Variability)**
12,460 acres	16,040 acres	16,780 acres	10,800 – 32,400 acres

Cumulative Effects: The recent 18 fire and past harvest, precommercial thinning, and reforestation treatments were considered in the classification of structural stage and stand densities. Future construction (Frontage road, Sunriver Interchange, and Weigh Station) would increase the non-forest area, affecting less than 1 percent of the forested portion of the planning area. Fuels reduction in association with the Weigh Station would decrease tree density within 100 feet immediately adjacent to the parking and inspection areas.

TREE DENSITY

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: Alternative 2 (Proposed Action) would thin approximately 5,665 acres and Alternative 3 would thin approximately 6,630 acres (Table 17). Residual stocking following proposed thinning treatments would vary.

Table 17: Thinning Treatments Grouped by Thinning Intensity				
Thinning Prescription[1]	**Alternative 2**		**Alternative 3**	
	Acres	**% of Total**	**Acres**	**% of Total**
Group Regeneration Harvest				
Group regeneration harvest – Deer habitat	185	3.3	325	4.9
Group regeneration harvest – OSU study	165	2.9	165	2.5
Stand Regeneration Harvest				
Mistletoe Reduction	330	5.8	100	1.5
Ponderosa pine restoration	60	1.1	0	0
Lodgepole pine regeneration	15	0.2	15	0.2
Thin to Wide Spacing				
Thin to low stocking levels	2,780	49.1	1,475	22.2
Thin to low stocking levels – OSU Study	235	4.2	235	3.6
Uneven-aged regeneration harvest – OSU Study	175	3.1	175	2.6
Thin to moderate spacing	635	11.2	2,565	38.7
Thin to variable spacing				
Mistletoe	160	2.8	260	4.0
Goshawk	170	3.0	170	2.6
Scenic	20	0.3	25	0.4
Value	0	0	350	5.3
Sanitation Harvest	50	0.9	50	0.7
Precommercial Thin	685	12.1	720	10.8
Total	**5,665**	**100**	**6,630**	**100**

[1]See discussion following Table 18, page 36 for description of thinning activities.

Table 18: Units Proposed for Group Regeneration

Unit	Alternative	Unit Size (Acres)	Prescription*	Unit percent in openings	Number of Openings	Total Acres of Openings
14	2	72	8	30 - 40%	2 - 4	22 - 29
21	2, 3	112	8	30 - 40%	3 - 7	34 - 44
259	2, 3	27	93	20 - 30%	1 - 2	5 - 8
262	2, 3	69	93	20 - 30%	4 - 5	14 - 21
267	2, 3	69	93	20 - 30%	4 - 5	14 - 21
442	**3**	**211**	**8**	**30 - 40%**	**6 - 12**	**63 - 84**

* Prescription 8: Improve big game forage; and Prescription 93: Create diversity of stand structure.

The greatest reduction in existing tree density would occur with group regeneration (Table 17, page 35, and Table 18). All trees less than 21 inches dbh would be cut to create openings of varying sizes. Prescription 8 would create openings of 6 to 12 acres in size over 30 to 40% of the unit and planted with ponderosa pine seedlings. Prescription 93 would create openings approximately 4 acres over approximately 20 to 30% of the treatment area and reforested through natural regeneration of ponderosa pine.

Stand regeneration harvest to eliminate dwarf mistletoe, restore ponderosa pine dominance, or regenerate lodgepole pine would result in substantial reductions in tree density. Low residual stocking would necessitate site planting or natural regeneration.

Thinning to wide spacing, approximately 30 to 40 feet (30 to 50 residual trees per acre), would substantially reduce stand density and increase the average individual tree and stand diameter. Time needed for trees to achieve diameters greater than or equal to 21 inches DBH would be shortened. Crown density would be reduced. Sufficient numbers of large trees would meet ponderosa pine old growth definitions within approximately 40 years. 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 (Modified Proposed Action) and 3 are similar in the amount of wide thinning that would be done within the Monument. Proposed activities are similar and consistent with the goals of NNVM, which include allowing natural processes to function while reducing the need for re-entry with the use of mechanical equipment.

Tree density would be substantially reduced with wide thinning (Table 17, page 35xx). Following thinning, trees would be spaced approximately 30 to 40 feet (30 to 50 residual trees/acre). Sufficient trees would remain to preclude the need for reforestation following thinning. Reduced stand density would increase individual tree diameter growth and the time needed to achieve diameters common in late or old structure (greater than or equal to 21 inches DBH). Within approximately 40 years, sufficient number of large trees would be present to meet ponderosa pine old growth definitions (USDA Forest Service, 1993). Approximately 10 percent less volume would be produced during the next 40 years than in stands growing at optimal spacing. Bark beetle risk would remain low for approximately 40 years.

Alternative 2 proposes more acres (approximately 53 percent) of wide thinning than Alternative 3 (approximately 24 percent) (Table 17, page 35). 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 Newberry National Volcanic Monument and the Wild and Scenic River Corridor, over 90 percent of proposed thinning would be wide spacing (Refer to Official Record, Appendix E, for a comparison of the amount of wide thinning proposed by management allocation). Projections indicate stands thinned to the higher densities would produce approximately the same amount (99 percent) of cubic foot volume than 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. The potential for future soil compaction would be highest with Alternative 3.

Thinning to moderate to variable spacing, approximately 20 to 35 feet (40 to 90 trees/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. Thinning to moderate spacing between trees, approximately 16 to 22 feet (90 to 170 trees/acre), would occur in plantations. Residual stocking would be highest following proposed precommercial thinning in plantations. Following thinning, trees would be spaced approximately 16 to 22 feet (90 to 170 trees/acre).

STRUCTURAL STAGE - Group regeneration harvest **(**Table 17, page 35**)** would increase the amount of stand initiation structural stage. It is proposed primarily in portions of stands classified as understory reinitiation. Alternative 2 would create approximately 105 and Alternative 3 approximately 154 additional acres of the stand initiation structural stage and the acreage would remain within the Historic Range of Variability **(**Table 15, page 34).

Both alternatives propose vegetation treatments in units that contain late or old stand structure **(**Table 19**)**. Proposed treatments include timber harvest and natural fuels treatment. Proposed treatments would not change the existing late or old structural stage.

Within Newberry National Volcanic Monument, both Alternative 2 and 3 propose commercial thinning in two (2) stands. 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, being consistent with Monument Plan direction. For these proposed treatments, Monument Plan direction is considered to take precidence over Interim Management Direction. Consistent wtih the intent of the Interim Wildlife Standard, proposed treatments would not result in the loss of late or old structure.

Within the Deschutes Wild and Scenic River allocation, Alternative 3 proposes to commercial thin in a portion of a ponderosa and lodgepole pine stand (Unit 205), classified as multi-story with large trees and susceptible to bark beetles. This late or old structural stage classification is based on the presence of lodgepole pine greater than or equal to 10 inches dbh. Proposed thinning would reduce stand stocking, favoring ponderosa pine as leave trees. The proposed removal of lodgepole pine change the structural classification from late or old structure to multi-story without large trees with ponderosa pine dominating. Proposed treatment is consistent with probable actions identified in the River Plan to protect and enhance vegetation, wildlife and scenic values. River Plan direction is considered to take precedence over Interim Management Direction that would not allow the use of comercial thinning.

Table 19: Units Proposed for Treatment that Contain Late or Old Stand Structure (LOS)

Unit	Unit Acres	Allocation[1]	Alternative	LOS Acres	Thinning	Natural Fuels [2]
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
205	5	WS1	3	5	Moderate	None

[1] Newberry National Volcanic Monument (NNVM), Deer Habitat (DHB), and Wild and Scenic (WS1).
[2] Mechanical Shrub Treatment (MST)

A small portion of proposed thinning would be done within stands classified as stem-exclusion closed canopy and multi-story without large trees. Thinning would decrease the amount of these structural stages, remaining within HRV. Treatments would increase understory reinitiation, further increasing this structural stage above HRV.

Natural disturbances potentially could change stand structure. Similar to the no action alternative, high intensity wildfires greater than 2,230 acres (Alternative 2 – Modified Proposed Action) or 2,210 acres (Alternative 3) would put the amount of the stand initiation structural stage above the HRV. Potential for wildfires of this size would be reduced by proposed thinning, mechanical shrub treatment, and prescribed underburning. Alternatives 2 and 3 would have less potential than Alternative 1 (No Action) for large, stand replacing wildfires.

Thinning proposed in Alternatives 2 and 3 would increase the acreage of ponderosa pine stands with potential to develop into late or old structure **(**Table 16, Page 35**)**. With Alternative 2 there would be approximately a 30 percent increase over the existing condition. With Alternative 3, there would be an approximate 40 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) 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 **(**Table 16, Page 35**)**.

***Cumulative Effects*:** Past harvest, precommercial thinning, and reforestation activities were considered in the classification of structural stage and stand densities. Construction activities of the Weigh and Safety Station along Highway 97 would increase the amount of non-forest area by less than one (1) percent of the forested portion of the planning area.

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 that have 120 to 160 trees per acre (tree spaced 16 to 20 feet) and are 10 inches in diameter at 4.5 feet above ground level are considered imminently susceptible to bark beetle. Refer to Appendix E, page 10 of the Silviculture Report in the Official Record for the methods used to determine bark beetle risk.

Table 20 and Table 21, page 39 display existing beetle risk within the planning area. Approximately 40 percent is imminently susceptible to bark beetle attack. Excluding lava and cinder (10,288 acres, 22 percent) approximately 52 percent is imminently susceptible to bark beetle attack.

Table 20: Percent of Acres Imminently Susceptible to Bark Beetle (Post-Treatment)

Alternative	Acres	Percent of Planning Area	Percent of Forested Area (35,879 acres)
1 (No Action)	17,141	37%	48%
2 (Modified Proposed Action)	13,555	29%	38%
3	12,710	28%	35%

Table 21: 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	3,394 (65%)	2,497 (48%)	2,049 (39%)
Deer Habitat (DHB) (% Allocation)	13,582	4,492 (33%)	3,821 (28%)	3,686 (27%)
Scenic Views (SV) (% Allocation)	8,467	4,404 (52%)	2,848 (34%)	2,646 (31%)
Old Growth (OGR) (% of Allocation)	254	203 (80%)	203 (80%)	203 (80%)
Newberry National Volcanic Monument (NNVM) (Percent Forested Portion of Allocation)	17,611	4,263 (24%)	3,801 (22%)	3,795 (22%)
Percent Forested Area (7,852 acres)		54%	48%	48%
Deschutes River, Wild and Scenic (% Allocation)	474	366 (77%)	366 (77%)	312 (66%)
Other Ownership (% Allocation)	573	19 (3%)	19 (3%)	19 (3%)
% Forested Portion (60 acres)		32%	32%	32%
Planning Area Total	46,167	17,141	13,555	12,710
% Planning Area (46,167 acres)		37%	29%	28%
% Forested Area (35,879 acres)		48%	38%	35%

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 I-1). 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.

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 or adjacent to 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 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: As with the no action alternative, endemic beetle populations would continue to operate across the landscape. 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.

Thinning and underburning are proposed in Alternatives 2 and 3 with potential to affect susceptibility to bark beetle. Other proposed vegetation treatments, such as the mowing of shrubs, would have no effect on susceptibility to bark beetle. Thinning activities would reduce susceptible forested acres (18,643 acres) in Alternative 2 (Proposed Action) by approximately 3,900 acres (21 percent) and in Alternative 3 by approximately 5,025 acres (27 percent). Depending on thinning intensity, thinned stands would remain at low risk to bark beetle attack for 20 to 50 years. Stands thinned to wide spacing (25 to 35 feet) would remain at low risk for approximately 40 to 50 years. Approximately one-half (50 percent) of proposed thinning in Alternative 2 would be done to wide spacing. Approximately one-quarter (25 percent) of proposed thinning in Alternative 3 would be done to wide spacing.

Fire can kill foliage and buds in the crown, heat the trunk can where part or all of the cambium is killed, and/or 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)

Natural fuels would be reduced by thinning, underburning, or mowing **(Table 20)**. 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.

Table 22: Proposed Thinning and Underburning Acres

Treatment[1]	Alternative 2	Alternative 3
Thinning (Commercial and precommercial)	5,661 acres	6,633 acres
Underburn (Underburn, Underburn/MST, MST/Underburn/None[2])	1,909 acres	2,045 acres
Underburn following mechanical shrub treatment (MST/Underburn)	3,426 acres	5,112 acres

[1]Mechanical Shrub Treatment (MST)

[2]Treatment proposed within Oregon State Research units: Approximately one third of the 236 acres proposed for treatment be in each treatment type. Seventy-nine (79) acres of underburning are included in each alternative.

Following proposed underburns, 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).

Cumulative Effects: The 18 Fire, past harvest, precommercial thinning, and reforestation treatments were considered in the classification of beetle risk. Reasonably foreseeable future actions within or adjacent to 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. 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.

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).

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct, Indirect Effects, 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.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Proposed thinning has the greatest potential to reduce the amount of disease present within stands. Thinning would generally leave 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 23, page 43). 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 thinning 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 25 percent more thinning **(**Table 23, page 43**)** 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 23, page 43**)**. 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 4 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. Mistletoe spread into openings would be minimized by either not planting within 65 feet of opening edge or pruning trees adjacent to openings.

Table 23: Proposed Treatment Acres Reducing Dwarf Mistletoe		
Thinning Prescription *	**Alternative 2 (Proposed Action)**	**Alternative 3**
Stand Regeneration Harvest: Mistletoe Reduction	330	102
Thin to Wide Spacing	3,016	1,713
Thin to moderate stocking levels	634	2,566
Total Acres	3,980	4,381

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.

Cumulative Effects: Alternatives 2 and 3 propose to thin around Lava River Cave in proposed stands 97, 98, 99, and 100. Recently, some trees within these stands were pruned. Proposed thinning 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.

HERBICIDES

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 1960's. 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 and/or increasing tree canopy cover would encourage natural control of competing and unwanted vegetation. Refer to Appendix F, page 115 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%. 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 2 to 10 years to return to preburn populations (Cope. 1992).

The following discussion of human health, terrestrial plants and animals, aquatic species, soil, and air quality have the common Alternative 1 (No Action) and cumulative effects: There would be no additional effects other than those described for the broader Alternative 1 (no action) without the application of herbicides.

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 2 (Modified 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.

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 2 (Modified 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.

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 2 (Modified Proposed Action) and Alternative 3
Direct and Indirect Effects: With no habitat present in units proposed for herbicide treatment, there would be limited potential for amphibians to receive a toxic dose of hexazinone.

Water
Existing Condition: Within the planning 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.

Alternative 2 (Modified Proposed Action) and Alternative 3
Direct and Indirect Effects: Surface ground water contamination is not expected. 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.

Groundwater contamination is not expected. 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.

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. 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 2 (Modified 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, as well as 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.

Air Quality

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: No effects on air quality are 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 RESOURCE

INTRODUCTION

The Kelsey project area includes mule deer summer range, spring/fall transitional range, and winter range. Summer and transitional range is generally within General Forest (MA-8), while the winter range is designated as Deer Habitat (MA-7). The 18 Fire burned within the Deer Habitat and General Forest along the easternmost portion of the project area. Besides the Deer Habitat management allocation, the biological winter range (area actually utilized by deer during winter time) includes areas designated by the LRMP as Old Growth and Scenic Views. Included within the biological winter range are portions of NNVM, the Wild and Scenic corridor, and Ryan Ranch Key Elk Area. Substantial 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 Key Elk Area. Potential calving habitat is found in the 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. Table 24, page 46 lists wildlife ecological indicator species and those designated as species of concern (SOC). Each species potentially represents a community of animals that have specific requirements, many of the requirements overlapping with other species. The following species are known or suspected to occur in the area.

Table 24: Selected Wildlife Species Summary – Kelsey Planning Area					
Species	**Occurrence***	**Management Indicator Species**	**FWS Species of Concern**	**ODFW Sensitive Species**	**Ecological Indictor Species and/or Special Habitat Requirements****
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)
White-breasted nuthatch	C				X (1-PP, 2)
Gray flycatcher (NTMB)	U				X (3)
Green-tailed towhee (NTMB)	U				X (3)
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)
Golden-crowned kinglet (NTMB)	U (declining BBS)				X (1-MC, 3)
Chipping sparrow (NTMB)	U (declining, BBS)				X (7- open understory w/regenerating pines)
Sage thrasher	U				X (7-sage and mt. Mahogany)
Mountain bluebird (NTMB)	C				X (2, 7- burns, openings)
Vesper sparrow (NTMB)	U				X (7-dry meadows, openings)
Rock wren	U				X (7-talus, rock)
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)
Fringed myotis	S		X	X	(6)
Pallid bat	S			X	(6, 7-roosts in trees)
Silver-haired bat	S			X	(2-cavities, 7-forages in forest, bark of trees)
Northern sagebrush lizard	S		X		X (3, 6-rock outcrops)

***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.

**** 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).

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 provides security to big game and protection from predators. Hiding cover is important for reducing vulnerability to hunting and poaching pressure by providing concealment in areas of high open road densities and easy access by hunters.

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). Crown cover greater than 40 percent with trees 30 feet tall is recommended for thermal cover on the Deschutes National Forest. Optimal thermal cover conditions have been compromised somewhat due to low site productivity for tree growth and widespread insect-pest infestations that have killed or severely damaged tree 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 25 displays the existing amount (acres) of cover and the ratio of cover to foraging habitat and applicable LMRP standards and guidelines. Standards and guideline numbers are minimums and not the preferred or desired conditions for wildlife.

Table 25: Existing Condition of Hiding and Thermal Cover by LRMP Management Allocation.

	*Hiding Cover – Acres (percent)	Hiding Cover – LMRP Standard & Guideline (S&G), Goal & Objective G&O), or Desired Condition (DC)	*Thermal Cover Acres (percent)	Thermal Cover – LMRP Standard & Guideline (S&G), Goal & Objective G&O), or Desired Condition (DC)
Kelsey Planning Area (46,050 acres – lava = 35,352 acres)	12,202 (35%)	NA		
Summer Range** (15,084 acres)	6,174 (40%)	30% (S&G)	NA	NA
Deer Habitat (15,664 acres)	3,989 (25%)	10% (G&O)	3,727 (24%)	30% (G&O)
Green Mt. Winter Range Habitat Unit**	5,158 (30%)	30% (DC)	4,904 (29%)	30% (DC)
Lava River Winter Range Habitat Unit**	2,882 (26%)	30% (DC)	2,664 (24%)	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%)	

***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). **Thermal cover** 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.

****Summer Range:** includes all LRMP management allocations in the Kelsey project area except Deer Habitat. Deer Habitat is evaluated separately. **Winter Range**: habitat units are areas in the biological winter range of mule deer (area utilized by deer during the winter regardless of LMRP management allocation) ranging from 15,000 to 20,000 acres where habitat conditions and the potential effects of management activities are evaluated.

Summer Range: Hiding cover exceeds minimum guidelines, is generally well distributed, and currently approximates the ideal cover to forage ratio of 40:60. Stands north and west of Lava Butte and stands in the Monument are generally larger than what is considered optimum.

Deer Habitat: Overall, hiding cover exceeds minimum levels. There is a large stand of hiding cover in the western portion of Deer Habitat that is larger than considered optimum. Hiding cover is below desired for the Lava River Winter Range Habitat Unit. Thermal cover within Deer Habitat (MA-7) is below the LRMP minimum guideline. Thermal cover stands are generally larger than desired or considered optimal, particularly in the northern portion. Distances between stands exceed 1,200 feet in many areas, particularly in the north and east areas. Some Thermal cover levels are below the desired level within the Lava River WRHU (Table 25).

Ryan Ranch Key Elk Area (KEA): Hiding cover exceeds minimum guidelines and is relatively well distributed throughout the KEA. The majority of hiding cover is found in lodgepole pine stands along the

Deschutes River. Thermal cover exceeds minimum guidelines in the KEA. Distribution of thermal cover in the KEA closely matches the distribution of hiding cover.

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. Long-term (greater than 20 years), hiding cover quality in some ponderosa pine stands would diminish with increasing site distances. Fallen, dead trees would provide visual screening, maintaining or improving hiding cover. Green leaf manzanita (*Arctostaphylos patula*) and snowbrush (*Ceanothus velutinus*), shrub species capable of attaining heights of 6 and 12 feet respectively, would provide hiding cover in some areas. Thermal cover quality and quantity is expected to remain nearly constant over the long-term. Hiding and thermal quality in mixed conifer and lodgepole pine stands would increase in quantity and quality (greater than 10-15 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.

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: Both action alternatives would reduce hiding and thermal cover **(**Appendix B, page 95**)**. The number of acres that would be affected by each action alternative is similar (Table 26). Stand densities, shrubs, and down logs that provide visual screening and hiding cover would be reduced. In deer summer and winter habitat and the Key Elk Area, hiding cover would be most reduced with Alternative 2 (Modified Proposed Action) and thermal cover would be most reduced with Alternative 3.

Deer Habitat Management Allocation: Although thermal cover would be reduced below desired, the distribution and quality of foraging areas and cover stands would be improved. Treatments would provide a mosaic of forested conditions and thermal cover would be maintained immediately adjacent to foraging sites. The availability of a variety of plants would be maintained or improved.

Treatments would be located in areas of thermal cover that are larger than necessary to receive maximum use by deer. Both action alternatives would result in a better distribution and arrangement of cover and foraging areas than the current condition. The removal of thermal cover would enhance bitterbrush growth and vigor to provide the appropriate size and shape to receive optimum use by deer. Thermal cover stands would be maintained between created foraging areas.

Deer hiding cover and vertical stand diversity would be promoted over approximately 30-40% of a 72-acre unit in which 6-12 acre openings would be created. All trees less than 21 inches DBH would be harvested and openings would be replanted with ponderosa pine seedlings. In the short-term, these areas would provide foraging areas. Over the long-term they would provide hiding and thermal cover. Alternative 3 would treat other areas that do not currently provide thermal cover to promote deer hiding cover and vertical stand diversity.

Table 26: Post Treatment Acres and Ratios of Hiding and Thermal Cover.

	Hiding Cover – Alternatives			Thermal Cover – Alternatives		
	1	**2**	**3**	**1**	**2**	**3**
Planning Area (46,050 acres)	12,202 (35:65)	9,762 (28:72)	9,942 (28:72)	NA		
Summer Range* (15,084 acres)	6,174 (41:59)	5,312 (35:65)	5,496 (36:64)	NA		
Deer Habitat (15,664 acres)	3,989 (25:75)	3,574 (23:77)	3,656 (23:77)	3,727 (**24:76**)	2,559 (**16:84**)	2,702 (**17:83**)
WRHU: Green Mountain	5,158 (30:70)	4,361 (25:75)	4,319 (25:75)	4,904 (29:71)	3,548 (**21:79**)	2,972 (**18:82**)
WRHU: Lava River	2,882 (26:74)	2,169 (**19:71**)	2,180 (**19:71**)	2,776 (**25:75**)	2,251 (**20:80**)	2,236 (**20:80**)
KEA: Kelsey (4,604 acres)	1,599 (35:65)	1,317 (29:71)	1,289 (28:72)	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)

*Summer range includes all LRMP management allocations except Deer Habitat. Deer Habitat is evaluated separately.
WRHU = Winter Range Habitat Unit; **KEA** = Key Elk Area (Ryan Ranch)
Bold = Below minimum LRMP standards and guidelines.

Treatments would be expected to reduce overstory and understory tree density, simplify stand structure, and reduce canopy cover. Natural fuels treatments without harvest would not affect overstory tree density or canopy cover. The recruitment of thermal cover would be slowed over the long-term. Alternative 3 would provide slightly better security and areas of escapement in summer range, would retain several strategically located untreated stands to provide quality hiding cover in areas important for home range movements and migration, and would provide better security in winter range.

Table 27: Acres Proposed for Treatment to Promote Hiding and Thermal Cover.		
	Alternative 2	**Alternative 3**
Acres with Primary Treatment Objective to Promote Hiding and Thermal Cover	327	381
Acres Planted to Provide Future Hiding and Thermal Cover	720	441
Total	1,047	822

Cumulative Effects: The 18 Fire reduced the overall levels of thermal and hiding cover. Within Deer Habitat (MA-7 and Green Mt. WRHU), thermal cover was reduced below Forest Plan objectives. Proposed activities would further reduce these levels. The effectiveness and quality of Deer Habitat has been reduced through the proposed 18 Fire salvage, past wildfires, the proximity to the wildland urban interface and human population centers and would be through proposed thinning activities,. This would be true for the short term (15 - 20 years). Structural diversity would improve hiding cover in units where trees are planted with trees and shrubs respond with increased growth. It would 20 years or longer for thermal cover to improve. Both alternatives would close or decommission roads to mitigate the effect of habitat reduction. Proposed road closures would improve habitat through the reduction of intentional and inadvertent harassment. Alternative 3 would physically close more roads, and with a seasonal closure, help to offset the negative effects of reduced cover.

OPEN ROAD DENSITY

Existing Condition: Table 28 displays the existing open road density and target open road density within the specified management allocations (desired based on LRMP standards and guidelines). Open road densities are above the desired Forest Plan Standards and Guidelines in all management allocations (Table 45, page 67).

Table 28: Open Road Density by Management Allocation		
Management Allocation	**System Road Density (mi/mi^2)***	**Target Open Road Density (mi/mi^2)**
General Forest (MA-8)	5.1	2.5 (LRMP WL-53)
Deer Habitat (MA-7)	4.5	1.0-2.5 (LRMP M7-22)
Ryan Ranch Key Elk Area	6.6	0.5-1.5 (LRMP WL-46)

***mi/mi^2** = miles per square mile

Ryan Ranch Key Elk Habitat includes portions of the Wild and Scenic management area and a portion of the General Forest management area. The Wild and Scenic portion of the Key Elk Habitat contains calving areas located near the Deschutes River. The higher than desired density allows for increased habitat fragmentation, harassment, and fawning disturbance in both deer and key elk habitat.

The road system provides access within critical mule deer winter range, increasing human disturbance and reducing habitat effectiveness. Roads also provide access to the Key Elk Area. 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. Road-associated noise has the potential to disrupt active northern goshawk and Cooper's hawk nests. Edge habitat is attractive to cowbirds, a parasitic nester that lays its eggs in other species nests. Jays and ravens that feed on the eggs of other species are also attracted to this habitat. Interior-forest nesting birds may be experiencing higher than normal impacts from nest parasitism and predation.

It is estimated that roads result in a reduction of approximately 935 acres of potential wildlife habitat. Habitat effectiveness is reduced by an estimated 18,678 acres (400' affected x 385 miles). Estimates of acres affected do not include un-inventoried user-created roads.

Alternative 1 (No Action): The current open road density would be maintained, nearly double the Forest Plan desired density. A seasonal road closure in Deer Habitat would not occur. High levels of disturbance of wildlife, and increased vulnerability of big game to hunting and poaching would continue.

Alternative 2 (Modified Proposed Action), and Alternative 3
Direct, Indirect, and Cumulative Effects:
No new roads would be created. Deer and elk habitat effectiveness would be improved with a decrease in road density. Approximately 56 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 seasonal closure from December 1 – March 31 within the Green Mountain WRHU from December 1st to March 31st. 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.

SHRUB HABITATS
Existing Condition: 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, sagebrush sparrow, and green-tailed towhee (Paige & Ritter, 1999). 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).

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. The planning area contains the Green Mountain and Lava River WHRUs. Table 29 describes the characteristics of each of the major eco-types.

Table 29: Ecotype*, Plant Association Group (PAG), and Potential Productivity

Eco-type	Plant Association(s)**	Shrub and Grass Potential Productivity (% cover)	Tree Species Potential Productivity (% cover)
3	Ponderosa pine/bitterbrush/fescue Ponderosa pine/bitterbrush/needlegrass	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%
4	Ponderosa pine/bitterbrush-manzanita/needlegrass Ponderosa pine/bitterbrush-manzanita/fescue Ponderosa pine/bitterbrush-snowbrush/needlegrass	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%
6	Lodgepole pine/bitterbrush/fescue	Bitterbrush: 0-25% Idaho Fescue: 5-30%	Lodgepole Pine: 35-60%

***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.

Shrub habitats vary widely between ecotypes **(**Table 30**)**. Ecotypes 3 and 6 show a low abundance of mid-seral shrubs. Ecotype 4, under both WRHUs, approximates the desired level within each seral stage. The 18 Fire most impacted late seral shrubs within the Green Mountain WHRU by converting approximately 1,712 mid- and late-seral shrubs to an early seral stage. Table 30 displays the acres of early, mid and late seral shrub by WRHU and eco-type.

Table 30: Existing Condition – Shrub Seral Stage By Deer Winter Range Habitat Unit (WRHU) And Major Ecological Type (eco-type).

	Green Mt. WRHU – 19,982 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 (5%)
Late	2,979 (42%)	4,062 (32%)	1,341 (38%)	1,048 (32%)	583 (77%)
Total	**7,119 acres**	**12,853 acres**	**3540 acres**	**3,249 acres**	**761 acres**

To quantify shrub seral stage within the WRHUs, 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: **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 1970-1989. **Late Seral** – Management activities that were completed before 1970. Areas with no record of past management activity. 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.

Alternative 1 (No Action): Shrub habitats would continue to age, a greater proportion of shrubs moving into late seral. Mature shrubs would increase in abundance. As shrubs become decadent, the nutritional quality would decline. Natural regeneration of bitterbrush would occur that eventually would develop into winter forage. Grasses and forbs, high in nutritional quality during spring and early summer, would decrease in abundance and diversity with accumulation of litter, maturity of shrub habitats, and lack of disturbance. The risk of wildfire and the associated loss of critical mule deer winter forage would remain high or increase through time. The opportunity to reduce the risk of wildfire in critical mule deer winter range and the opportunity to improve the abundance of herbaceous forage would not occur.

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: Natural fuels treatments would convert treated areas to early seral conditions. Treatments would reduce the amount of mule deer winter forage and shrub habitat for small mammals and birds. Spring and early summer mechanical shrub treatment and prescribed underburning could result in mortality of nesting small mammals and birds **(**Mitigations, Appendix C, page 95**)**. The action alternatives would treat nearly the same acreage and have nearly effects to shrub habitats. Tables 31 and 32, page 52 display post treatment shrub seral stage acreages and percentages by eco-type in the WRHUs. The desired condition is a ratio of 1/3 early seral, 1/3 mid seral, and 1/3 late seral shrub habitat.

Table 31: 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**		
	No Action	Modified Proposed Action	Alternative 3	No Action	Modified Proposed Action	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 32: Post Treatment Shrub Seral Stage by Ecotype – Lava River Winter Range Habitat Unit									
Lava River WRHU – 8,651 total acres									
Seral Stage	Eco-type 3 – 3,540 acres			Eco-type 4 – 3,249 acres			Eco-type 6 – 761 acres		
	No Action	Modified Proposed Action	Alternative 3	No Action	Modified Proposed Action	Alternative 3	No Action	Modified Proposed Action	Alternative 3
Early	1849(52%)	2199(62%)	2200(62%)	1167(36%)	1627(50%)	1768(54%)	139(18%)	202(27%)	218(29%)
Mid	350(10%)	207 (6%)	221 (6%)	1034(32%)	832(26%)	709(22%)	39 (5%)	55 (7%)	38 (5%)
Late	1341(38%)	1118(32%)	1119(32%)	1048(32%)	790(24%)	772(24%)	583(77%)	504(66%)	505(66%)

Natural Fuels treatments in eco-type 3 would increase the amount of shrubs in the early seral stage post treatment. Mid seral shrub habitat is below the desired level and would be reduced further. Natural fuels treatments would reduce the amount of late seral shrub within eco-type 3 to approximately 1/3, the desired ratio. Natural fuels treatments would result in approximately half of eco-type 4 being early seral. Early seral conditions would provide poor winter forage (abundance, availability, and quality) because above snow forage would be reduced in treated areas. Both mid and late seral shrubs would be below the desired condition **(**Mitigations, Appendix C, page 95**)**. Mule deer would be expected to primarily utilize mature shrubs in untreated areas until treated areas have bitterbrush available above snow level. Natural fuels treatments in Eco-type 3, particularly prescribed underburning, would be expected to stimulate growth of green leaf manzanita, a non-palatable forage species. Bitterbrush would be expected to regenerate but be subordinate to manzanita. The length of time necessary for bitterbrush to regenerate in eco-type 4 would be less than in eco-type 3 due to more productive soils and higher amounts of precipitation in this eco-type. Natural fuels treatments in eco-types 3 and 6 would promote herbaceous species production. Treated areas would be dominated by Idaho fescue and would be expected to benefit elk. The risk of wildfire and introduction and/or spread of noxious weeds would be reduced in mule deer winter range.

Maintaining 50 to 70 percent of individual treatment units as untreated would provide a well-distributed shrub population. The dominance of early-seral shrubs would likely be a long-lasting effect. Habitat for species dependent on late-seral shrubs and winter forage would be reduced.

Cumulative Effects: Proposed treatments, reasonably foreseeable projects, and past projects would trend toward more early seral conditions. This is particularly true in the lower elevations, the most important mule deer winter habitat, along the forest boundary and adjacent to the urban interface. 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.

LATE AND OLD STRUCTURE FOREST HABITAT (LOS)

Existing Condition: 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. Single- and multi-story LOS are below the Historical Range of Variability (HRV). Low amounts of this habitat 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. Table 33 displays the amount of LOS habitat in the Kelsey project area by structural stage, tree species, and selected LOS associated wildlife species.

Table 33: Acres of Late and Old Structure Habitat Structural Stage, Plant Association Group, and Associated Wildlife Species		
Plant Association Group (PAG)	Acres	Selected LOS Associated Wildlife Species
Lodgepole Pine Dry Multi-story with Large Trees	144	Northern Goshawk, Northern Pygmy Owl, Great Gray Owl, Black-backed Woodpecker, American Marten
Ponderosa Pine Dry Multi-story with Large Trees	160	Cooper's Hawk, Northern Goshawk, Flammulated Owl, Great Gray Owl, Sharp-shinned Hawk, Williamson's Sapsucker, Pygmy Nuthatch,

Table 33: Acres of Late and Old Structure Habitat Structural Stage, Plant Association Group, and Associated Wildlife Species		
Plant Association Group (PAG)	**Acres**	**Selected LOS Associated Wildlife Species**
		Brown Creeper, Hermit Thrush, White-breasted Nuthatch, Golden-crowned Kinglet
Ponderosa Pine Dry Single-story with Large Trees	0	Flammulated Owl, Lewis's Woodpecker, White-headed Woodpecker, Pygmy Nuthatch, White-breasted Nuthatch
***Total Acres**	***304**	

* Less than 1 percent of the planning area is represented.

Alternative 1 (No Action): LOS forest habitats would continue to age and mature. Earlier structural stage stands would also mature, moving these stands towards LOS habitat. High tree densities in many ponderosa pine stands would retard tree growth, increasing the amount of time to attain large diameter trees. These stands would continue to be at an increased risk to insects, disease, and wildfire with potential loss of LOS. Connectivity of these stands to other LOS stands outside of the planning area would also be at risk. Current levels of connectivity would be maintained given no major disturbance events occur.

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: A combination of commercial harvest, precommercial thinning and natural fuels treatments would reduce stand complexity and density on similar acreage (Table 34). This would include the removal of subordinate trees and seedlings and saplings, creating more open stand conditions. These stands would continue to meet criteria for structural stage 6 (multi-story with large trees) and would provide suitable habitat for many LOS associated species. Those species associated with more open stand conditions, including the flammulated owl, pygmy nuthatch, and white-breasted nuthatch would particularly benefit. These stands would provide foraging habitat of the Cooper's hawk and northern goshawk, not dense stand conditions that are preferred for nesting. Tree crowns and understory trees would mature and develop into more suitable nesting habitat for the goshawk and Cooper's hawk.

Increased tree growth would more quickly provide large diameter trees and multiple canopied stands; reduce risk of loss to wildfire by reducing ground and ladder fuels; reduce risk of mortality from insects by reducing stand density; and provide larger diameter snags and CWM suitable for a greater variety of cavity and down wood dependent wildlife. There would be an undesirable reduction in the recruitment of snags and coarse woody material (CWM).

Table 34: Acres of Proposed Treatment in Stands Classified as Late and Old Structure			
	Alternative 1 (No Action)	**Alternative 2 (Modified Proposed Action)**	**Alternative 3**
Commercial Harvest, Non-commercial Thin, and Natural Fuels Treatment within LOS – Acres	0	20	22
Natural Fuels Treatment Only within LOS	0	56	55
Treatment in LOS – Acres	0	76	77
LOS in the Kelsey Project Area Treated – Percent	0	25%	25%

Cumulative Effects: Short-term (20 years), much of the project area will have little LOS habitat due to management actions and potential natural events, though it would continue to increase. Long-term (20 years) the abundance of wildlife species associated with LOS habitats would be expected to increase within the planning area. LOS areas are expected to be more resilient to major events (wildfire, insects) because of the managed stands around them and an overall decrease in fuel loading within the whole area. Those wildlife species that would benefit most, long-term, are those associated with old-growth ponderosa pine. Table 35, page 54 displays the number of acres treated that would promote LOS habitat. Although the action alternatives would have no

cumulative effects to any of the OGMAs directly, they would, in the long-term, help in establishing a wider system of such habitats.

Table 35: Acres of Proposed Treatment that would Promote Late and Old Structure			
	Alternative 1 (No Action)	**Alternative 2 (Modified Proposed Action)**	**Alternative 3**
Promote Multi-Story LOS – Treatment* Acres	0	410	395
Promote Single-Story LOS – Treatment** Acres	0	1,495	1,530
Total Treatment Acres to Promote LOS	0	1,905	1,920

***Treatment Objective:** Accelerate development of multi-story late or old structure LOS.
****Treatment Objectives: 1)** Accelerate development of single-story late or old structure; **2)** Maintain/accelerate development of ponderosa pine old growth; **3)** promote open, park-like stands.

OLD GROWTH MANAGEMENT AREAS (OGMA)
Existing Condition: Three (3) OGMAs, totaling approximately 467 acres, are within the planning area. 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. These OGMAs are not classified as single- or multi-storied stands and are not providing an old-tree environment or a unique representation of landscape ecology. They contribute to the biodiversity of the forest by providing habitat for other wildlife species, big game hiding and thermal cover, and dead tree habitat for numerous species of primary cavity excavators and secondary cavity users. There is a minor amount of suitable nesting habitat for the northern goshawk.

Alternative 1 (No Action)
Direct and Indirect Effects: LOS forest habitats and OGMAs would continue to age and mature. Earlier structural stage stands would also mature, moving these stands towards LOS habitat. High tree densities in many ponderosa pine stands would retard tree growth, increasing the amount of time to attain large diameter trees and placing stands at risk to insects, disease, and high-intensity wildfire likely resulting in loss of LOS and OGMA habitats. The current levels of connectivity would be maintained without the occurrence of natural disturbances.

Alternative 2 (Modified Proposed Action) and Alternative 3
Direct and Indirect Effects: No treatments are proposed within the OGMAs located within the planning area. No direct effects to OGMAs or old growth associated species.

Reduced tree growth and vigor, increased time needed to attain large tree (>21") diameters and old growth characteristics, and a continued risk of natural disturbances would result from no thinning or fuels reduction activities. Mortality would increase the number of snags and CWM. Small diameter habitats (approximately 7-12" dbh) would be less suitable for cavity dependent wildlife than large diameter material. These habitats would provide 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. Multi-storied ponderosa pine stands would provide high quality nesting habitat for the northern goshawk and, over time, would provide habitat for other old growth associated wildlife species such as the flammulated owl, northern pygmy owl, pygmy nuthatch, white-breasted nuthatch, brown creeper, and hermit thrush. Suitable habitat for the black-backed woodpecker, American marten, and a small amount (currently 14 acres) of suitable nesting habitat of the northern goshawk would continue. Habitat diversity would contribute to providing hiding and thermal cover for big game and suitable snag and CWM habitat for numerous other wildlife species.

Cumulative Effects: Proposed activities would reduce the risk of wildfire spreading from adjacent areas into two (2) OGMAs and associated habitat. The greater the amount of treatment adjacent to the OGMA, the lower the risk of wildfire. Refer to cumulative effects discussion in LOS, page 52.

LATE AND OLD STRUCTURE (LOS) CONNECTIVITY

Existing Condition: Maintaining connectivity between habitats, particularly LOS habitat, is believed to be important for numerous wildlife species. Connectivity between LOS stands, as well as allocated OGMAs, allows free movement, interaction of adults, and dispersal of young. A minimum of two connections between late and old structure stands and each OGMA is required, including those outside of the planning area boundary. Connectivity corridors should be those in which: 1) medium to large diameter trees are common; 2) canopy closures are within the top one-third of site potential; and 3) 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 OGMAs should be as short as possible. Seventeen (17) LOS corridors were identified in the project area.

Stands that meet hiding cover definitions, many of the big game travel/movement corridors, are the same as the LOS connectivity corridors since these corridors are the densest available. Treatments have been designed to retain cover patches within units (see mitigations) or treatments would occur in stands without appropriate cover.

Seventeen (17) LOS corridors were identified in the project area. The 18 fire, burned through seven (7) corridors mapped within the fire boundary. Two (2) were LOS, the other five (5) big game travel corridors. No quality linkages currently exist through the burned area. A proposed fire salvage effort will analyze the suitability and re-establishment of these connectivity corridors.

Alternative 1 (No Action)

Direct and Indirect Effects: Connectivity corridors would not be designated. The current levels of connectivity would be maintained without the occurrence of natural disturbances. Travel and movement of big game would be less effective presenting more risk of harassment from human activity. Refer to discussion of LOS, page 52.

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: Treatments proposed within LOS connective corridors and acres affected would be nearly the same for each action alternative. Thinned stands would retain approximately 45-100 trees per acre with an average dbh of approximately 13 inches and retain approximately 20 percent canopy cover. Treated stands would continue to provide suitable connective habitat for wildlife species associated with LOS ponderosa pine. As trees develop more full crowns and larger diameters, connective habitat would improve and provide suitable breeding habitat. Thinned stands that are inconsistent with Eastside Screens would have low stocking levels to maximize tree growth and reduce the risk of bark beetles for at least 30 years. Canopy cover would be estimated to be approximately 10 percent less than the upper third of site potential. Canopy closures would be estimated to be at the lower end of the top one-third of site potential within approximately ten (10) years **(**Mitigations, Appendix C, page 95**)**. Table 36 displays acres treated within the corridors by each action alternative.

Table 36: Total Acres Treated Within Corridors

	Alternative 2 (Modified Proposed Action)	Alternative 3
Total Acres Treated in Corridors	62	71
Total Acres Treated inconsistent with Eastside Screens	34	16
Number of Corridors in which Connectivity is Disrupted	10	8

SNAGS, COARSE WOODY MATERIAL (CWM), AND GREEN TREE REPLACEMENT (GTR)

Existing Condition: Selected wildlife species known or suspected to occur in the planning area utilizing these habitats include the flammulated owl, northern pygmy owl, white-headed woodpecker, black-backed woodpecker,

Williamson's sapsucker, pygmy nuthatch, brown creeper, white-breasted nuthatch, mountain bluebird, American marten, western small-footed myotis, long-eared myotis, long-legged myotis, pallid bat, and silver-haired bat.

A snag is defined as a dead tree over 10 inches in dbh and taller than 10 feet. Coarse Woody Material (CWM) is considered to be dead and down material greater than 8-10 inches dbh at the small end. Desired conditions of snag and CWM habitat were determined using DecAID (Decayed Wood Management Advisor; Marcot, et. al. 2002 preprint). The DecAID Advisor helps determine snag and log levels best suited for the management area and associated wildlife species. Densities are given in the form of wildlife species tolerance levels at the 30%, 50%, and 80% levels (An 80% tolerance level means that 80% of a wildlife species dependent on snags or logs will use an area containing these levels). The DecAID advisory gives downed log (CWM) recommendations in terms of size and percent of area covered by downed material.

Using the studies and information within DecAID, it is entirely expected and realized within this analysis area that distribution of snags will be clumpy (i.e. some areas have no snags while others have many snags). Since most of the project area falls within the small/medium tree types, the clumps of snags would be small (2-5/acre) with the majority of these snags being less than 20" dbh. The large tree type would have more of the larger snags.

The current average levels in each of the habitat types are below the desired densities for large snags (Table 37). As a result of the 18 Fire, the ponderosa pine/Douglas-fir, small/medium tree habitat type is probably closer or even exceeding the desired levels, but these snags are all in one area. The expected clumping is exaggerated within the fire.

Table 37: Desired And Existing Average Snag Density (Snags Per Acre) And Size By Habitat Type

Habitat Type*	Average Snags Per Acre Greater than or equal to 10" dbh	Average Snags Per Acre Greater than or equal to 20" dbh
Ponderosa Pine/Douglas Fir - Small/Medium trees		
50% tolerance level	1.6	1.1
Existing Condition	1.4	0.09
Ponderosa Pine/Douglas Fir - Small/Medium trees		
80% tolerance level**	4.8	2.5
Existing Condition	7.57	1.12
Ponderosa Pine/Douglas Fir - Large Trees		
50% tolerance level***	2.9	3.6
Existing Condition	1.4	0.09
Lodgepole Pine**		
Eastside Screens	1.21	0.59 (greater than 12")
Draft EIS	6	-----
Existing	2.15	0.06

* Habitat type determined using DecAID and the plant association groups within the project 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 is 20" or larger.

** The 80% tolerance level was chosen to take into account the mixed conifer plant association group. Mixed conifer stands within the project area reflect a higher moisture regime and better capability to support higher snag levels.

*** 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.

**** The DecAID analysis process does not have recommendations or data summaries for lodgepole pine types as of this project date. Data presented in this table reflect what was originally presented for the Kelsey project area. Screens = Revised Interim Management Direction, and Draft EIS = Supplemental Draft EIS direction - Appendix 12 from the Proposed Decision for the Interior Columbia Basin Final Environmental Impact Statement (2000).

Using the DecAID analysis and background information, all PPDF acres has coarse woody material, mostly greater than 5 inches dbh. Very few large concentrations and few large pieces are present.

Table 38: Existing and Desired Coarse Woody Material (CWM) By Habitat Type*		
Habitat Type	**Tolerance Level (Percent)**	**Desired Percent Cover of CWM**
Ponderosa Pine/Douglas Fir – Small/Medium	50%	1 to 2
Ponderosa Pine/Douglas Fir – Small/Medium (mixed conifer)	80%	3
Ponderosa Pine/Douglas Fir – Large	50%	1.8
	Ponderosa Pine/Douglas Fir – Existing: 1.4	
Lodgepole Pine		No data
Existing:		0.36-2.3
	Screens target: 15 to 20 pieces per acre greater than 8" dbh	
	Existing: approximately 13 pieces per acre greater than 8" dbh	

*Existing levels are estimates. 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 have probably suffered in the reconciling of the different measurement units. Marcot, et. al. 2002 explains the rationale for using percent cover as the desired measurement for CWM levels.

Table 39: Log Density Per Acre To Meet Target Log Cover Percentage For 50 Percent Tolerance Level Within Ponderosa Pine/Douglas-Fir Small To Medium Trees* Habitat Type			
Number of Logs	**Log Length**	**Log Diameter**	**Percent Log Cover Per Acre**
4	20 to 40 feet	5 to 10 inches	0.2
8	20 to 40 feet	10 to 20 inches	0.8
4	20 to 40 feet	20 to 40 inches	0.5
Total: 16			**1.5**

*The larger the logs left, the greater the individual log's percent cover. To attain the higher percent covers (e.g. 80% tolerance level and Ponderosa Pine /Douglas-fir large tree) add to the number of logs in each size class.

Summarizing Tables 38 and 39, CWM is below desired levels of DecAID in the mixed conifer (80% tolerance level) and large tree types. The amount in the Ponderosa Pine/Douglas Fir small/medium tree, characterizing a majority of the project area, is within the desired level. CWM in the Lodgepole pine habitat type is below desired levels. Large quantities of CWM less than 9.1 inches diameter exist. Considering only logs greater than 9.1 inches diameter, CWM standards are not met. This may be attributed to the average stand diameter of most lodgepole pine stands being less than 9.1 inches. These tables do not incorporate the 18 Fire effects. Little CWM remains within the fire area and may be below desired levels.

Green tree replacements are trees retained or managed through time to provide snag or coarse woody material habitat at some point in the future. All tree removal activities are required to maintain green tree replacement of greater than 21 inches DBH, or the representative DBH of the overstory layer if less than 21 inches, at 100 percent potential population levels of primary cavity excavators. Units within the Kelsey planning area are fully stocked and green tree replacements are above the recommended management levels.

Alternative 1 (No Action)

Direct and Indirect Effects: Snag, CWM and green tree replacement habitats would be maintained in the current condition. Snag and CWM habitat would remain above desired levels within lodgepole pine dry and mixed conifer PAGs, and below desired levels in the ponderosa pine dry PAG during the short-term (less than 10-15 years). Natural disturbances would recruit snag and CWM habitat, increasing the density of these habitats; particularly in high tree density stands. High tree density in many of the ponderosa pine stands would retard the development of large diameter (>21") trees and future snags.

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: The alternatives do not propose commercial harvest or salvage of snags or CWM. Commercial harvest activities would not affect snags or CWM habitats, except for falling snags that pose a hazard to human safety. Commercial harvest would affect GTR by reducing the number of trees, but units would remain fully stocked, exceeding levels recommended in the Deschutes National Forest Wildlife Tree and Log

Implementation Strategy. Noncommercial thinning would not reduce the number of GTRs in treated units below management levels.

Prescribed underburning in the ponderosa pine and mixed conifer PAGs would have direct effects to snags and CWM, reducing the amount of CWM by length and diameter reduction or overall abundance. A high intensity burn could reduce the number of existing snags, but could result in large diameter green tree (>15") mortality, supplementing snag numbers in the short-term and CWM over the long-term. The exact number of snags and CWM lost to prescribed fire, or recruited from prescribed fire is unknown but CWM could be reduced below standards. Burn objectives and mitigations **(**Appendix C, page 95) would reduce the loss of snags and CWM. Incidental mortality of GTRs may occur. Post-treatment GTRs would exceed minimum management requirements. Mechanical shrub treatments would have no direct effects to snags or CWM.

Thinning activities would reduce the risk of mistletoe infection, insect mortality, and wildfire and would decrease available trees for snag recruitment and CWM. Alternative 3 would treat the greatest number of acres, having the greatest effect on snags, CWM, and GTRs. Alternative 2 (Modified Proposed Action) would treat fewer acres but with the greatest number of acres with activities to reduce bark beetle risk for the greatest amount of time (30 years) and mistletoe occurrence **(**Table 40**)**. With fewer residual trees, the recruitment of snags and CWM would decrease. GTRs would have faster growth and larger diameters. Prescribed underburning and mechanical shrub treatment would reduce fire risk and maintain habitats over the long-term.

Table 40: Indirect Effects –Acres Treated that Reduce the Recruitment of Snags and CWM

	Alternative 2 (Modified Proposed Action)	**Alternative 3**
Commercial Thinning – Acres	4,974	5,355
Reducing Beetle Risk for 30 Years – Acres	2,730	1,761
Reducing Mistletoe Occurrence – Acres	696	640

Cumulative Effects: Proposed, past, and foreseeable treatments, including continued fuels treatments within the wildland/urban interface, would reduce the amount and recruitment of snags and CWM. Reduced tree competition would accelerate tree growth, providing future large diameter snags and CWM.

RAPTORS

Existing Condition: Several known raptor nest sites are within the Kelsey planning area. Species that are known to occur, or that would likely nest within the area, include the Cooper's hawk, northern goshawk, red-tailed hawk, osprey, and golden eagle and there are active, or recently active, nests for the golden eagle. Other species with potential habitat that are suspected to occur include the sharp-shinned hawk, flammulated owl, northern pygmy owl, and great gray owl. Surveys of potential northern goshawk habitat were conducted in 1998, 2000, and 2001. A more localized survey was conducted for northern goshawks near the High Desert Museum in 1996. Surveys for great gray owls were conducted in 2000 in potential habitat along the Deschutes River. No great gray owls were reported.

Nest stands consisting of 30 acres of suitable nesting habitat and 400 acres post fledgling areas have been identified for northern goshawk sites. The 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 41, page 59 summarizes the existing condition of nesting habitat in the Kelsey project area.

Table 41: Existing Condition of Potential Nesting Habitat for Selected Raptor Species		
Species	**Acres of Potential Nesting Habitat in the Kelsey Planning Area**	**Acres of Habitat Meeting the LRMP Definition***
Northern Goshawk	2,283	1,531
Cooper's Hawk	2,740	1,383
Sharp-shinned Hawk	915	606
Great Gray Owl	236	---

*Forest Plan definitions for each species are as follows: **Northern goshawk** – mean canopy cover of 60% 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% or greater, tree density of at least 365 trees per acre, stand age of 50-80 years (Forest Plan WL-17); **Sharp-shinned Hawk** – mean canopy cover of 65% or greater, tree density of at least 475 trees per acre, stand age 40-60 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% (50-70%), distance to nearest meadow 440 (63-1,070) feet (Forest Plan WL-31).

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no immediate change to raptors, habitat, or known nesting sites. Current management activities and natural processes would continue to affect raptor habitat and the use of habitat. The risk of natural disturbances would likely continue to increase without reductions in forest density and/or natural fuels.

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: Treatments are not proposed in known nest stands 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. Treated stands would have reduced stand density and simplified stand structure that would not provide the preferred characteristics for nesting, primarily mistletoe infected trees, 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 (Modified Proposed Action). The difference would not be substantial and treated stands would continue to provide foraging habitat.

Table 42: Direct Effects to Potential Nesting Habitat of Selected 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	6	31	0	397	402	0	456	467	0	167	157
Potential Nesting Habitat degraded or eliminated: Percent	0%	3%	13 %	0%	17%	18%	0%	17%	17%	0%	18%	17%
Nesting Habitat: Acres	---	NA	NA	1,531	1,248	1,244	1,383	1,137	1,153	606	463	522
Nesting Habitat Degraded or Eliminated*: Acres	0			0	283	287	0	246	230	0	143	84
Nesting Habitat Degraded or Eliminated*: Percent		NA	NA	0%	18%	19%	0%	18%	17%	0%	24%	14%

*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).

Commercial and noncommercial thinning would create more open stand conditions. This would allow greater maneuverability, visibility, and access to prey. Treatments would promote greater plant diversity that provides 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. Increased tree growth would provide future larger diameter snags that could be utilized by the flammulated owl and northern pygmy owl for nesting. Given adherence to mitigations measures, neither, the Modified Proposed Action or Alternative 3 would have any direct effects to raptor species or known nesting sites.

Cumulative Effects: Proposed treatments, past treatments, and 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. There would be a trend towards increasing open stand conditions that are more suitable as foraging habitat for the red-tailed hawk, flammulated owl, and northern pygmy owl.

ASPEN STANDS

Existing Condition: Aspen is unique and highly valuable as wildlife habitat, providing forage and cover for big game, forage for a variety of birds, and habitat for cavity nesters. Aspen is limited in distribution, abundance, and reproduction from the lack of fire, competition with conifers, and big game and stock browsing. Small stands, generally less than ¼ acre, or individual trees occur in lava flows or outcroppings. There is one approximate 5-acre stand.

Alternative 1 (No Action) and Alternative 2 (Modified Proposed Action)

Direct and Indirect Effects: Without treatment of the 5-acre aspen stand, trees would continue to mature and have smaller diameters. Competition with conifers would result in a gradual decrease in aspen distribution and size without treatment or natural disturbance.

Alternative 3

Direct and Indirect Effects: Alternative 3 would treat the 5-acre aspen stand to increase aspen suckers, growth, and survival. The stand would be expected to mature, with larger diameter aspen trees providing habitat diversity for a variety of animals, particularly songbirds. The treated aspen stand would be fenced to protect aspen suckers from big game browsing. There would be no cumulative effects to aspen stands.

LAVA ROCK OUTCROPPINGS, WATER SOURCES, AND CAVES

Existing Condition: 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 (Table 24, page 46).

One fenced, 600-gallon wildlife guzzler is located within the planning area. Guzzlers collect precipitation and are designed to provide water for primarily big game, with birds and other wildlife also benefiting. The Deschutes River provides the only free flowing water and riparian habitat within the planning area.

Two caves are located within the planning area, Lava River Cave and Bessie Butte Pit. Lava River Cave is used for hibernation for small numbers (<5 at any one time) of Townsend's big-eared bats. There are no records of bats in the Bessie Butte Pit.

Alternative 1 (No Action), Alternative 2 (Modified Proposed Action), and Alternative 3: None of the alternatives would have direct, indirect, or cumulative effects to lava rock outcroppings, water developments, or caves.

HYDROLOGY AND FISHERIES RESOURCES

Existing Condition: The planning area is within the Pilot Butte (approximately 147,000 acres) and Newberry (approximately 70,900 acres) 5th-field Watersheds. The planning area covers approximately 46,050 acres and includes part of nine 6th-field subwatersheds. The Kiwa Subwatershed has been designated as an A2 subwatershed, which is critical for maintaining quality red band trout habitat. A2 subwatersheds should receive restoration priority over other subwatersheds (ICBEMP, unsigned). Recommended management direction in A2 subwatersheds includes watershed restoration, noxious weed treatments, prescribed fire, thinning, and road restoration.

Existing channels are predominately old ephemeral channels that flow only during high precipitation events, rarely joining perennial flow primarily because of high soil infiltration rates. The planning areas western boundary borders the perennial flowing Deschutes River. The hydrology of the Deschutes River is a combination of spring-fed base flow, augmented by spring runoff from melted snow, and modified by the presence of Wickiup Dam, located upstream approximately 40 miles, which regulates the flow of the River. Generally, summer flows from the dam are greater than normal due to irrigation demand, while winter flows are less than normal. The presence of Wickiup Dam and the associated irrigation canals have reduced the natural variability of flow within this system.

The Federal Wild and Scenic River and State Scenic Waterway Act established an overriding goal to protect and enhance the Outstandingly Remarkable Values (**ORV**) for which the river was designated. The fisheries resource is regarded as an ORV in Segment 4 because of the trophy brown trout (*Salmo trutta*) fishery. Redband trout (*Oncorhyncus mykiss gairdneri*), listed on the Regional Foresters Sensitive Species List and by the State of Oregon, may occur within this portion of the river. The redband trout historically inhabited the entire Upper Deschutes River system. There are no known threatened, endangered, proposed, or candidate fish species listed by the U.S. Fish and Wildlife Service within the planning area.

The planning area includes lands adjacent to the east bank of the Deschutes River from the north boundary of Sunriver to the southern urban growth boundary of Bend (approximately 11 miles), over 400 acres within the RHCA (east riverbank only). There are approximately four (4) lineal miles of the Deschutes River and 145 acres of Riparian Habitat Conservation Area (**RHCA**) within the planning area from the north boundary of Sunriver to Benham Falls Day Use area.

RHCAs are areas that 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. RHCA widths are based on site-potential tree heights and may be adjusted during site-specific project analysis where rationale for appropriate widths is presented in the decision making process.

The riparian zone width is variable, mostly narrow (5-10 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 and/or ponderosa pine and bitterbrush. In other areas, loose rock/large boulder slopes separate the river from the uplands.

The primary source of hydrologic disturbance along the River is from compaction of soils due to user-created roads and recreational sites. Riparian conditions vary from good to poor and limit proper hydrologic function, depending upon the degree of conifer encroachment, recreational use (dispersed and developed), and road use.

This portion of the river is included on the Oregon Department of Environmental Quality (ODEQ) list of water quality impaired streams (303(d) list). The parameters for which it is listed are temperature (September 1-June 1), chlorophyll a, dissolved oxygen, sedimentation, and turbidity. The riparian vegetation is generally in an undisturbed condition, except where dispersed recreation sites have encroached. An extensive network of official and unofficial roads, and abundant dispersed campsites are located adjacent to the river. Compacted soils are associated with roads and dispersed sites and some have channeled sediments into the river. Riverbanks have been trampled at some sites. Bacteria, nitrogen, and phosphorus may be being introduced into the river from unsanitary waste disposal practices at these dispersed campsites.

Wickiup Dam, located approximately 45 miles upriver from Benham Falls, regulates flows of the Deschutes River to meet downstream irrigation needs. The flow regime was historically very stable, with a mean flow of approximately 1190 cubic feet/second (**cfs**) and an annual range from approximately 1000 – 1600 cfs measured at

Benham Falls. Large flood events were uncommon. The river now experiences a large swing in flow with storage practices for irrigation needs. Flows range from approximately 700 cfs to 2500 cfs as measured at Benham Falls. During drought years flows may be substantially less during the winter. During the summer flows may be above 3000+ cfs.

Log drives down the river in the 1930's damaged riverbanks and reduced instream large wood that fish depend on for cover from predators and as velocity breaks 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. The remainder of the river within the project area is lacking in instream wood. Historically, abundant large ponderosa pines up to 4' diameter were likely found within the channel to provide fish habitat.

The flow regime from Wickiup Dam, private land development, and recreational use are other actions in the watershed adversely effect redband habitat and populations through changes in flow, increased sedimentation of substrates, increased turbidity, and decreased dissolved oxygen. Restoration projects undertaken on federal, state, and private land on areas upriver of the Kelsey Planning area have improved upstream fish habitat and water quality. A project was completed in within the Kelsey planning area during the spring of 2003, placing approximately 150 trees along the shore for fish habitat improvement. More instream large wood restoration and riverbank stabilization projects are foreseeable upriver of the planning area.

HYDROLOGY

Alternative 1 (No Action)

Direct and Indirect Effects: This alternative would not protect or enhance watershed health. Management activities would continue as are presently occurring. Without vegetation treatments, high-intensity, stand replacement wildfires could remove all or most riparian and upland vegetation. 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.

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct, Indirect Effects, and Cummulative: Alternative 2 (Modified Proposed Action) would treat approximately 9,930 acres by thinning, fuels treatments, or thinning and fuels treatments. Alternative 3 would treat approximately 11,250 acres, approximately 13 percent more than Alternative 2. 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.

Alternative 2 would incorporate non-mechanized (hand) vegetation treatments in four (4) units (78, 84, 85, and 87) across approximately 11 acres within the RHCA. Alternative 3 would treat nine (9) units (78, 87, and 200 to 206) and approximately 25 acres within the RHCA. A 100-foot buffer from the waters edge, on the lower terrace, would be maintained and promote and enhance all Riparian Management Objectives (**RMOs**) (Appendix D, Hydrology, page 129). Thinning and fuels reduction would occur within unit 87, but would be restricted to non-conventional methodology, such as horse or all terrain vehicle (**ATV**) logging. These units currently are dense and at high risk to mountain pine beetle mortality. Treatments within the RHCAs would reduce the risk for watershed degradation from wildfire, and tree mortality from insect vectors and mistletoe.

Temporary roads needed for treatments would be closed and decommissioned. Approximately 0.6 miles of system road and 1 mile of non-system roads within the RHCA would be closed or decommissioned. Alternative 3 would obliterate 0.25 miles less of non-system roads. Two dispersed campsites would be closed, rehabilitated, and relocated.

In the short-term (less than 10 years) Alternative 3 provides more potential for overland flow and sediment delivery than in Alternative 2 resulting from more proposed treatment acres. Gentle slopes, highly permeable soils, and mitigations **(**Appendix C, page 95**)** in both action alternatives would protect any adverse effects to watershed health. There would be no measurable adverse effects to bank stability, width/depth ratio, or stream temperature within the RHCA. All proposed management activities 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.

FISHERIES

Alternative 1 (No Action)

Direct and Indirect Effects: This alternative may effect individuals (redband trout) or habitat **(MEIH)** as a result of no vegetative treatments. There would not be a loss of population viability or create a significant trend toward federal listing. Overall, the No Action alternative does not protect and enhance the fisheries Outstandingly Remarkable Value identified in the Wild and Scenic River Plan.

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/or large scale wildfire that could occur within riparian habitat would continue and 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, 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. There would be a short term benefit of increased large wood recruitment to the river in the event of a large forest disturbance adjacent to the river.

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: 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. This alternative is consistent with ICBEMP science and NNVM objectives and standards and guidelines.

Sediment flow into the river, as a result of the Modified Proposed Actions, would be immeasurable due to flat to very gentle slopes, highly permeable soils, and mitigation measures. There would be no measurable reduction of river tree shade on the due to the small acreages proposed for treatment within the RHCA, the size of the trees to be thinned, a 100 foot setback, and gentle sloping away from the river. Any incidental reductions in tree shade would not result in any measurable increases in water temperatures. Management activities would not be expected to result in any changes to peak flow of the river.

The proposed activities would protect and enhance the fisheries ORV in the short-term (less than 10 years). Thinning and fuels activities within one (1) mile of the river and within the RHCA would reduce the high intensity wildfire risk and the potential for insect damage. The long-term (greater than 10 years) risk for a high intensity, stand replacement wildfire or damage from insect vectors would remain. A high-intensity wildfire could disrupt fish habitat. Thinning activities within the RHCA would reduce ponderosa pine competition that would result in healthier and larger trees that would provide shade, riverbank stability, and future instream large wood. Riparian and upland vegetation would be protected and improved over the long-term.

Within the RHCA, approximately 0.6 miles of system and 1 mile of non-system roads would be closed or decommissioned and two (2) dispersed campsites would be closed, rehabilitated, and relocated. These activities would provide long-term benefits to fish and fish habitat by improving riparian and upland vegetation conditions and reducing overland flow of sediments. During the obliteration of roads and the closure, there would be a temporary potential for overland flow of sediments into the Deschutes River which would be reduced with implementation of mitigation measures (Appendix C, page 95).

Cumulative Effects: Proposed vegetation and fuels activities would reduce the potential for adverse effects to fish habitat within and downriver from the planning area over the long-term. There would be little potential for proposed activites to be additive to any adverse effects occurring upriver. The proposed activities may not be substantial enough to improve and protect redband habitat in the long-term. Instream large wood restoration and riverbank stabilization projects using bio-engineering techniques are anticipated. Activities to improve large wood fish habitat have recently occurred.

Although the Kelsey Project area is located greater than 50 miles upriver of 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. The proposed activities are consistent 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). Despite these two (2) criteria not being met, the Biological Evaluation determined there would be no affect to bull trout. This is due to the distance of the nearest population, several dams near Bend, and sediment transport. The proposed activities would not prevent attainment of the Riparian Management Objectives listed in the Inland Native Fish Strategy (INFISH). Proposed activities are designed to promote large woody debris and shade to meet long-term Riparian Management Objectives.

Table 43: Riparian Habitat Conservation Area (RHCA) Summary

Alternative	Acres Treated In RHCA	% RHCA Acres From Benham Falls To Sunriver	% Total RHCA Acres Within Project Area
1 (No Action)	0	0	0
2 (Modified Proposed Action)	11	8	3
3	25	19	7

SOILS RESOURCE

Existing Condition: Soils in the Kelsey planning area are strongly influenced by materials deposited from volcanic eruptions, including volcanic ash, pumice and cinders. Mount Mazama was the primary volcanic event that influenced the present soils in this area. The Mazama pumice and ash depths generally range from 20 to 40 inches. Newberry Crater shaped the landscape in the planning area. Ash and pumice from associated cinder cones covered the area.

Soils within the project area exhibit high water infiltration rates and are classified as well to excessively drained. Surface soils are sands and pumiceous loamy sands. Underlying soils are loams to gravelly loamy sands and sands. Permeability is very rapid in surface soils and moderate to rapid in buried soils. The water table can be encountered within two (2) to five (5) feet from the surface in some of these soils. The underlying bedrock has a high to moderate capacity to store water and a low to moderate rate of water transmission unless storage capacity is exceeded.

Approximately 1,061 acres of roads (2.5 percent of the planning area) have been removed from the productive land base. Some of these roads are native surfaced and have segments that are rutted and/or eroding. Deficits of dead and down wood in areas of dispersed recreation and areas of unauthorized fuel wood gathering are difficult to maintain long-term site productivity in these areas. Historic railroad logging and more recent mechanical entries have compacted soils, also reducing site productivity. Detrimental soil quality exists on approximately 160 acres.

Low intensity fire enhances recycling of plant debris and the associated release of plant nutrients on these dryer sites, which have slower vegetative decomposition rates due to limited moisture. High intensity wildfires have the potential to damage soil quality. Both above and belowground biomass (nutrients) is susceptible to being lost through heat and combustion. The present biomass has increased substantially above what was historically present, primarily as a result of fire suppression activities.

The existing soil quality can be evaluated by looking at the inherent soil quality (productivity), sensitivity (susceptibility and resiliency to disturbances), and soil condition class (percent area of detrimental impacts from previous activities). Approximately 4 percent of the planning area has high existing soil quality, 34 percent moderate, and approximately 62 percent low to very low. Lava flows, naturally low soil quality, occupy approximately 25 percent of the planning area. Approximately 116 acres of soil quality has declined from high to moderate. Approximately 45 acres of soil quality has declined from moderate to low.

On July 23, 2004 the 18 Fire burned approximately 3,800 inside the Kelsey project area. The surface textures of these soils provide high infiltration and percolation rates that account for low amounts of overland flow. Burn severities were mapped using field observation and generally revealed low to moderate throughout the fire area. Zero (0) to five (5) percent slopes make surface erosion in the fire area a low concern.

Alternative 1 (No Action)
Direct and Indirect Effects: There would be no new areas of detrimental soil compaction or displacement**.** Plant debris and associated nutrients would continue to accumulate above ground as a result of associated slow decomposition rates. Soil quality would continue to be at risk to high intensity wildfires, particularly in areas where fuel loadings exceed historical levels. These areas would be expected to experience substantial loss of soil organic matter and nutrients following wildfire as well as soil loss associated with wind erosion. Inherent soil quality would continue to be reduced on approximately 161 acres.

Erosion along roads (primarily native surfaced roads) would continue and be projected to increase with increased public use. It is projected that user-created road and Off Highway Vehicle (OHV) use would continue to increase as a result of an expanding population. Dispersed recreation and use of dispersed recreational sites would continue to increase, new sites would develop, and user-created roads would most likely continue to be created. Maintenance of dead and down wood for long-term site productivity would continue to be deficit in and around areas of dispersed camping and areas of illegal fuel wood gathering.

Alternative 2 (Modified Proposed Action) and Alternative 3
Direct and Indirect Effects: Vegetation and fuels management treatments would occur on approximately 10,840 acres under Alternative 2 (Modified Proposed Action) and approximately 12,163 acres under Alternative 3, reducing the risk of high intensity wildfire and associated reduction in soil quality. Large woody debris would be left on-site, as necessary, to meet minimum, long-term site productivity needs. Localized firewood collection may make it difficult to maintain down wood in sufficient quantities to maintain long-term site productivity. Minimizing disturbance to the fine surface organic matter would sustain short-term site productivity. Treatments would help recycle nutrients into soils. Treatments would occur on approximately 378 acres of sensitive soils with implementation of Alternative 2 (Modified Proposed Action) and 353 acres with Alternative 3.

Machinery used for mechanical shrub treatments and thinning activities would cause limited soil displacement and compaction due to the small size of machinery used. Skid trails, landings and temporary roads would be designated and rehabilitated/stabilized upon completion of activities, maintaining or reducing stand soil compaction levels.

Approximately 1,150 additional acres would be treated under Alternative 3 than Alternative 2 (Modified Proposed Action). Wide thinning would lengthen the time before future thinning is needed, allowing soils additional recovery time.

Yarding systems studies by Dyrness (1965) and others found that an average of 36% of the total unit area would be in a deeply disturbed or compacted state using a ground base tractor logging system for both clear cuts and selective tree harvest. This would include landings and skid trails and usually occurs on slopes lees than 50 percent.

Cumulative Effects: The Sunriver/Benham Falls/ Lava Lands Trail would disturb approximately 2.1 acres and remove these acres from the productive soils base. If funding is unavailable to rehabilitate previous detrimental soil impacts, 161 acres would continue having detrimental soil quality, exceeding both Regional and Forest standards.

ROAD ACCESS

Existing Condition: There are approximately 258 miles of Forest Service roads and 13 miles of State, County, or other roads within the planning area, totaling 271 open road miles. 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 (ATVs, motorcycles, 4WD, 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 snowmobiles.

These roads are separated into three categories: primary, secondary, and others. There are also numerous unclassified, user-created roads throughout the planning area that are not tracked on the official transportation inventory. An administrative closure to off-highway 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 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. These roads total approximately 201 road miles and include closed and decommissioned roads.

Table 44: 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 are becoming overgrown with vegetation. 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.

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 1900's, or roads developed by four-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 Roads Analysis. Road density includes maintenance

level roads 2-5, and State and County roads. Table 45 provides a comparison between present, desired, and recommended road density for each Management Area.

Table 45: Present, Desired, And Recommended 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)	5.0	1.0 – 2.5	4.3 (3.7)***
General Forest (MA-8)	3.4	2.5	2.8 (2.9)***
Scenic Views (MA-9)	6.3	2.5	5.2
Old Growth (MA-15)	2.8	2.5	2.4
Wild and Scenic (MA-17)	6.1	Lowest density to meet Long-term needs	2.9
Ryan Ranch – Key Elk Habitat	6.6	0.5 – 1.5	4.9
NNVM	2.0	Lowest density to meet Long-term needs	1.8
Density **(Miles/Square Mile)***	**4.0**		**3.5**

* 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.

Temporary roads and road reconstruction would be needed to access and support management activities and to improve existing roads. Open road miles would be decreased with road closures in all Management Areas that have higher road densities than desired. Sufficient funding to cover annual and deferred maintenance on all roads is not expected. Unclassified, non-system roads would be closed when associated with vegetation management activities and/or when other funding becomes available.

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 (Official Record, Appendix H). Normal maintenance activities would continue. Maintaining unneeded roads would continue to keep road maintenance costs higher than desired.

Alternative 2 (Modified Proposed Action) and Alternatives 3
Direct and Indirect Effects: There would be no new permanent road construction in either action. Temporary roads may be constructed for short-term use where the risk of resource impact is low, or can be mitigated, and where analysis has shown they are cost effective. 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. Project activities are summarized in Table 10, page 22. Access to proposed unit 111 would require access through Deschutes River Woods.

Vegetation management activities would result in no change to the overall transportation system mileage. Approximately 25.3 miles of roads would be reconstructed prior to thinning activities. Approximately one-half (1/2) mile of temporary road would need to be constructed for access into one (1) unit. This road would be would be closed and rehabilitated following vegetation management activities to eliminate soil compaction.

Roads that are proposed for closure and decommissioning (Table 7, page 23 and Table 8, page 26) would be closed or decommissioned following completion of vegetation treatments. Closing and decommissioning roads would mitigate the direct, indirect, and cumulative effects of proposed activities within the biological range of mule deer, including deer habitat, key elk habitat, and NNVM.

Cumulative Effects: 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 may change. Access to these areas would be via frontage type roads from possible reconstruction activities at the Cottonwood Interchange.

The Highway 97 Weigh and Safety Station is being completed. Forest road access to Highway 97 in this area would be limited through proposed road closure.

The proposed ODOT interchange at Highway 97 near the present access to Sunriver via Road 40 would not change road access within the planning area.

RECREATION RESOURCE

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 located in some areas where shrub and tree density is substantial. The density of the vegetation provides fuels that provide an immediate threat, in the event of wildfire, to these developed and dispersed recreation areas.

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 take out 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.

Alternative 1 (No Action)

Direct and Indirect Effects:

Developed Recreation – Developed recreation use would be expected to continue to increase with no increase in developed recreation opportunities. 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 fire. In addition, public health and safety of forest users would be at high risk during a wildfire event.

Dispersed Recreation – There would be no change to dispersed recreation 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.

Alternative 2 (Modified Proposed Action) and Alternative 3
Direct, Indirect, and Cumulative Effects:
Developed – 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. 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 – Recreational use would likely not be affected by the proposed vegetation treatments. Treatments for the reduction of tree density and diseased trees would improve visual quality for the recreating public.

Closing and decommissioning Forest and user created roads would impact the use of 23 campsites within the Wild and Scenic River corridor. Forest Roads 640 and 645 would be closed for approximately the last 300 feet to the Deschutes River. Two campsites, which are causing soils and vegetation damage, would be closed for rehabilitation at the end of the present 640 road and two new sites would replace the closed and rehabilitated sites. The 645 road would remain open to within approximately 300 feet of the river and the dispersed site would remain open as a walk-in or boat-in site. The 640 and 645 roads are proposed for complete closure in Alternative 2 (Proposed Action). Five (5) campsites along a user created road would be retained.

It is estimated that nine (9) non-water related sites would become inaccessible by motorized vehicles due to the decommissioning or closing of roads. There are numerous other flat and dry sites, which could be utilized as dispersed campsites.

Cumulative Effects: Closing sites would reduce the options of dispersed campers on the District and Forest. Other completed projects have made the decision to close dispersed campsites. The Dillman EA closed 53 percent and Charlie Brown EA closed 6 percent of inventoried sites. In two other examples, 30 percent of the inventoried sites were closed. Many areas have dispersed campsite closure because: 1) many sites are user created and adjacent to water, affect riparian vegetation, and cause unacceptable resource damage and 2) they are adjacent to a road that is recommended for closure or decommissioning. Campsites continue to be analyzed for unacceptable resource damage. It is likely that more dispersed campsites would be closed in the future. The result would likely be increased use of the remaining sites. Attractive destinations such as water will continue to attract the public. It is probable that new sites will be created if topography allows.

Recreational use will likely change with the designated trail from Lava Lands Visitor Center to Benham Falls day use area to Sunriver. OHV use would likely increase with the development and designation of an OHV play area and trail system. The OHV trail system would likely alter dispersed camping within the planning area. The proposed winter seasonal closure would reduce recreational use, particularly during low precipitation winter months. Road closure activities would alter access and use patterns within the planning area, particularly within the Wild and Scenic Management Area.

CULTURAL RESOURCES

Existing Condition: 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, 12 were determined not eligible, and 53 are still unevaluated. Two (2) of these sites have both an historic and a prehistoric component, 16 are historic, and 58 are prehistoric.

Alternative 1 (No Action)
Direct and Indirect Effects: Without implementation of proposed activities, disturbance to cultural sites would not occur. The risk of a high intensity fire would continue. Wildfire could both reveal new cultural sites and/or damage new and previously recorded sites.

Alternative 2 (Modified Proposed Action) and Alternative 3
Direct, Indirect, and Cumulative Effects: Heavy equipment, log skidding, activity at landings, and pile burning can all adversely effect an historic property. Machine piling of slash can break and redistribute artifacts. Intense heat associated with pile burning can 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 and/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.

Alternative 2 (Modified Proposed Action) has ten (10) sites in areas proposed for commercial thinning, four (4) sites in areas with proposed non-commercial thinning, three (3) sites where mechanical shrub treatments (mowing) would occur, three (3) sites with both mowing and burning proposed, and eight (8) sites within units proposed to be underburned.

Alternative 3 has 11 sites in areas proposed for commercial thinning, four (4) sites in areas with proposed precommercial thinning, three (3) sites where mowing would occur, four (4) sites with both mowing and burning proposed, and eight (8) sites within units proposed to be underburned.

Hand thinning with chainsaws and no pile burning would not affect lithic scatter sites. Mechanical shrub treatment (mowing) has similar light 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 implemetation if sites are found during operations.

Adverse effects can be avoided through modification of implemetation and mitigation measures (Appendix C, page 95).

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.

BOTANY RESOURCE

Affected Environment
Proposed, Endangered, Threatened, and Sensitive (PETS) Species – No plant species that are on the Region 6 Forester's Sensitive Plant List (May 13, 1999) were found during surveys. Sites of *Lucoviciana* spp. *Estesii,* a sensitive plant, have been documented adjacent to the Deschutes River. No known habitat for Threatened or Endangered plant species exists within the planning area. Refer to Appendix E, page 107, Botany Report for the Regional Forester's Sensitive Species List for the Deschutes National Forest.

Noxious Weeds – Surveys for noxious weeds were conducted at the same time as the PETS plants surveys. A map with weed site locations in the Kelsey planning area is included in the project files. Several sites are in the planning area. These are: 1) new sites, 2) expansion of sites included in the 1998 Weed EA, or 3) sites in the 1998 Weed

EA with proposed treatment changes. Table 46 lists the known noxious weed sites within the planning area. Refer to Appendix E, page 113**,** for the Deschutes National Forest Noxious Weed List.

Table 46: Known Noxious Weed Sites (2002) – Kelsey Planning Area		
Species	**Location**	**Units**
Diffuse and Spotted knapweed	Highway 97	50,96-101,117,130,147, 152,268,269
Dalmatian toadflax; Diffuse and Spotted knapweed	Road 40, west of Highway 97 to Sunriver	30, 265-267
Diffuse and Spotted knapweed	Cottonwood Road, east of Sunriver	68,73-75,105,148-150,269
Spotted knapweed	Mowed areas by Lava Butte	129 (adjacent)
Dalmatian toadflax and spotted knapweed	Road 100, south of High Desert Museum	No unit
Spotted Knapweed	Slough Camp, Dillon Falls	No unit
Diffuse knapweed, Spotted knapweed, Dalmatian toadflax, Bull thistle, Russian thistle	Road 18	133,134,137,141
Dalmatian toadflax	Northwest boundary of Forest, west of China Hat Road (Road 18), Road 1801199	133
Dalmatian toadflax	South side of Road 18, west of power line	141
Knapweed, Bull thistle	Benham Falls	84-87

Alternative 1 (No Action)
Direct and Indirect Effects: Without implementation of vegetation and fuels treatments, there would be a low-risk for the introduction and spread of noxious weeds to new sites from existing sites in and near the project area. Present populations of noxious weeds would continue to survive, grow, and would likely expand.

Alternative 2 (Modified Proposed Action) and Alternative 3
Direct and Indirect Effects: Proposed vegetation and fuels activities would provide a high-risk for the spread of noxious weeds in the planning area. Approximately 25 percent more acres are proposed for treatment in Alternative 3, which would have the highest risk for the spread of noxious weeds. Proposed activities would cause no direct, indirect, or cumulative impacts to any species on the Regional Forester's Sensitive Plant List. Proposed activities would not cause a loss of viability or a trend toward Federal listing for *Artemisia ludoviciana* var. *estesii.*

Cumulative Effects: Potential use from a designated OHV play/staging area and trail system would substantially increase the likelihood that new populations of noxious weeds would be introduced and existing populations would spread within the planning area. The likelihood of an increase of noxious weeds from the 18 Fire is high. Road closures associated with the 18 Fire would reduce the opportunity for an increase in those areas where those roads would enter the remaining portion of the Kelsey planning area.

SCENIC RESOURCE

Existing Condition: Under the Visual Management System[9], 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

[9] 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.

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.

An estimated 18,224 acres (40%) of the planning area falls within the Scenic Views management allocation **(**Table 47**)**. This allocation is included within Newberry National Volcanic Monument (7,621 acres) and the Upper Deschutes Wild and Scenic River (designated scenic) (480acres). The remaining portions of Scenic Views (10,123 acres) are within the Foreground (Retention – SV1, 2,723 acres/Partial Retention – SV2, 2,837 acres) and Middleground (Retention – SV3, 1,717/Partial Retention – SV4, 2,846) categories. The Foreground and Middleground viewing distance zones are the primary zones viewed from travel corridors including: Highway 97 and County Road 40 (Retention Foreground), and Forest Roads 9720, 9710, and 9702 (Partial Retention Foreground) and the Deschutes 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.

Table 47: Management Areas and Treatment Acres/Percent

Management Areas	Existing Acres/%	Alternative 2, Proposed Treatment Acres/%	Alternatives 3 Proposed Treatment Acres/%
General Forest	11,570 Acres (25.2 %)	2,051 Acres (17.7%)	2,698 Acres (23.3%)
Deer Habitat	14,400 Acres (31.3%)	4,124 Acres (28.6%)	4,312 Acres (30.0%)
Scenic Views:			
a) SV1,SV2,SV3,SV4	10,134 Acres (22.0%)	2,970 Acres (29.3%)	3,724 Acres (36.8%)
b) Wild and Scenic River	480 Acres (01.0%)	27 Acres (05.7%)	78 Acres (16.3%)
c) NNVM	7,621 Acres (16.6%)	852 Acres (11.2%)	873 Acres (11.5%)
Other Allocations	1,785 Acres (03.9%)	856 Acres (48.0%)	345 Acres (19.3%)
Total	**45,990 Acres**	**10,880 Acres (23.7%)**	**12, 030 Acres (26.2%)**

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.

Alternative 1 (No Action)

Direct and Indirect Effects: The Forest Plan direction and the Desired Future Condition for Scenic Resources would not be met. The entire acreage of the planning area would not be managed, altered or changed by management activity with the exception of wildfire suppression and normal routine stewardship activities. 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 integrity and landscape character would remain essentially the same during the short-term duration (0-5 years) and could be adversely altered with any increase in natural disturbance through time (5 years and beyond). Large, old growth pine would remain an important constituent.

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: Scenic views would be enhanced. Activities within the General Forest allocation would be more intensive while being consistent with visual objectives. 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 would move the scenic resource further toward desired future conditions. **A**pproximately 1,220 additional acres would have vegetative and fuels treatments than Alternative 2 (Modified 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.

RANGE RESOURCE

Existing Condition: Portions of two vacant grazing allotments, Sugar Pine and Coyote, are included within the planning area **(**Table 48**)**. 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 Cinder Hill EA has been initiated to determine future grazing activities, including those that may occur within the Coyote Allotment.

Livestock may utilize existing roads for travel. Livestock and vehicles using the same routes can cause vehicle damage, personal injury, injury to livestock, and less than desirable interaction between livestock and public users. Livestock "water sets" are often popular camping locations, creating dual use areas, which may be compatible as long as they occur at separate times.

Grazing potential for livestock is: excellent, 5,199 acres (30%); moderate, 5,451 acres (32%); poor, 5,904 acres (34%); and very poor, 605 acres (4%). 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 48: 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	1996/Vacant
Coyote	35, 181	13, 712 (39%)	Cattle	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. Forage quality is decreasing because of tree and shrub canopy closure and lack of grazing. Where management tree thinning, mowing, and prescribed burning activities have occurred, forage quality is being maintained or increasing. Improvements include 10 miles of barbed wire fence. Water Haul is the only source of water.

Coyote Allotment – The allotment was established in 1936 as a community 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 changing. 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. Water Haul is the only source of water.

Alternative 1 (No Action)
Direct and Indirect Effects: This alternative would allow tree canopy closure to increase and the availability, quantity, and quality of forbs, grasses and shrubs to decrease. Range improvements, in need of repair, would not be removed or maintained and would remain a continued hazard to big game and the forest user. Vegetation condition would continue to decline, not being beneficial for livestock management.

Alternative 2 (Modified Proposed Action) and Alternative 3
Direct and Indirect Effects: The proposed vegetation and fuels activities within the allotments would benefit grazing by increasing available livestock forage. The quantity and quality of forage and browse species would increase over time following vegetation and fuels treatments. A reduction of existing bitterbrush could limit seasonal grazing opportunities for a short period of time following treatments. Plantations within allotment boundaries would require exclusion of livestock, which would increase reforestation costs.

The proposed vegetation and fuels treatments within the allotments, approximately 5,960 acres for Alternative 2 (Modified Proposed Action) and approximately 6,510 acres for Alternative 3, would improve forage and browse conditions and improve vegetation conditions for livestock grazing. Alternative 3 would provide a more favorable effect to the range resource than Alternative 2 (Modified Proposed Action) based on the number of acres proposed for treatment.

One proposed road closure (Road 1815640) would eliminate vehicle access to a portion of the existing range boundary fence along the southern urban growth boundary of Bend. This would likely increase maintenance costs through an increase in time to perform routine maintenance activities.

Cumulative Effects
The Kelsey Access EA, which would include road closures and a designated off highway vehicle (OHV) trail system and play area, would: 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.

SPECIAL USES

Existing Condition: Special Uses and permitted utilities in the planning area include; 1) power lines, buried and aerial, 2) gas pipeline, and 3) phone lines. All are under permit and maintained by the permittee. Tree removal work was conducted adjacent to aerial power lines in 1999.

Alternative 1 (No Action), Alternative 2 (Modified 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.

PUBLIC 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
Alternative 1 (No Action)
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.

Alternative 2 (Modified Proposed Action), and Alternative 3

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

Existing Condition: Unit 258 is approximately 0.3 mile south of private property and approximately 0.7 mile southeast from human habitation[10]. Unit 259 is approximately 0.6 mile south of private property and approximately 1.0 mile southeast from human habitation. These units are approximately 0.8 to 1.0 mile southeast of the High Desert Museum, east of Highway 97. Remaining units proposed for herbicide application 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 potentially occur in or near the treatment areas.

Alternative 2 (Modified Proposed Action) and Alternative 3

Direct and Indirect Effects: The tool used for applying the herbicide would direct the herbicide down to the ground, minimizing potential for the herbicide to come in dermal contact with the worker. Herbicide would be applied on a relatively small percent of each site (approximately 13 to 16% of an acre). In a treatment area, there would be 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 one (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 sites proposed for application of herbicide are on relatively flat ground, with slopes ranging from 5 to 10 percent. Potential for falling and coming in contact with herbicide on the ground would be limited (Appendix F, page 115).

PUBLIC/COMMERCIAL FIREWOOD GATHERING

The goal of the Deschutes National Forest is to maintain a supply of firewood while protecting other resources. Forest-wide areas for personal use firewood gathering are coordinated among Ranger Districts and designated after the appropriate level of analysis to consider all resources such as wildlife, soil, fuels/fire management, cultural resources and botany. The objective for these areas can serve more than one purpose such as for personal firewood and to reduce fuel loadings in a given area. However, the firewood-gathering program does not sufficiently reduce the slash that causes the greater risk of loss from fire. Firewood gathering areas usually require additional cleanup and restoration activities when the firewood gathering areas are closed.

ECONOMICS

Table 49 summarizes the economic effects from each 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/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 49: Economic Effects of the Alternatives

Alternative	1 (No Action)	2 (Modified Proposed Action)	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.**

PRIME LANDS

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

[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.

There are no lands within the planning area that are classified as prime farm or rangelands. Proposed activities in Alternatives 2 (Modified Proposed Action) and 3 would not change areas classified as prime forestland. There would be no direct, indirect, or cumulative adverse effect to these resources and thus are in compliance with the Farmland Protection Act and Departmental Regulation 9500-3, "Land Use Policy".

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. The purpose of the analysis is to determine whether adverse civil rights impacts are anticipated on an underrepresented population. The analysis is to determine also whether disparate or disproportionate impacts associated with the alternatives are anticipated. A purpose of the action alternatives is to provide for the health and safety of all members of the public by reducing the risk of entrapment from wildfire. Provision of these benefits does not discriminate between subsets of the general population.

COMPLIANCE WITH STATE AND LOCAL LAWS

Implementation of Alternative 1 (No Action), Alternative 2 (Modified Proposed Action), or Alternative 3 would be consistent with relevant Federal, State and local laws, regulations, and requirements designed for the protection of the environment including the Clean Air and Clean Water Act. None of the alternatives establishes a precedent for future actions or a decision in principle about a future consideration.

OTHER EFFECTS AND FINDINGS

Wetlands, fisheries, water quality and designated floodplains would not be adversely affected by any of the proposed management activities.

No designated roadless areas, old growth stands, Wild and Scenic Rivers or parkland would be adversely affected by the proposed activities. No significant irreversible or irretrievable commitment of resources would occur under Alternative 2 (Modified Proposed Action) or Alternative 3. There would be some negligible irretrievable losses of dust caused by mechanical operations. 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.

Proposed vegetation management activities are consistent with the Record of Decision for the Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation and the subsequent Mediated Agreement of 1989 (Refer to Appendix E, page 107).

The alternatives are consistent with the goals, objectives and direction contained in the Deschutes National forest Land and Resource Management Plan and accompanying Final Environmental Impact Statement and Record of Decision dated August 27, 1990 as amended by the Regional Forester's Forest Plan Amendment #2 (6/95) and Inland Native Fish Strategy. The alternatives are in compliance with the Upper Deschutes Wild and Scenic River and State Scenic Waterway Comprehensive Management Plan and accompanying Final Environmental Impact Statement and Record of Decision dated July 25, 1996. The alternatives are consistent with the goals, objectives and direction contained in the Newberry National Volcanic Monument Comprehensive Management Plan and accompanying Final Environmental Impact Statement and Record of Decision dated August 1, 1994.

REASONABLE FORESEEABLE FUTURE ACTIONS ADJACENT TO OR WITHIN THE PROJECT AREA

The following ongoing or reasonably foreseeable actions were considered for the cumulative effects analysis.

Tumbull Planning Area – Vegetation Management – 2005
Opine Planning Area – Vegetation Management – 2004
Lava Cast Planning Area – Vegetation Management – 2004
Highway 97 Barriers – 2004
Weigh and Safety Station – 2004
Fuzzy EA implementation activities – Vegetation Management – Ongoing through 2010
Lava Lands Visitor Center and Lava River Caves Fuels Reduction CE – 2002
Cinder Hills Grazing EA: Proposes to reauthorize grazing on three (3) grazing allotments totaling approximately 89,210 acres – 2004
18 Fire Hazard Tree Removal CE – 2004
18 Fire Salvage EIS – 2004

LIST OF PLANNING PARTICIPANTS

This section identifies the Forest Service personnel who participated in the analysis and the preparation of the EA. For a list of organizations and individuals contacted during the scoping process, refer to the project file located at the Bend-Ft. Rock Ranger District.

Interdisciplinary Team

David Frantz	Writer/Editor/Team Leader
Maurice Evans	Fire/Fuels Specialist
Barbara Schroeder	Silviculturist
Kevin Keown	Wildlife Biologist
Barbara Webb	Wildlife Biologist
Carolyn Close	Botanist
Rick Cope	Soil Scientist
Duane Monte	Soil Scientist (Deceased)
Steve Bigby	District Road Manager
Chuck Hedges	Engineer
Marv Lang	Recreational Planner
Connie Rawson	Geographical Information Systems
Gini Stoddard	Geographical Information Systems
Don Sargent	District Range Technician
Tom Walker	District Fisheries Biologist
Rob Tanner	Hydrologist
Ronnie Yimsut	Landscape Architect
Don Zettel	Archaeologist

Consulted

Oregon Department of Fish and Wildlife (ODFW)
Confederated Tribes of Warm Springs

APPENDIX A

CONSISTENCY WITH RELEVANT STANDARDS AND GUIDES

CONSISTENCY WITH STANDARDS AND GUIDES

Table 1: Relevant Standards and Guides	
Standard and Guide	**Description of Standard and Guide**
DESCHUTES NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN	
Standards and Guides, as stated within the Forest Plan, provide overall direction that guide the application of project prescriptions for management areas. The Standards and Guides with Management Areas provide the framework for use, development, and protection of the Forest's resources. The following Forest Plan Standards and Guides apply to activities on the Deschutes National Forest. Applicable Standards and Guides have been used to maintain consistency of this environmental assessment with the Forest Plan.	
	Wildlife
WL-3, 11, and 19	Raptor nests discovered during project preparation or implementation will be protected from disturbing activities within ¼ mile (1 mile for the use of explosives) of the nest by restricting operations during the nesting period (March 1 to August 31: *Red-tailed hawk & northern goshawk*); (February 1 to July 31: *Golden Eagle*); (April 15 to August 31: *Cooper's hawk & sharp-shinned hawk*).
WL-9, 17, 25	Where nest sites are unknown, use the following criteria: mean canopy cover of 60% or greater, tree density of at least 195 trees per acre, stand age of 100 years or more (*Northern Goshawk*); mean canopy cover of 60% or greater, tree density of at least 365 trees per acre, stand age of 50-80 years (*Coopers Hawk*); mean canopy cover of 65% or greater, tree density of at least 475 trees per acre, stand age 40-60 years (*Sharp-shinned Hawk)*.
WL-31	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% (50-70%), distance to nearest meadow 440 (63-1,070) feet (*Great Gray Owl)*.
WL-38	Retain all existing soft snags as supplemental wildlife trees for roosting and foraging except when impractical because of human safety, other resource protection, or project logistics (*Deschutes National Forest Wildlife Tree Implementation Plan)*.
WL-47, 49, 51	Provide cover and visual screening throughout the Ryan Ranch Key Elk area with 30 percent of the commercially harvested units that contain cover retained in untreated clumps greater than 2 acres in size.
WL-48, 56	Travel corridors may be provided where needed by linking stands that meet hiding cover definitions for deer and elk.
WL-54	Hiding areas must be present over at least 30 percent in each implementation unit. 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.
WL-72	Fallen trees and other woody debris will be retained in sufficient quantity, distribution, and physical characteristics to provide habitat for viable populations of dependent wildlife species over time.
WL-73	Within commercial harvest and fuels treatment units that are below minimum management levels for coarse woody material (CWM), leave one slash pile (approximately 100 square feet) or concentration (approximately 200 square feet) per acre to supplement qualifying material.
WL-74	Diversity of habitat will be provided. Large homogenous areas of the same species and /or successional stages will be avoided.
WL-75	Habitat for species associated with special or unique habitats will be protected during project development.
CV-3	Trees will not be harvested in a 150 to 250 foot radius around cave entrances.
	Soils
SL-1	Management activities will be prescribed to promote maintenance or enhancement of soil productivity. The potential for detrimental soil damages will be specifically addressed through project environmental analysis. Alternative management practices will be developed and mitigating measures implemented when activities will result in detrimental soil compaction, puddling, displacement, or soils with severely burned surfaces or those with accelerated erosion.

Table 1: Relevant Standards and Guides	
Standard and Guide	**Description of Standard and Guide**
SL-3	Leave a minimum of 80 percent of an activity area in a condition of acceptable productivity potential for trees and other managed vegetation following land management activities. Include all system roads, landings, spur roads, and skid roads or trails to evaluate impacts. Soil monitoring, to include statistical methods, will be required on all sensitive soil areas.
SL-4	Any sites where this direction cannot be met will require rehabilitation. Measures may include tillage, smoothing, fertilizing or spreading of biological rich organic materials.
SL-5	The use of mechanical equipment in sensitive soil areas will be regulated to protect the soil resource. Operations will be restricted to existing trails and roads whenever feasible.
SL-6	In order to minimize soil erosion by water and wind, the following ground cover objectives should be met within the first 2 years after an activity is completed.
	Cultural
CR-2	Cultural resource properties located during inventory will be evaluated for eligibility to the Register.
CR-3	The Forest will develop thematic Register nominations and management plans for various classes of cultural resources.
CR-3	Project level inventories or the intent to conduct such shall be documented through environmental analysis for the project.
	Forest Health
FH-3	Treatments emphasize prevention of insect and disease problems rather than suppression.
	Timber Management
TM-9	Site preparation and planting would be done within if there is no positive trend toward meeting minimum stocking requirements within 10 years (OSU study).
TM-13	Fuels treatments (site preparation) in these units would be completed within 2 years of harvest. Reforestation within 3 years of harvest.
TM-15	Establishment of a new age class would occur through natural regeneration.
TM-16	Even-aged groups may be as small as .25 acre or in rare cases as large as 6 or 7 acres. Even-aged groups are usually less than 2 acres in size and no wider than twice the height of mature trees in the stand.
TM-18	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-20	Ponderosa pine is expected to dominate mixed conifer stands following proposed treatments.
TM-21	Uneven-aged management is not appropriate in the lodgepole pine community types.
TM-23	Stands proposed for uneven-aged management are generally on slopes less than 30 percent.
TM-32	Dwarf mistletoe will be at low levels and is projected to be maintainable at low levels in stands proposed for uneven-aged management.
TM-38	Uneven-aged management is most applicable where there is reasonable assurance that natural regeneration will occur within ten years.
TM-48	Natural regeneration is planned where stand and site conditions are appropriate.
TM-49	Natural regeneration would meet minimum stocking requirements within 10 years of site preparation.
TM-50	Treatment is proposed where the stand would be minimally stocked (100 trees per acre) within 10 years of site preparation at least 80% of the time.
TM-53	Fuels treatment and site preparation would reduce fuel loading to a level where no fuels treatment would be required following seed tree removal in 10-15 years.
TM-58	Forest openings created by even-aged silviculture should not exceed 40 acres in ponderosa pine and mixed conifer.
TM-61	Timber management activities that create essentially uniform structural conditions should generally not exceed 100 contiguous acres on >95% of each implementation unit.
	Deer Habitat (MA-7)
M7-3	Timber harvest is appropriate when required to regenerate new cover stands, maintain tree vigor

Table 1: Relevant Standards and Guides	
Standard and Guide	**Description of Standard and Guide**
	for resistance to stand-threatening insect damage, or encourage desirable forage in deficient areas.
M7-5	Even and uneven-aged management will be applied and may include precommercial and commercial thinnings. Stocking levels will be based on sit-specific conditions. A crown cover greater than 40 percent with trees 30 feet his is recommended for thermal cover.
M7-10	Habitat management will be designed to provide a mosaic of forested conditions.
M7-13	Crown cover greater than 40 percent with trees 30 feet tall is recommended for thermal cover on the Deschutes National Forest.
M7-14	Forage conditions will be maintained or improved with emphasis on increasing the variety of plants available for forage.
M7-15	Where forag3 improvement activities which are not directly associated with manipulation of the tree stands (crushing, prescribed burning) are planned, the size of the treatment units normally will be 300 to 500 acres including unmanipulated islands. If more than one unit is treated in a single year, treatment units should be 600 to 1,200 feet apart. The untreated portion of the area involved can be improved after the treated areas provide a good quality of forage.
M7-16	Thermal cover will be maintained immediately adjacent to the foraging site.
	General Forest (MA-8)
M8-7	Uneven-aged management is the preferred silviculture system; should be prescribed within the mature and over mature ponderosa pine and mixed conifer community types where stand and site conditions are appropriate.
	Scenic Views (MA-15)
M9-4	Ponderosa pine retention foreground areas, visual changes will not be noticeable to the casual forest visitor.
M9-5, 16, 24, 41, 55, 67	Perpetuate the desired visual condition and control insect and disease problems.
M9-10	While creation of openings is allowed within ponderosa pine foreground retention, creation of such openings is to result from harvesting natural mortality.
M9-11, 12, 32	Trees greater than or equal to 24 inches dbh are to be retained.
M9-14	Thin immature trees ... to maintain acceptable health and vigor of stands, with the objective of eventually producing replacement trees of 24 inches diameter and larger. In retention foregrounds, thin to slightly closer than normal spacing in order to provide full crowns and some screening. In partial retention foregrounds, normal silviculturally prescribed spacings are acceptable.
NEWBERRY NATIONAL VOLCANIC MONUMENT COMPREHENSIVE MANAGEMENT PLAN	
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.
M-8	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.
M-10	Restoration treatments would provide for habitat diversity, including horizontal, vertical, and vegetative species diversity. Existing vegetative species diversity would be maintained.
M-12	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.

Table 1: Relevant Standards and Guides	
Standard and Guide	**Description of Standard and Guide**
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:
M-14	Machine piling of slash during fuels treatment should be used only when no other metho accomplish objectives, and should generally be avoided on slopes over 30 percent. Min impacts of machine piling by piling no more than needed to break up fuel continuity.
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.
M-43	Wildfires within the Monument are to be suppressed to ensure no more than 300-400 acres burn annually as a result of wildfire.
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 proposed treatments)
The Plan includes standards and guidelines for protection, restoration, and enhancement of riparian vegetation. Facilities may be redesigned, and dispersed camping may be limited or prohibited to protect riparian areas.	
UPPER DESCHUTES WILD AND SCENIC RIVER AND STATE SCENIC RIVER COMPREHENSIVE MANAGEMENT PLAN	
V-9	Prescribed fire may be used at locations, scale, intensity, and frequency which will mimic pre-suppression historical averages for the watershed, where such fires would not have long-term adverse effects on other river values or cause undue risk to public health and safety or private property.
V-12	Some fuel reduction activities (pre-treatments), may be permitted (if such activities would not adversely affect Outstandingly Remarkable Values) to assist in the safe use of prescribed fire and adjacent to private inholdings to reduce the threat of fire spreading to federal, state, or county lands and elsewhere.
V-16	Ponderosa pine or other species suitable for eagle or osprey nesting will be managed to provide trees which are 20 inches or larger in diameter.
V-17	Vegetation will appear natural and emphasize protection of riparian plant communities. Any silvicultural practices which provide long-term benefits to Outstandingly Remarkable Values may be allowed.
INLAND NATIVE FISH STRATEGY	
RF-2	For each existing or planned road, meet the Riparian Management Objectives (RMOs) and avoid adverse effects to inland native fish.
RF-3	Determine the influence of each road on the RMOs. Meet RMOs and avoid adverse effects on inland native fish.
RM-2	Adjust dispersed and developed recreation practices that retard or prevent attainment of RMOs or adversely affect inland native fish. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities, and/or specific site closures are not effective in meeting RMOs and avoiding adverse effects on inland native fish, eliminate the practice or occupancy.
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.	

Table 1: Relevant Standards and Guides	
Standard and Guide	**Description of Standard and Guide**
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. **Hydrology** Desired future watershed conditions to come out of the Kelsey Access Management Project include the following; • Manage watershed health and integrity so as prevent future listing as 303(d) streams. • Incorporate management activities involving OHV, roads, and dispersed sites that may aid in removing streams from the 303(d) list.	
INTERIM MANAGEMENT DIRECTION ESTABLISHING RIPARIAN, ECOSYSTEM AND WILDLIFE STANDARDS FOR TIMBER SALE (REGIONAL FORESTER'S FOREST PLAN AMENDMENT #2)	
The following provide management direction that supersedes Interim Management Direction established by the Regional Forester's Forest Plan Amendment #2: • Legislation for Newberry National Volcanic Monument specifies the Monument is to be managed in accordance with laws, rules, and regulations pertaining to the National Forest System and to the Deschutes National Forest, to the extent that such laws and regulations are consistent with the Monument legislation. The Monument legislation supersedes any Forest Plan direction that is inconsistent with the purposes for which the Monument was established. The direction provided in the Monument Plan (August 8, 1994) takes precedence over the Forest Plan. • The Final Environmental Impact Statement (FEIS) and the Record of Decision (ROD) for the Upper Deschutes River amends the 1990 Deschutes National Forest Land and Resource Management Plan (as amended by the Regional Forester's Forest Plan Amendment #2 also know as Interim Management Direction and the Inland Native Fish Strategy). Direction found in The Upper Deschutes Wild and Scenic River and State Scenic Waterway Comprehensive Management Plan (Wild and Scenic River Plan) results from the FEIS. • According to the Decision Notice Correction for the Inland Native Fish Strategy, the interim standards and guidelines included in the Inland Native Fish Strategy (1995) replace the interim riparian standard established May 20, 1994 in the Decision Notice for the Continuation of Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales (Interim Management Direction). <u>Interim Riparian Standard</u> 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. Consequently, the Kelsey project was not evaluated for consistency with interim riparian standards. <u>Interim Ecosystem Standard</u> Consistent with the Interim Ecosystem Standard, the Kelsey Planning Area has been characterized for patterns of stand structure by biophysical environment and compared to the Historic Range of Variability (HRV). Attachment 2 documents this analysis. <u>Interim Wildlife Standard</u> 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.	

Table 1: Relevant Standards and Guides	
Standard and Guide	**Description of Standard and Guide**
NATIONAL FOREST MANAGEMENT ACT (NFMA)	
Clearcutting would only be used when it is determined to be the optimum method to achieve multiple use values [NFMA 16 USC 1606 (g) (3) (E) (iv)]. This harvesting system is proposed for reasons other than it would give the greatest dollar return or the greatest unit output of timber [NFMA 16 USC 1606 (g) (3) (F) (i)].	
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: 1. To establish, maintain, or enhance habitat for threatened or endangered species. 2. 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. 3. To rehabilitate lands adversely impacted by events such as fires, windstorms, or insect or disease infestations. 4. To preclude or minimize the occurrence of potentially adverse impacts of insect or disease infestations, windthrow, logging damage, or other factors affecting forest health. 5. To provide for the establishment and growth of desired tree or other vegetative species that are shade intolerant. 6. To rehabilitate poorly stocked stands due to past management practices or natural events. 7. To meet research needs.	

APPENDIX B

ALTERNATIVE 2 (PROPOSED ACTION)
And
ALTERNATIVE 3

UNIT SUMMARIES

Alternative 2 (Modified Proposed Action) Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary[11]**	**Objectives[12]**
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	219	General Forest, Deer Habitat	HTH, MST/UB	5
14	72	Deer Habitat	HSL, SPC, GPR, MST/UB	1,5,12a
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
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

[11] **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).

[12] **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..

Alternative 2 (Modified Proposed Action) Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary[11]**	**Objectives[12]**
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
103	44	Deer Habitat, Scenic Views	HTH, SPC, MST/UB	1,4
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
121	93	Deer Habitat	HSL, SPC	1,12a
122	76	Deer Habitat	HTH	1

Alternative 2 (Modified Proposed Action) Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary[11]**	**Objectives[12]**
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
127	41	Deer Habitat	HSL, SPC	1,11b
128	58	Deer Habitat	HSL, SPC	1,12a
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	211	Deer Habitat	MST/UB	5,7
143	69	Deer Habitat	MST/UB	5
145	247	Deer Habitat	MST/UB	5
146	157	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, MST, 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 PLOT)	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 PLOT)	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 PLOT)	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	**9,750**			

Table 4: Alternative 3 (Modified Proposed Action) Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary[13]**	**Objectives[14]**
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
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
103	44	Deer Habitat, Scenic Views	HTH, SPC, MST/UB	1,4

[13] **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).

[14] **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 4: Alternative 3 (Modified Proposed Action) Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary[13]**	**Objectives[14]**
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
122	76	Deer Habitat	HTH	1
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
127	41	Deer Habitat	HSL, SPC	1,11b
128	58	Deer Habitat	HSL, SPC	1,12a
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
205	5	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
219	89	Scenic Views	HTH, MST/UB	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

Table 4: Alternative 3 (Modified Proposed Action) Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary[13]**	**Objectives[14]**
225	10	General Forest	HTH, MST	1,6
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
232	8	Scenic Views	HTH, SPC	1
233	38	Scenic Views	HTH, SPC	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 PLOT)	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 PLOT)	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 PLOT)	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
281	5	Transition Zone	UB, WHIPFELL	14
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
314	72	Deer Habitat	HTH, MST/UB	1,5
325	85	Lava Zone, Transition zone	MST/UB	5,7

Table 4: Alternative 3 (Modified Proposed Action) Vegetation and Fuels Treatment Summary				
Unit #	**Gross Acres**	**Management Area**	**Treatment Summary[13]**	**Objectives[14]**
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
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	211	Deer Habitat	HSL, MST/UB, GPR	5,7,12a
446	157	Deer Habitat	HTH, MST/UB	5
447	135	Scenic Views	HTH, MST/UB	5
451	238	Deer Habitat	MST	5,7
TOTAL	**11,080**			

APPENDIX C

MITIGATION MEASURES, BEST MANAGEMENTPRACTICES, PROJECT DESIGN CRITERIA, KV PROJECTS

MITIGATION MEASURES
Common To Alternative 2 (Modified Proposed Action) And Alternative 3

Botany

1. Begin project activities in uninfested areas before operating in weed-infested units (30, 50, 68, 73-75, 84-87, 96-101, 105, 117, 129, 130, 133, 134, 137, 141, 147-150, 152, 265, 267-269).
2. Inspect all limited-term ground-disturbing operations, including temporary roads, in noxious weed infested and uninfested areas for at least three growing seasons following completion of the project. Provide follow-up treatments if necessary. ***All units with KV-funded post sale treatments.***
3. Treat weeds in road decommissioning and reclamation projects before roads are made impassable. Reinspect and follow up based on initial inspection and documentation.

Wildlife

4. Do not conduct mechanical shrub treatments during the period of April 1 – August 15 to avoid negative effects to birds including nest destruction, loss of broods, and direct mortality of adults.
5. Active nest sites of raptors would be protected from disturbing activities within ¼ mile (1 mile –explosives) of the nest by restricting operations during the nesting period (LRMP WL-3):
   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
6. Deer Habitat Seasonal Operating Restriction – December 1 through March 31:
   All Noncommercial thinning, commercial thinning, and mechanical shrub treatment activities.
   Motorized vehicle access would be allowed on designated travel routes only, or by special permit, including over-the-snow motorized vehicles.

Fisheries and Hydrology

7. Use of mechanized equipment would be allowed within RHCAs: a) incorporate silt fences as needed; b) minimize ground disturbance; c) re-vegetate site as soon as feasible; d) use straw wattles or erosion cloth to protect bare slopes; e) avoid operations during excessive soil moisture conditions.

Soils

8. If post harvest monitoring shows an activity area with more than 20 percent detrimental soil conditions, appropriate rehabilitation efforts will be initiated to reduce detrimental conditions below 20 percent. (LRMP SL-4); (Watershed Restoration BMP W-1)
9. Limit use of ground-based mechanized equipment on slopes greater than 30 percent, longer than 200 feet and making up more than 10 percent of the unit. If larger areas with slopes greater than 30 percent occur they will be evaluated with the soil scientist prior to harvest.
10. On slopes greater than 30 percent, where fire lines are constructed, install and maintain water control structures to avoid excessive water runoff and accelerated soil erosion.

Range

11. Avoid and protect fences that are constructed with primarily wood materials. Reconstruct metal and/or wood fences damaged during treatments (Units 20, 67, 132-136, 141, 145, 146, 154).
12. 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.
13. Leave 25-foot buffer around the water set to prevent cheatgrass spread, if present.
14. Flag and avoid Parker 3-step enclosures and surrounding study areas from prescribed fire or mechanical treatments.
15. Range specialists will review contracts and burning plans prior to approval and implementation.

Herbicides

16. Public notification will be used for all applications requesting that people who know or suspect that they are hypersensitive to herbicides contact the Forest Service to determine appropriate risk management measures.
17. 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.

Cultural

18. Avoid burning, constructing fire lines, mopping up fires, mechanical shrub treatments, mechanical thinning, machine piling, and subsoiling within cultural sites. Avoid historic properties in commercial thinning units, landings, temporary roads, and skid trails. Avoid constructing fire lines and fire mop up during meadow enhancement activities.
19. Minimize maneuvering of equipment in prehistoric site areas.

Best Management Practices (BMPs)

The following Best Management Practices (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.

Table 1: Relevant Best Management Practices (BMP)

Resource and Best Management Practice	Description of Best Management Practice
Soil and Water	**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 material 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	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.
T-21	Servicing and Refueling of Equipment: To prevent pollutants from entering water, all servicing and refueling of equipment shall occur outside of RHCAs. Equipment may be used to obliterate roads and dispersed campsites.
	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.

Table 1: Relevant Best Management Practices (BMP)	
Resource and Best Management Practice	**Description of Best Management Practice**
	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.

Project Design Criteria (PDC)

Botany

1. Ensure that equipment and vehicles used in prescribed fire projects are free of weed seed and propagules before entering the project area, especially units where cheatgrass does not occur.
2. Clean equipment before leaving the project site, if operating in areas infested with weeds.
3. To the extent feasible, during mowing and/or burning, avoid mowing or lighting obvious high-density cheatgrass locations, such as cattle water sets, hunter camps, or adjacent to roads.
4. Leave a 15 to 20 foot untreated buffer strip along edges that lie adjacent to roads to reduce the spread or introduction of cheatgrass in proposed mowing units.
5. Where appropriate and practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (road embankments or landings).
6. Treat weeds in project area, emphasizing treatment of weed infestations on existing landings, skid trails, and haul roads before activities commence.

Wildlife

7. Approximately 10 percent of all commercial thinning units (except units 112, 117, and 120) would be retained in untreated tree clumps (0.5 – 6 acres, densest available, distributed throughout the unit). As a general rule, untreated clumps will be located greater than 200 feet from open roads and be distributed approximately 600-1,200 feet apart.
8. Ryan Ranch Key Elk Area: Thirty percent (30%) of each commercially harvested unit containing cover in the Ryan Ranch Key Elk area will be retained in untreated clumps greater than 2 acres in size (WL-47, 49, & 51) to provide cover and visual screening.
9. To provide a seed source for shrub re-establishment and wildlife habitat, 30-50 percent of unit acreage would not be mechanically treated and would be distributed in a mosaic of untreated shrubs, 0.5 – 6 acres. Logs and rock outcrops should be included in untreated areas, retaining no-treatment buffers of at least 25-30 feet (WL-74 & WL-75). Spacing between 6-acre islands would be 300 to 1000 feet. Spacing between patches of less than 6 acres could be less than 300 feet to capture key features. Untreated areas would be no closer than 400 feet to the wildland/urban interface. This applies to all units within the urban interface, except the following:

Alternative 2 (Modified Modified Proposed Action)	Alternative 3
27,30,78,94,95,132,133,135,141,251,254	78,132,133,135,141,206,218,221,225,225,227,254,272,273,276

10. Thinning would not occur less than 150 feet from the entrance to Lava River cave (LRMP CV-3).
11. Maintain snags at 100% percent potential population level (PPL) of primary cavity excavators (LRMP M15-9, Eastside Screens). In units below 100% PPL, create snags by blasting, saw topping, or use of bark beetle attractants.

Table 7: Hard Snags per 100 Acres		
PAG	**Average DBH**	**100% MPP**
LPD	>12”/>10”	59/121= 180
PPD, PPW, MCD	>20”/>15”	14/211=225

12. Retain all existing soft snags as supplemental wildlife trees for roosting and foraging except when impractical because of human safety, other resource protection, or project logistics (Wildlife Tree and Log Implementation Strategy, LRMP WL-38).
13. Develop treatment prescriptions to retain CWM in the following quantities (Eastside Screens):

Table 8: Post-treatment Coarse Woody Material Retention			
Species	**Pieces Per Acre**	**Diameter at Small End**	**Piece Length & Total Lineal Length**
Ponderosa Pine	3-6	12”	>6 ft. 20-40 feet
Mixed Conifer	15-20	12”	>6 ft. 100-140 feet
Lodgepole Pine	15-20	8”	>8 ft. 120-160 feet

14. Avoid direct ignition of CWM material (greater than 12 inches DBH and 6 feet in length) and snags. Minimize charring of logs (LRMP Standard WL-72). Consumption will not exceed 3 inches total (1.5 inches per side) of diameter reduction in featured logs (Eastside Screens).
15. Within units below minimum CWM levels, leave one slash pile (approximately 100 square feet) or concentration (approximately 200 square feet) per acre (LRMP Standards WL-72 & WL-73).

Scenic Resource

16. Flush cut stump within 100’ (minimum) of road corridor within Foreground Scenic View.
17. Paint on backsides of all leave trees (within 100’ 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.
18. Slash treatment will be completed within one year for Retention and two years for Partial Retention.
19. 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.
20. Avoid fire scorch above 2/3 of live tree crown within the Foreground landscape. Severely damaged and/or burned trees shall be treated and/or removed.

Fisheries and Hydrology

21. No fire or hand piles within 100 feet of Deschutes River. No fire lines within RHCAs.

Soils

22. Design project activities so that no more than 20 percent of an activity area would have detrimentally disturbed soil (compaction, erosion, displacement or severely burned) (LRMP SL-1 & SL-3); (Timber BMP T-2, T-3 & T-13); (Fuels Management BMP F-2).
23. Designate or use existing skid trails.
24. Restrict skidders to trails and limit off trail travel of other harvest equipment.
25. Avoid harvest operations when soils are dry and subject to excessive soil displacement.
26. Use existing barriers for fire lines whenever possible.
27. To maintain site productivity, strive to reduce litter and litter/duff, while not exposing bare mineral soil (LRMP SL-6).
28. Fuels Management BMP F-2); (Timber Management BMP T-13).
29. Limit necessary ground disturbing mop-up activities to prevent spread of fire out of unit.
30. Reduce slash pile concentrations prior to broadcast burning.
31. Avoid operations during periods of excessive soil moisture conditions.

Refer to page 6 of the Soils Report in the Official Record for Appraisal and Contract Preparation guidance.

Silviculture

32. No more than 50% of the live crown ratio of dominant and co-dominant ponderosa pine should be scorched during proposed underburns.

Cultural

33. Hand thin small trees that encroach within a cultural site area.

KV Projects

Required Reforestation

- **Site Preparation:** Areas less than minimally stocked following harvest treatments that would require planting: Treatment would consists of felling mistletoe infected and poor vigor ponderosa pine trees (primarily less than 5 inches dbh) and, if present, residual lodgepole pine (primarily less than 3 inches dbh). Ponderosa pine seedlings would be planted using an auger or a planting hoe.
- **Site Preparation Whipfell for Natural Regeneration:** Ponderosa pine and lodgepole pine stands planned for natural regeneration: Treatment would consist of felling mistletoe infected and poor vigor ponderosa pine trees (primarily less than 5 inches dbh) and lodgepole pine (primarily less than 3 inches dbh).
- **Animal Damage Control**
  Big Game: To protect planted seedlings, apply repellent or tubing to planted trees to protect seedlings from big game browse.
  Gopher: Gopher baiting would occur in planted areas to minimize damage to seedlings.
- **Stocking Surveys – Planting:** Year one (1) of planting, two years following planting (3 year) and four years following planting (5 year) to monitor reforestation progress, animal damage, and competing vegetation growth.
- **Machine Pile/Site Preparation for Natural Regeneration:** Mechanical piling lodgepole pine seed tree units for site preparation and slash reduction.
- **Stocking Surveys – Natural Regeneration:** Two (2) years following site preparation (3 year exam) and 4 years following subsoiling (5 year exam) to monitor natural regeneration progress, animal damage, and competing vegetation growth.

Non-Required KV Work

Mitigation

- **Subsoil:** Units or portion of units planned for natural regeneration or planting would be subsoiled.
- **Precommercial thin and slash treatment within scenic views:** Fall small diameter trees. Slash treatment would likely be hand piling. Other slash treatments may be possible.

Stand Enhancement

- **Pruning (for mistletoe reduction):** Prune mistletoe infected branches from ponderosa pine trees within or adjacent to areas prior to ponderosa pine planting to prevent spread of mistletoe.
- **Pruning (for value): P**rune ponderosa pine seedlings within existing plantations to improve future wood quality.
- **Precommercial thin and slash treatment:** Improve diameter growth, vigor, and quality of the remaining trees by falling small diameter trees.
- **Release (Existing Plantations):** Mechanically treat shrubs, reducing shrub canopy cover, to improve growth of trees and reduce risk of stand replacing wildfire.
- **Release (New Plantations):** Reduce unwanted vegetation within approximately a 6-foot radius of planted seedlings by manually grubbing/pulling shrubs or applying herbicides.

APPENDIX D

WILDLIFE BIOLOGICAL EVALUATION (BE)

United States Department of Agriculture	**Forest Service**	**Deschutes National Forest**	**Bend-Ft. Rock Ranger District 1230 NE 3rd St., Ste. A-262 Bend, OR 97701**

File Code: **2670** **Date:** **July 15, 2003**

Subject: **Kelsey Vegetation Management Project Biological Assessment/Evaluation Threatened, Endangered, and Sensitive Wildlife**

To: **David Frantz**
Project NEPA Coordinator & Writer/Editor

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 adverse effects totally through alternatives identified in a biological opinion rendered by the Fish and Wildlife Service. 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 (FSM 2670.31). Through the biological evaluation process (FSM 2672.4), actions and programs authorized, funded, or carried out by the Forest Service are to be reviewed to determine their 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 through the National Environmental Policy Act process by conducting biological evaluations to determine the potential effect of all programs and 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 findings of biological evaluations are to be documented in a decision notice or, if applicable, in official files.

The following biological evaluation assesses the effects of all proposed alternatives for the Kelsey Vegetation Management Project including the No Action alternative. For species other than those classified as Proposed, Endangered, Threatened or Sensitive (PETS) refer to the Wildlife Report for the project. Candidate species are included in the biological evaluation. A Biological Assessment will not be prepared for the Kelsey Project because 1) it is not a major federal construction project that requires a environmental impact statement; 2) the effects on federal threatened, endangered and proposed species are not significant (i.e. adverse or jeopardy); 3) with minor exceptions it meets the Project Design Criteria for the Joint Aquatic and Terrestrial Programmatic Biological Assessment (BA) for the Fiscal Year 2000.

Effects of the project are evaluated for those PETS and C species that are documented or suspected to occur within the Project Area. Existing management direction is found in the Deschutes National Forest Land and Resource Management Plan (1990), as modified by the Eastside Screens (1995). Projects proposed in occupied or potential habitat of any P, T, E, or C species on the Forest must be consistent with the Project Design Criteria for that species, as described in the Deschutes National Forest Programmatic BA (Fiscal Year 2000).

Location Description/Legal

The Kelsey project area is located within the administrative boundary of the Deschutes National Forest. It is bordered by the southern urban growth boundary of Bend on the north and Sunriver and the Deschutes River on the west and southwest. The township and range legal description is: T. 19 S., R. 11-13 E. and T. 20 S., R. 11-13 E. It encompasses approximately 46,566 acres, including 576 acres of private lands. Major geologic features within the project area include the Lava Butte Geologic Area, Lava River Cave, Bessie Butte, Luna Butte, Mokst Butte, and the Deschutes River. Elevations range from 3,900 to 6,000 feet.

Landscape Overview

The project area contains seven management allocations, as designated by the Deschutes National Forest Land and Resource Management Plan (LRMP). Management allocations include General Forest (11,570 acres), Deer Habitat (14,401 acres), Old Growth (467 acres), Scenic Views (10,134 acres), Special Interest Area (7,621 acres), Wild and Scenic River (480 acres), and Research Natural Area (1,317 acres). It also includes the Newberry National Volcanic Monument (18,140 acres of the planning area) and the Upper Deschutes Wild and Scenic River Corridor. Management allocations or areas with emphasis on

providing high quality wildlife habitat include Deer Habitat, Key Elk Area, and Old Growth. The project area is located east of the range of the northern spotted owl. There are no inventoried (RARE II) roadless areas.

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 (9-20 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 LRMP as General Forest (LRMP Management Area 8), while the winter range is designated as Deer Habitat (LRMP 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 LRMP 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. The following species with special designations are known or suspected to occur in the area.

Project/Activity Description

The Kelsey Environmental Assessment analyzed three alternatives, the no action alternative and two action alternatives. Activities proposed in the action alternatives would: 1) reduce stocking in high-density stands through non-commercial thinning, commercial thinning, mechanical shrub treatment, and prescribed burn; 2) protect and enhance wildlife habitat; 3) treat areas with severe infection of dwarf mistletoe to improve stand resiliency; and 4) mechanically treat brush and/or prescribe burn to reduce fire flame lengths and transition towards a more historic low intensity, more frequent fire regime.

Following are detailed descriptions of the alternatives responding to the "Purpose and Need" that are considered to be reasonable and viable by the Decision Maker (the Deschutes National Forest Supervisor). Alternatives, other than the no action alternative, are designed to move towards the desired condition consistent with the standards and guidelines of the Forest Plan. **All measurements are approximate.**

Alternative 1 (No Action)

Under this alternative, the Forest Service would continue to manage the planning area under current Forest Plan direction. No vegetation or fuels reduction treatments, wildlife or scenic view enhancement activities, or activities to restore natural processes to soil would occur. This alternative provides a baseline by which compares relative changes and their effects that would occur with implementation of proposed activities in either Alternative 2 (Modified Proposed Action) or Alternative 3. Current conditions and trends would likely remain unchanged with selection of the No Action Alternative.

Alternative 2 (Modified Proposed Action)

Fuels and Vegetation: 10,840 acres are proposed for treatment. Where fuels treatments are proposed, the acreage to be treated will be variable and dependent upon site-specific needs. Proposed commercial harvest is outside the Riparian Habitat Conservation Area (**RHCA**).

Table 1: Alternative 2 (Modified Proposed Action) Vegetation, Fuels, and Associated Treatments		
TREATMENT TYPE	**UNIT NUMBER**	**ACRES**
Fuels Treatment Only	1,2,5,6,9,10,17,18,20,24,25,30,77,79,81-86,90,95,101,104,107,116,123 132-145,151,153-155,157,158, 251	4,090
With Non-commercial Thinning and/or Pruning	29,31,40,46,48,53,55,57,62,63,106,108-110,114,115,131	695
Sub-Total		**4,785**
Vegetation and Fuels Treatments	3,4,11-13,16,19,22,23,39,41,42,45,50,52,54,56,67,73-75,94,105,124,126 146-149,152,156,256,263-265,269	2,220

Table 1: Alternative 2 (Modified Proposed Action) Vegetation, Fuels, and Associated Treatments		
TREATMENT TYPE	**UNIT NUMBER**	**ACRES**
With Non-commercial Thinning and/or Pruning	7,8,14,21,26,27,35-38,49,58-61,64,66,68-71,78,80,87-89,96,98-100,102 103,111,112,117,129,130,150,254,258,259,261,262,267,268	2,000
With Replant	7,8,14,21,26,27,36,58,59,68,258,259,261,262,267,268	915
With Sub-soiling	7,8,14,21,26,27,36,58,59,68,259,262,267	740
Sub-Total		**4,220**
Vegetation Treatment Only	47,119-122,125	505
With Non-commercial Thinning and/or Pruning	15,33,34,65,97,113,127,128	245
With Sub-soiling	33	15
Sub-Total		**750**
Total		**9,755**

Alternative 3
Fuels and Vegetation: 11,0 acres are proposed for treatment. Where fuels treatments are proposed, the acreage to be treated will be variable and dependent upon site-specific needs. Proposed commercial harvest is outside the RHCA.

Table 2: Alternative 3 Vegetation, Fuels, and Associated Treatments		
TREATMENT TYPE	**UNIT NUMBER**	**ACRES**
Fuels Treatment Only	2,9,17,18,20,24,77,81-83,90,107,116,123,132-139,141,143-145,153207,208 216,222,223,226,234-238,245,249,251,252,255,270,274,275,325,404,451	4,495
With Non-commercial Thinning and/or Pruning	29,31,48,53,55,57,62,63,106,108-110,114,115,131,221,271,281,340,346	735
Total		**5,230**
Vegetation and Fuels Treatments	3,11,19,22,23,39,41,42,45,73-75,126,148,149,152,209-211,215,217-220 225,227,239,248,253,256,263-265,269,277,312-314,316,352,354,356,367 405,424,446,447	2,700
With Non-commercial Thinning and/or Pruning	21,26,37,49,61,78,87-89,96,98-100,102,103,129,150,200,201,206,224,254 258,259,261,262,267,268,272,273,276,307,308,327,338,368,369,411,412 430,442	1,900
With Replant	21,26,258,259,261,262,267,268,442	705
With Sub-soiling	21,26,259,262,267,442	505
Total		**4,600**
Vegetation Treatment Only	119-122,125,212-214,230,231,240-244,246,250,347	835
With Non-commercial Thinning and/or Pruning	15,33,65,66,97,113,127,128,202-205,229,232,233,247,278,335,360	415
With Sub-soiling	33	15
Total		**1,250**
Total Acres		**11,080**

Analysis of Effects

The following species and their habitats were considered in the preparation of this document:

SPECIES		**FEDERAL CLASSIFICATION**
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	SOC
Buffledhead duck		
Falco peregrinus anatum	American peregrine falcon	S

Numenius americanus	Long-billed curlew		S
Tricolored blackbird			
Centrocercus urophasianus	Western sage grouse		S, SOC
Coturnicops noveboracensis	Yellow rail		S
Podiceps auritus	Horned grebe	S	
Red-necked grebe			
Gulo gulo luteus	California wolverine	S, SOC	
Martes pennanti	*Pacific fisher*	*S*	
Sylvilagus idahoensis	Pygmy rabbit		S, SOC

- E=Endangered, T=Threatened, S=USFS Region 6 Sensitive, P=Proposed for Federal listing,

  C=USFWS Candidate species, SOC=USFWS Species of Concern

Corynorhinus townsendii	Townsend's big-eared bat	S, SOC

Pre-field review summary and field survey results

The bald eagle is occasionally observed in, or in close proximity to the project area, however, there are no nest, winter roosts, or Bald Eagle Management Areas, as designated by the Deschutes National Forest Land and Resource Management Plan, within the project area.

There have been historical sightings of the peregrine falcon on the west side of the Deschutes River near Benham Falls. There are no known nests in the project area.

The bufflehead duck 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.

Conclusion

Alternative 1 (No Action) would have **No Effect/No Impact** to PETS wildlife species.

Alternative 2 (Modified Proposed Action) would have **No Effect/No Impact** to PETS wildlife species.

Alternative 3 would have **No Effect/No Impact** to PETS wildlife species.

Project activities occurring during the spring and summer breeding season could disturb nesting buffleheads, and potentially result in direct mortality of nesting ducks and/or young.
The project meets/does not meet all Project Design Criteria I and II of the Deschutes National Forest Programmatic BA (Fiscal Year 2000). There would be **No Effect** on any PETS or C species or associated habitat. The recommendation is to proceed as planned.

Prepared by: Kevin Keown Date: July 15, 2003
Wildlife Biologist

Reviewed by: James C. Lowrie Date:
Supervisory Wildlife Biologist

References

Joint Aquatic and Terrestrial Programmatic BIOLOGICAL ASSESSMENT For Federal lands within the Deschutes Basin Administered by Bureau of Land Management Prineville Office, Deschutes and Ochoco National Forests – 05/06/04

APPENDIX E

BOTANY
BIOLOGICAL EVALUATION (BE)
AND
NOXIOUS WEED RISK ASSESSMENT

Botany Report
Kelsey Vegetation and Fuels Treatments

Environmental Assessment
Bend-Fort Rock Ranger District

Deschutes National Forest

Prepared and Reviewed by: _____ Date: _____

Carolyn M. Close
District Botanist
Crescent Ranger District
Deschutes National Forest

INTRODUCTION

The Botany Report includes two (2) sections:

Section 1: Biological Evaluation (BE), prepared in compliance with the requirements of Forest Service Manual (FSM) 2672.4.

Section 2: Noxious Weed Risk Assessment prepared in compliance with requirements of FSM 2081.3 (November 29, 1995) and the February 3, 1999 Executive Order (13112) on Invasive Species.

SECTION 1: BIOLOGICAL EVALUATION

Effects of activities associated with the Kelsey Vegetation and Fuels Treatments Project are evaluated for those Proposed, Endangered, Threatened, or Sensitive (PETS) plant species on the current Region 6 Forester's Sensitive Plant List (dated May 13, 1999) which are documented or expected 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.

Table 1: REGIONAL FORESTER'S SENSITIVE PLANTS (1999): DESCHUTES NATIONAL FOREST

Scientific Name	**Common Name**	Listing Status[15]	**Codes[16]**
Agoseris elata	Tall agoseris	ONHP List 2	D
Arabis suffrutescens var. *horizontalis*	Crater Lake rockcress	Sp. Of Concern; ONHP List 1	S
Arnica viscosa	Shasta arnica	ONHP List 2	D
Artemisia ludoviciana ssp. *Estesii*	Estes' artemisia	Sp. Of Concern; ONHP List 1	D
Aster gormanii	Gorman's aster	Sp. Of Concern; ONHP List 1	S
Astragalus peckii	Peck's milk-vetch	Sp. Of Concern; ONHP List 1	S
Botrychium pumicola	Pumice grape-fern	Sp. Of Concern; ONHP List 1	D
Calamagrostis breweri	Brewer's reedgrass	ONHP List 2	S
Calochortus longebarbatus var. *longebarbatus*	Long-bearded mariposa lily	Sp. Of Concern; ONHP List 1	S
Carex hystricina	Porcupine sedge	ONHP List 2	S
Carex livida	Pale sedge	ONHP List 2	S
Castelleja chlorotica	Green-tinged paintbrush	Sp. Of Concern; ONHP List 1	D
Cicuta bulbifera	Bulb-bearing water-hemlock	ONHP List 2ex	S
Collomia mazama	Mt. Mazama collomia	Sp. Of Concern; ONHP List 1	S

[15] **Species of Concern** = Federal Designation; neither Endangered or Threatened; **Oregon Natural Heritage Program (ONHP) List 1:** Contains species which are endangered or threatened throughout their range or which are presumed extinct; **ONHP List 2:** Contains species which are threatened, endangered or possibly extirpated from Oregon, but more common or stable elsewhere; **ONHP List 3:** Contains species for which more information is needed before status can be determined, but which may be threatened or endangered in Oregon or throughout their range.
[16] **D** = Documented; **S** = Suspected

Scientific Name	Common Name	Listing Status[15]	Codes[16]
Gentiana newberryi var. *newberryi*	Newberry's gentian	ONHP List 2	D
Lobelia dortmanna	Water lobelia	ONHP List 2	D
Lycopodiella inundata	Bog club-moss	ONHP List 2	D
Lycopodium complanatum	Ground cedar	ONHP List 2	S
Ophioglossum pusillum	Adder's-tongue	ONHP List 2	S
Penstemon peckii	Peck's penstemon	Sp. Of Concern; ONHP List 1	D
Pilularia americana	American pillwort	ONHP List 2	S
Rorippa columbiae	Columbia cress	Sp. Of Concern; ONHP List 1	S
Scheuchzeria palustris var. *americana*	Scheuchzeria	ONHP List 2	D
Scirpus subterminalis	Water clubrush	ONHP List 2	D
Thelypodium howellii ssp. *Howellii*	Howell's thelypody	ONHP List 2	S

Project Description

See the Kelsey Environmental Assessment for project description.

Methods and Results

Prefield Review

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, Deschutes National Forest were compared with habitats that occur within the planning area.

All DNF PETS plant species and their habitat descriptions are on file at Bend/Fort Rock Ranger District.

Prefield Review Results

The □daho□ld review indicated that two species of PETS plants, *Castilleja chlorotica* and *Artemisia lucoviciana* ssp. *Estesii*, have sites near the Kelsey project area but only *Castilleja chlorotica* had potential habitat in the units to be surveyed in the project area. *Artemisia ludoviciana* ssp. *Estesii* has known sites along the Deschutes River on the western boundary of the Kelsey project area.

Survey Methods

Plant surveys were conducted in Kelsey project units in 1998 and 2000 using methods approved by the Deschutes National Forest. Surveys for other projects in the Kelsey Planning Area were conducted between 1990 and 1998. Surveyors inventoried plant populations and habitats using the controlled intuitive meander method. They traversed at least one-third of the total area of each unit in a semi-random fashion, but biased their search pattern to specifically include all areas that appeared to provide habitat for the suspect plants. The plant survey records are on file at Bend/Fort Rock Ranger District in the Botany files.

Survey Results

Records of surveys show that two (2) species of PETS plants, *Castilleja chlorotica* and *Artemisia lucoviciana* ssp. *Estesii*, have sites near the Kelsey project area. *Artemisia ludoviciana* ssp. *Estesii* has known sites along the Deschutes River on the western boundary of the Kelsey planning area. *Castilleja chlorotica* has potential habitat in some units in the Kelsey Planning Area, however, no sites for PETS plants were found during surveys in any units in the planning area.

Determination

The Kelsey Vegetation and Fuels Treatments Project will not have direct, indirect, or cumulative impacts to habitat, sites, cause a loss of viability or a trend toward Federal listing for *Artemisia ludoviciana* var. *estesii* or for *Castilleja chlorotica.* The vegetation and fuels treatments project will not have direct, indirect, or cumulative impacts to habitat, sites, or cause a loss of viability or a trend toward Federal listing of any other species on the Regional Forester's Sensitive Plant List.

SECTION 2: NOXIOUS WEED RISK ASSESSMENT

FSM direction requires that Noxious Weed Risk Assessments be prepared for all projects involving ground-disturbing activities. For projects that have a moderate to high risk of introducing or spreading noxious weeds, recent Forest Service policy requires that decision documents must identify noxious weed prevention practices and control measures that will be undertaken during project implementation (FSM 2081.03, November 29, 1995). The *Guide to Noxious Weed Prevention Practices* (July 2001) helps identify weed prevention practices that mitigate identified risks of weed introduction and spread that may occur due to Forest Service projects and programs. This Noxious Weed Risk Assessment and Identification of Prevention Practices has been prepared for the Kelsey Vegetation and Fuels Treatments Project.

Aggressive non-native plants, or noxious weeds, can invade and displace native plant communities causing long-lasting management problems. Noxious weeds can displace native vegetation, increase fire hazards, reduce the quality of recreational experiences, poison livestock, and replace wildlife forage. By simplifying complex plant communities, weeds reduce biological diversity and threaten rare habitats. Potential and known weeds for the Deschutes National Forest are listed at the end of this section.

Surveys for noxious weeds were conducted at the same time as the PETS plants surveys. A map with weed site locations in the Kelsey Planning Area is included in the project files. The following table gives information about weed sites in the Kelsey Planning Area found in previous surveys (DNF Weed EA, 1998):

TABLE 2: 1998 Weed Sites

Site number	Species	Location	Treatment	Strategy	Units
6110001	Diffuse and Spotted knapweed	Hwy 97	Chemical Pull	Correction; Treat from south end moving north	50,96-101, 117,130, 147, 152, 268, 269
6110002	Dalmation toadflax, Diffuse knapweed, Spotted knapweed, Bull thistle, Russian thistle	Road 18	Coordinate treatment with county	Prevention, Correction	133,134,137,141
6110003	Scotch thistle	North Paulina Road @ Hwy 97	Pull/clip	Maintenance; Past pulling seems to be successful; site is considered eradicated.	No unit
6110004	Dalmation toadflax; Diffuse and Spotted knapweed	Rd. 40 W of Hwy 97 to Sunriver	Chemical Pull	Prevention, Correction; Coordinate treatment with Sunriver	30, 265-267
6110019	Diffuse and Spotted knapweed	Cottonwood Road, East of Sunriver	Chemical Pull	Correction	68,73-75, 105, 148-150,269
6110021	Dalmation toadflax	NW boundary of Forest W of China Hat Road 18	Pull	Correction; Pulling has been effective; close to eradication	133
6110022	Dalmation toadflax	Rd. 18 S side, W of powerline	Pull	Correction	141
6110056	Dalmation toadflax and spotted knapweed	On NF just S of High Desert Museum	Chemical Pull	Correction	No unit
6110124	Spotted knapweed	Slough Camp	Pull	Correction; Lava Butte SIA	No unit
6110125	Spotted knapweed	Dillon Falls	Pull	Correction; Appears to be near ARLUE site	No unit
6110131	Knapweed Bull thistle	Benham Falls	Pull	Correction; Lava Butte SIA	84-87

Several sites in the proposed 2002 Noxious Weed EA are in the Kelsey Planning Area. These are:

1) new sites,
2) expansion of sites included in the 1998 Weed EA, or
3) sites in the 1998 EA but are now proposing treatment changes.

The following table lists the sites in the proposed 2002 Weed EA in the Kelsey Planning Area.

TABLE 3: 2002 Weed sites

Site number	Species	Location	Treatment	Strategy	Units
1) 6110083	Dalmation toadflax	Rd 18-199	Chemical Pull; Biocontrol	Correction	133
1) 6110090	Spotted knapweed	Mowed areas by Lava Butte	Chemical Pull	Early Treatment	129 (adjacent)
1) 6110096	Dalmation toadflax	Rd 100, south of High Desert Museum	Chemical Pull	Early Treatment	No Unit
1) 6110021 (also see table above)	Dalmation toadflax	Rd 18-199	Pull to Chemical Pull	Correction	133

- Prevention = Prevent further spread of the population.
- Maintenance = Maintain the population at the current level (i.e., either too large to eradicate or not high enough priority for aggressive treatment.
- Correction = Take direct action to reduce the size or eradicate the population.
- Early Treatment = Control the population when both the locations and numbers of plants are few.

RISK ASSESSMENT

- **Presence of known weed populations and whether or not those populations can be avoided**
  - See Table above for information about the known weed sites in the Kelsey Planning Area. These sites are mainly along roads and other disturbed areas. Vehicles and equipment used in the implementation of Kelsey Project activities would not be able to avoid known sites, especially traveling on weed infested roads to and from units.
- **Level of Disturbance**
  - Soil could be displaced and compacted by activities associated with the Kelsey project. Roads may need to be maintained, opened, or constructed. Temporary roads will be needed. Vegetation will be removed by harvest and/or fire creating bare ground.
- **Resource Value**
  - The project area includes the Lava Butte Geologic Area and Newberry National Volcanic Monument, and is adjacent to the High Desert Museum, Sunriver and other subdivisions, and the Deschutes River Benham Falls and Dillon Falls recreation areas. Highway 97 bisects the project area. The Deschutes River is on the western boundary of the Kelsey Planning Area where there are known sites for *Artemisia ludoviciana* spp. *Estesii*, a plant taxon on the R6 Sensitive Plant List.
- **Introduction Vectors**
  - Activities in the planning area include OHV use, heavy equipment, recreation activities, and other activities, including grazing, which can contribute to the introduction and spread of noxious weeds.

RISK DETERMINATION

Analysis of these factors indicates a **HIGH RISK** of the introduction and spread of noxious weeds in the project area. The Forest Service ***Guide to Noxious Weed Prevention Practices*** (USDA Forest Service, July 12, 2001) provides management direction that will help prevent noxious weeds from becoming established or help reduce the spread of noxious weeds that are already established. The ***Guide*** provides a toolbox of ideas for use in mitigating identified weed risks in resource management operations.

Vegetation Management Activities

Alternative 1 (No Action): No proposed harvest, stand improvement, or fuels reduction activities are associated with this alternative for the Kelsey Project, therefore there will be LOW RISK of the introduction and spread of noxious weeds. Other projects that are being implemented or that are planned or proposed for implementation in the Kelsey Project Area and in adjacent areas have been or will be assessed for the risk of the introduction or spread of noxious weeds.

Alternatives 2 – 5: Analysis indicates a HIGH RISK of the introduction and spread of noxious weeds in the project area. The risk rating will vary by alternative, but will be HIGH RISK for all action alternatives. For treatment activities

proposed in the Kelsey Project the weed risk rating will be somewhat lower for Alternative 2 than for Alternatives 3, 4, and 5, since fewer acres are proposed for treatment in Alternative 2.

Determination: If the following noxious weed prevention practices are implemented the risk of the of the introduction and spread of noxious weeds will be significantly lowered.

Weed prevention practices that are <u>required</u> by Forest Service Policy for this project are:

1. For forested vegetation management operations, use equipment cleaning contract provisions WO-C/CT 6.36. ***Applies to all units that are covered in contracts.***

MITIGATIONS

To reduce the risk of the introduction and spread of noxious weeds in the Kelsey Planning area **the following mitigations will apply**:

1. Begin project operations (i.e. commercial and precommercial thinning, prescribed fire, mechanical shrub treatment, etc.) in uninfested areas before operating in weed-infested areas. ***Begin project operations in units that are <u>not</u> listed in the tables above.***
2. To the extent feasible, during mowing and/or burning, avoid mowing over or lighting the obvious high-density cheatgrass spots, such as cattle water sets, hunter camps, or adjacent to roads. ***All units with mowing and/or burning activities proposed where cheatgrass occurs.***
3. To reduce the spread or introduction of cheatgrass in mowing units, leave a 15-20 foot untreated buffer strip along unit edges that lie adjacent to roads. This is often where the greatest amount of cheatgrass seedbank reserves are located; by leaving this zone alone, there will be fewer opportunities for this weed (and any others present) to spread. ***All units with mowing treatment proposed that are adjacent to roads.***
4. Ensure that equipment and vehicles used in prescribed fire projects are free of weed seed and propagules before entering the project area. ***All units with underburn treatment, especially units where cheatgrass occurs.***
5. Clean equipment, before leaving the project site, if operating in areas infested with weeds. ***All units listed in the tables above.***
6. Inspect all limited-term ground-disturbing operations, including temporary roads, in noxious weed infested and uninfested areas for at least three growing seasons following completion of the project. Provide follow-up treatments based on inspection results. (KV funding may be used to inspect KV projects.) Prioritize areas for inspection, and treatment if needed, to make the most efficient use of available funding. ***All units with KV-funded post sale treatments.***

Recommendations

To further reduce the risk of the introduction and spread of noxious weeds **the following recommendations may be applied where appropriate and when practical**:

- ***General***

1. To attempt to minimize the possibility of increased vigor and distribution of cheatgrass, consider planting competing native species, such as yarrow (*Achillea millefolium*) and rabbit brush (*Chrysothamnus viscidiflorus*) within selected mow or mow/burn units where cheatgrass is especially prevalent.
2. Minimize soil disturbance and retain native vegetation in and around project activity areas to the maximum extent possible consistent with project objectives.
3. Where appropriate and practical, stockpile weed-seed-free topsoil and replace it on disturbed areas (e.g. road embankments or landings).
4. In prescribed fire units, use appropriate preparation and suppression tactics to reduce disturbances to soil and vegetation.
5. Provide information, training, and appropriate weed identification materials to people potentially involved in weed introduction, establishment, and spread. Educate them to an appropriate level in weed identification, biology, impacts, and effective prevention measures.
6. Develop incentive programs encouraging weed awareness, detection, reporting, and for locating new invaders. Encourage the formation of Cooperative Weed Management Associations with adjacent landowners.

- ***Timber Harvest Operations***:

1. Treat weeds in project area, emphasizing treatment of weed infestations on existing landings, skid trails, and haul roads before activities commence. ***Units in the above table with harvest treatments.***
2. Train contract administrators to identify noxious weeds and select lower risk sites for landings and skid trails.
3. Encourage operators to maintain weed-free mill yards, equipment parking, and staging areas.

- ***Recreation and Special Management Areas:***

1. Encourage public land users, before recreating on public lands, to inspect and clean motorized and mechanized trail vehicles of weeds and weed seeds.
2. Periodically inspect for weeds all campgrounds, trailheads, and recreation areas that are open to public vehicle use. Treat infestations.
3. Maintain areas of concentrated public use in a weed-free condition. Consider high-use recreation areas, such as Benham Falls, as high priority for weed eradication.
4. Post weed awareness messages and prevention practices at strategic locations such as campgrounds, trailheads, roads, boat launches, and forest portals.

- ***Road Management:***

1. Periodically inspect system roads and rights-of-way for invasion of noxious weeds. Train road maintenance staff to recognize weeds and report locations to the noxious weed coordinator.
2. Treat weeds in road decommissioning and reclamation projects before roads are made impassable. Reinspect and follow up based on initial inspection and documentation.

- ***Wildlife***

1. Periodically inspect and document those areas where wildlife concentrate in winter and spring, resulting in overuse or soil scarification (e.g. deer winter range and key elk areas.

DESCHUTES NATIONAL FOREST NOXIOUS WEED LIST

SCIENTIFIC NAME	COMMON NAME	PRESENCE
Bromus tectorum	Cheatgrass	Documented
Cardaria (=Lepidium) draba	Whitetop	Potential
Carduus nutans	Musk thistle	Potential
Carduus pycnocephalus	Italian thistle	Potential
Centaurea diffusa	Diffuse knapweed	Documented
Centaurea maculosa	Spotted knapweed	Documented
Centaurea pratensis	Meadow knapweed	Documented
Centaurea repens	Russian knapweed	Potential
Centaurea solstitialis	Yellow star-thistle	Potential
Centaurea virgata* var. *squarrosa	Squarrose knapweed	Potential
Cirsium arvense	Canada thistle	Documented
Cirsium vulgare	Bull thistle	Documented
Conium maculatum	Poison hemlock	Potential
Cynoglossum officinale	Common houndstongue	Documented
Cytisus scoparius	Scot's broom	Documented
Dipsacus sylvestris	Teasel	Potential
Euphorbia esula	Leafy spurge	Potential
Hypericum perforatum	St. Johnswort	Documented
Isatis tinctoria	Dyer's woad	Documented
Kochia scoparia	Kochia	Potential
Linaria dalmatica	Dalmation toadflax	Documented
Linaria vulgaris	Butter and Eggs	Documented
Lythrum salicaria	Purple loosestrife	Potential
Onopordum acanthium	Scotch thistle	Documented
Phalaris arundinacea	Reed canarygrass	Documented
Ranunculus repens	Creeping buttercup	Potential
Salvia aethiopsis	Mediterranean sage	Potential
Senecio jacobaea	Tansy ragwort	Documented
Taeniatherum caput-medusae	Medusahead	Potential

The weed species listed above are on the Oregon State Noxious Weed List. *Verbascum thapsus*, common mullein, is not on that list. However, it is of concern on the Deschutes National Forest because it invades disturbed sites, especially past harvest units, and may compete with young trees and other desirable native plants.

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APPENDIX F

SILVICULTURE
HERBICIDE ANALYSIS

Prevention Analysis

What is the nature and role of associated vegetation?

Table 1 lists plant associations (Volland 1985) found in: 1) existing plantations proposed for release treatments and 2) areas to be reforested to ponderosa pine following proposed regeneration harvest. The nature of associated shrub and grass vegetation is briefly described. Grass and shrub species within these plant associations have potential to reduce tree growth. Greenleaf manzanita (Arctostapylos patula) and snowbrush (Ceanothus velutinus) are the shrub species with the greatest potential to be competing and unwanted. Idaho fescue (Festuca idahoensis) and Ross Sedge (Carex rossii) are the grass and sedge species with greatest potential to be competing and unwanted.

Table 1. Plant associations within Kelsey Planning Area.

Plant Association	Plant Association	Native Understory Response to Timber Management[1]	Treatment for Artificial Regeneration[2]
CL-S2-11	Lodgepole/bitterbrush/needlegrass	Decrease in bitterbrush; in squirreltail.	Provide overhead protection.
CPS2-11	Ponderosa/bitterbrush/fescue	Decrease in bitterbrush. Goldenweed, needlegrass and fescue increase.	Scarify fescue.
CPS2-13	Ponderosa/bitterbrush-manzanita/needlegrass	Manzanita, snowbrush, needlegrass increase. Bitterbrush decreases.	Scarify for manzanita.
CPS2-17	Ponderosa/bitterbrush-manzanita/fescue	Increase in Idaho fescue and manzanita. Decrease in bitterbrush.	Scarify fescue.
CWS1-12	Mixed conifer/snowbrush-manzanita	Increase in manzanitas and snowbrush. Bitterbrush decreases.	Scarify for shrubs.

[1] Volland (1985). From Range and Wildlife Section (Pages 93 through 96)
[2] Volland (1985). From Timber Management Section 1 (Pages 97 through 100)

Greenleaf Manzanita (Arctostapylos patula)

The following information is from Zimmerman (1991):

Greenleaf manzanita has the ability to regenerate quickly in areas with frequent fires, allowing it to perpetually dominate a site. Greenleaf manzanita regenerates from seed, sprouts, and layering. Annually it produces seeds in large quantities that lie dormant in the soil. Seeds will germinate when exposed to heat from fire or mechanical scarification. When the plant reaches approximately 2 years of age, greenleaf manzanita is generally able to sprout from dormant buds in the root burl. Layering may occur when manzanita branches are forced to the ground and kept there for long periods of time, such as may occur with a heavy snowfall. With these conditions, branches may sprout roots and develop into separate plants.

Stands of manzanita can live 20 to 100 years. Greenleaf manzanita begins to die back when overtopped by trees, preferring open areas in full sunlight. It is very susceptible to fire due to its stand density, presence of volatile materials in its leaves, low moisture content of foliage during summer, and the persistence of its dead branches and stems.

Growth of ponderosa pine seedlings is severely limited by manzanita, primarily due to competition for water. Established tree seedlings seldom die from the suppressing effects of competing vegetation, but growth loss can be substantial. In one study, greenleaf manzanita crown density of only 25% resulted in a nearly 60% loss in tree productivity.

On sites where fire is excluded for long periods of time, greenleaf manzanita may provide a better microclimate for some tree seedlings than would exist on harsh sites in full sunlight, and it may enhance soil conditions through the addition of organic material. This could allow for the relatively slow but sure establishment of the seedling of some species of pine.

Snowbrush (Ceanothus velutinus)

The following information is from Conard et.al. (1985):

Snowbrush regenerates from both sprouts and seeds. It is generally a prolific seed producer. Seeds are able to remain viable in the soil for years. Excellent germination has been obtained in Ceanothus seeds known to be 9 to 24 years old. Seeds may remain viable for as long as 200 years. Fire commonly stimulates seed germination, although high soil temperatures caused by solar radiation and mechanical abrasion may also be factors. Because of large numbers of seeds in the soil, even

relatively low germination can be sufficient to produce high densities of Ceanothus shrubs. Sprouting is not the primary means of reproduction in the genus, although most forest species exhibit at least some ability to sprout. Even though disturbance is necessary to stimulate seed germination, fire can be either too frequent or too intense, and can eliminate Ceanothus species. Seed and plants can be destroyed with repeated burning.

Compared to other genera of shrubs, Ceanothus are short lived. Ceanothus is intolerant to shade. This may be due to being shaded out by overtopping vegetation. Overtopping begins to occur at 10 to 75 years on sites where conifers are present. In the Cascade Range, root crowns of mature C. velutinus can be damaged by snow, which can lead to senescence of stands. The functional life span of C. velutinus on many sites in the Cascades is believed to be between 20 and 40 years before shading by conifers and snow damage begin to decrease its vigor.

As with greenleaf manzanita, soil moisture depletion is probably the major factor limiting conifer growth. Ceanothus may have a competitive advantage because it can absorb water from relatively dry soil. Ceanothus is capable of fixing nitrogen, and to a point may be beneficial to the site. It can also provide site amelioration for seedlings by 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.

Observations on the district indicate that snowbrush, when not covered by snow, can be damaged by cold temperatures. Damage includes dieback of exposed branches. Observations indicate plant usually sprouts from the root collar following this type of damage.

Idaho fescue (Festuca idahoensis)

The following information is from Zouhar (2000, November):

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 in Idaho fescue arises from a relatively small budding zone within a compact root crown area. In cases of disturbance in which the root crowns survive, tillering may result in rapid increase in plant size in non-competitive environments.

Idaho fescue is a small bunchgrass that can survive light-severity fires. It is usually harmed by more severe fire. Fires burning at 10- to 25-year intervals have neutral to negative effects on this bunchgrass. Rapid tillering occurs when root crowns are not killed and soil moisture is favorable. Plants may re-establish after fire if temperatures are low enough to allow for survival of seed. In a study done on the Fort Rock Ranger District, Idaho fescue resprouted after spring prescribed burns and within 3 months more than 80% of the Idaho fescue plants had vigorous growth, with greater production in burned areas than in adjacent unburned areas.

Ross Sedge (Carex rossii)

The following information is from Cope (1992):

Ross sedge is a native, long-lived perennial graminoid. Ross sedge reproduces by rhizome growth and by seed production. Seed may remain dormant for long periods of time prior to germination.

Ross sedge is resistant to fire. It regenerates through rhizomes and seed germination. Recovery is rapid to moderate, taking 2 to 10 years to return to preburn frequency. Ross sedge survives fire through buried seed with long-term viability. These seeds germinate after heat treatment. Ross sedge's rhizomes survive low- to moderate severity fires. Ross sedge increases after fires that heat the soil but do not completely consume duff. Season of fire does not appear to have a major effect on plant recovery.

Do conditions exist that favor the presence of competing and unwanted vegetation?

Conditions are currently most favorable for competing and unwanted vegetation on the site of the Green Mountain Fire (Kelsey Proposed Treatment Unit 106). In 1995 a wildfire burned approximately 223 acres of the west side of Green Mountain. The stand prior to the burn was dominated by ponderosa pine. Area burned included ponderosa pine plantations that had been dozer stripped and planted in the early 1960's. At the time of the fire, an understory of greenleaf manzanita and snowbrush was present. Conditions following the fire, including little live tree cover and scarified seed, favored the growth of greenleaf manzanita (Arctostaphylos nevadensis) and snowbrush (Ceanothus velutinus) from sprouts and seeds.

On remaining sites in the Kelsey Planning Area proposed for treatment, tree canopy cover ranges from 15 to 40 percent, and generally averages approximately 25%. Tree canopy cover is currently not high enough to eliminate greenleaf manzanita,

snowbrush, daho fescue, or Ross sedge from the sites. Viable seed for competing and unwanted vegetation is likely present in the soil.

If conditions exist that favor the presence of competing and unwanted vegetation, have past management actions exacerbated the situation?
To meet a variety of objectives, treatments within the past 10 to 30 years have reduced tree canopy cover. Reduced canopy cover has allowed greenleaf manzanita, snowbrush, fescue and sedge to persist at varying levels on the sites.

Within the Green Mountain Fire (Kelsey Proposed Treatment Unit 106), dead trees were salvage logged in 1996 with the Green Labor Fire Salvage Sale (Unit 1). While ground disturbance during harvest may have scarified viable seed in the soil, this would have been minor compared to the scarification that occurred with the fire.

Do natural controls exist on the site?
Tree canopy cover is the primary means of naturally controlling competing and unwanted vegetation. With the exception of the Green Mountain Fire, tree canopy cover is present on all sites and is exerting varying levels of influence on understory vegetation. While tree seedlings are present in the Green Mountain Fire, their canopy cover is currently not high enough to influence competing and unwanted vegetation.

Can management actions be taken that either encourage natural controls or help avoid the conditions that favor the presence of competing and unwanted vegetation?
Management actions that maintain and/or increase tree canopy cover would encourage natural control of competing and unwanted vegetation.

Is it feasible to undertake the management actions, and if not why? If undertaken, are impacts on other Forest Service objectives and goals acceptable?
Where group regeneration harvest is proposed (Table 2), it is not feasible to retain existing level of tree canopy cover. Treatment objectives would not be met. Treatment objectives include either 1) promoting deer hiding cover and vertical stand diversity within deer habitat (WL-5), or 2) evaluating alternative silviculture treatments in even-aged, second growth ponderosa pine stands (RSH).

It is also not feasible to retain existing tree canopy cover where stand regeneration harvest is proposed (Table 2). Treatment objectives to reduce dwarf mistletoe (FH-2) and restore ponderosa pine (PPR) would not be met. It may, however, be feasible in some cases to retain a reduced level of tree canopy cover. Depending on the level of dwarf mistletoe infection, the mistletoe reduction objective could be met by removing trees with moderate to high levels of dwarf mistletoe infection. Need for reforestation could be deferred by not thinning below minimum stocking levels. Retained tree density would not be sufficient to control competing and unwanted vegetation. With no need to reforest the site, control of competing and unwanted vegetation would not be necessary to assure seedling survival and growth. Treatment of brush could still be necessary to reduce risk of stand replacing wildfire.

Table 2. Objectives to be met by proposed regeneration harvest and natural fuels treatments.

Unit	Alternative	LRMP Allocation	Prescription	Natural Fuels Treatment	Treatment Objectives			
Group Regeneration Harvest								
14	2	DHB	8	MST/Underburn	WL-5	NF-9	FH-1	
21	2, 3	DHB, GFO	8	MST	WL-5	FH-1	NF-1	
259	2, 3	DHB	93	Underburn	RSH	WL-1	WL-6	NF-1
262	2, 3	GFO	93	Underburn	RSH	NF-4	WL-1	
267	2, 3	GFO, SV1	93	Underburn	RSH	NF-9	NF-2	
442	3	DHB	8	MST/Underburn	WL-5	NF-9	NF-6	
Stand Regeneration Harvest								
7	2	SV2, GFO	6	MST	FH-2	NF-2		
8	2	GFO	6	MST	FH-2	NF-1		
26	2, 3	SV4, SV1, GFO	6	MST	FH-2	NF-3		
27	2	GFO	6	MST	FH-2	NF-3		
36	2	SV2	7	Underburn	PPR	NF-9	NF-2	

58	2	GFO	6	MST	FH-2	NF-1		
59	2	GFO	6	Underburn	FH-2	WL-2	NF-1	
68	2	SV4, GFO	7	MST/Underburn	NF-3	NF-2	FH-1	PPR
258	2,3	DHB	92	MST	RSH	WL-1	WL-6	NF-1
261	2,3	GFO	92	MST	RSH	NF-4	WL-1	
268	2,3	SV1, SV4	92	MST	RSH	NF-9	NF-2	
Conifer Release								
106	2, 3	SV3	0	MST	FH-3	NF-1		

LRMP Allocation:

DHB: Deer Habitat
GFO: General Forest
SV1: Scenic Views, Retention, Foreground
SV2: Scenic Views, Partial Retention, Foreground
SV4: Scenic Views, Partial Retention, Middleground

Prescription:

0: Thin plantations
6: Stand regeneration harvest to reduce dwarf mistletoe.
7: Regeneration harvest to restore ponderosa pine.
8: Group Regeneration harvest. Over 30 to 40% of the stand, create openings 6 to 12 acres in size.
92: Uneven-aged regeneration harvest. Thin widely for ponderosa natural regeneration. Leave variety of sizes.
93: Group Regeneration harvest. Over 25% of the stand, create openings approximately 4 acres in size.

Treatment Objectives:

FH-1: Reduce risk of mountain pine beetle outbreak.
FH-2: Reduce level of dwarf mistletoe infection.
FH-3: Maintain/improve plantation growth.
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: Protect long term study plots by reducing risk of spotting and crown fire.
NF-9: Create strategic fuel breaks.
PPR: Maintain or increase ponderosa pine dominance.
RSH: Evaluate alternative silvicultural treatments in even-aged, second growth ponderosa pine.
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.
WL-6: Increase herbaceous and forb species; reduce duff/liter layer.

Damage Thresholds

Table 3 displays action and damage thresholds for vegetative cover. Beyond these thresholds, tree survival and growth objectives would not be met.

The action threshold is the period in time during which an action should take place to keep or reduce vegetation below the damage threshold. Vegetation treatment at this time is usually less expensive and more effective than waiting until damage thresholds occur.

The damage threshold identifies how much associated vegetation is too much to permit meeting a site's management objectives. The damage thresholds for tree survival and growth are based on research data from studies on similar sites (McDonald and Fiddler 1989) and District operational experience. Above these threshold levels, unacceptable reductions in tree survival and tree height and diameter growth would occur. The thresholds for herbaceous vegetation and shrub cover are not additive. Total cover for a site (herbaceous vegetation and shrubs) should be determined and the thresholds (Table 3) for whichever one dominates applied.

Table 3. Action and damage thresholds for tree seedling/sapling growth and survival.

Objective	Herbaceous Cover Thresholds		Shrub Cover Thresholds	
	Action	Damage	Action	Damage
Tree Survival	10%	25%	25%	35%
Tree Growth	10%	10%	15%	20%

Deppmeier (2000, Page 11 to 13) summarizes results from studies assessing the effects of competing vegetation on tree survival and growth. This summary provides additional background information for the establishment of action and damage thresholds.

Alternatives Considered but Not Fully Developed

Recently the Bend-Fort Rock Ranger District analyzed alternatives for treating competing and unwanted vegetation growing around tree seedlings (USDA Forest Service 2000a). Treatment alternatives analyzed for controlling competing vegetation included: 1) No Action,
2) spot application of granular hexazinone, and 3) installation of 6 foot by 6 foot plastic mulch mats. Based on the analysis, the spot application of granular hexazinone was selected as the method for treating competing and unwanted vegetation (USDA Forest Service 2000b). It was decided this treatment would reduce or eliminate competing vegetation from around tree seedlings in an efficient and economic manner. It was found this treatment met the requirements for restocking trees while providing for worker safety and meeting other resource needs.

In this recent analysis, a number of treatment alternatives were considered but eliminated from further consideration. One of the alternatives was scalping (grubbing) the soil with hand tools. The analysis documented that while this treatment can be an effective means of removing grass, it has limited effectiveness because of its short duration of control. Additionally, the analysis stated scalping removes much of the nutrient rich humus layer of soil, thereby decreasing the amount of nutrients available to the seedlings.

Monitoring of herbicide application and the subsequent vegetation response has shown treatment effects have been as described in the environmental analysis (USDA Forest Service 2000a). In the intervening years since the analysis, its been recognized that costs associated with the use for vegetation mats would be higher that those displayed in the economic analysis for the project.

Based on this recent analysis and the associated findings, together with monitoring results, the following treatment alternatives for controlling competing and unwanted vegetation around tree seedlings were considered but not fully developed:

1) Installation of mulch mats around tree seedlings,
2) Scalping (grubbing) unwanted vegetation growing around tree seedlings, and
3) No treatment of competing and unwanted vegetation growing around tree seedlings. Poor seedling survival and growth would result from not treating competing and unwanted vegetation. This would reduce 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.

A prevention strategy was also considered for treating competing and unwanted vegetation. An alternative incorporating this strategy was not fully developed. Prevention was considered not feasible for meeting treatment objectives (Prevention Analysis, Page 1 to 5).

Herbicide Treatment Description – Alternative 2 (Modified Proposed Action) and Alternative 3

Within 1-2 years following natural fuels treatment (mechanical shrub treatment or underburning), if surveys indicate that shrubs, grasses, or sedges are re-establishing and have potential to exceed the action threshold (Table 3), vegetation would be treated with herbicide within the units identified in Table 4. Plant associations within units proposed for herbicide include the following: CPS2-11, CPS2-13, CPS2-17, and CPS2-12 (Table 1). A second application of herbicide would be done approximately 2 years following initial treatment if surveys indicate competing and unwanted vegetation again has potential to exceed the action threshold.

Treatment would consist of a spot application of a granular form of hexazinone (Pronone^{R}MG). Using a hand-held granular applicator, hexazinone would be applied as dry granules within a
3 foot radius of all planted ponderosa pine (200 to 250 trees per acre). Application rate would be equivalent to 20 pounds of product per acre or 2 pounds of active ingredient (a.i.) per acre. Approximately 13 to 16% of an acre would receive an

application of herbicide. Considering the percent of an acre to be treated, approximately 2.6 to 3.2 pounds of product would be applied per acre (.26 to .3 a.i. lbs/acre). Application would occur either in the spring after the ground thaws or in the fall before snowfall.

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).

Hexazinone is an herbicide that inhibits photosynthesis in plants. 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 damaging it. Granular forms of this herbicide act through root uptake and movement in an upward direction through the plant.

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) was approved on August 1, 2002.

Table 4. Units and amount of area proposed for herbicide treatment to facilitate reforestation.

Unit	Unit Acreage (Gross)	Alternative 2		Alternative 3	
		Reforestation Acres (Net[1])	Herbicide Treatment on Reforestation Acres (Net[2])	Reforestation Acres (Net[1])	Herbicide Treatment on Reforestation Acres (Net[2])
Group Regeneration Harvest					
14	205	72	11	--	--
21	112	39	6	39	6
259	27	7	1	7	1
262	69	17	2	17	2
267	69	17	2	17	2
442	269	--	--	94	14
Subtotal	--	152	22	174	25
Stand Regeneration Harvest					
7	80	32	5	--	--
8	46	18	3	--	--
26	102	41	6	41	6
27	47	19	3	--	--
36	14	6	1	--	--
58	41	16	2	--	--
59	15	6	1	--	--
258	46	12	2	12	2
261	44	11	3	11	3
268	84	21	3	21	3
Subtotal	--	182	29	85	14
Total Acres	--	334	51	259	39

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

Herbicide Mitigation Measures

District experience in a similar application of hexazinone indicates the following mitigation measures will be effective in limiting public exposure to the herbicide.

1. Public notification will be used for all applications requesting that people who know or suspect that they are hypersensitive to herbicides contact the Forest Service to determine appropriate risk management measures.

2. 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.

Effects and Risk Analysis

Components of a risk assessment include an evaluation of hazard, exposure, and risk. A methods information profile on herbicides (USDA 1994) defines these terms as follows:

Hazard: the characteristic of an object or substance that can inflict injury or illness.

Exposure: the opportunity to receive a dose, which is the amount of a potentially harmful substance actually encountered by an organism.

Risk: the likelihood of illness or injury based on the results of hazard and exposure evaluation.

Risks associated with the application of selected formulations of hexazinone were evaluated in a human health and ecological risk assessment (SERA 1997). This assessment (hereafter referred to as the SERA risk assessment) was commissioned by the Forest Service to assess the risk of using hexazinone in applications that are specific to Forest Service programs. In a report submitted to the Forest Service (SERA 2002, hereafter referred to as the SERA report), the following three specific toxicological endpoints considered in risk assessments were addressed: neurotoxicity, immunotoxicity, and endocrine disruption. The SERA risk assessment and the SERA report provide the basis for assessing risks associated with the proposed application of herbicide. Pronone^{R}MG, the product proposed for use with this project, is one of the commercial formulations containing hexazinone covered by the SERA risk assessment. The proposed application rate of the product (.26 to .30 a.i[17]. lbs/acre) is at the low end of the application rates (0.3 to 2.5 a.i. lbs/acre) displayed in the risk assessment (SERA 1997, Page 2-6, Table 2-3).

The Plantation Herbicide Environmental Assessment (USDA Forest Service 2000a) provides an additional basis for describing effects associated with proposed herbicide application. The assessment is applicable to the Kelsey proposal. The herbicide product, herbicide application method, and environmental conditions are similar in both proposals.

Human Health

Affected Environment

Of the units proposed of herbicide application (Table 4), Units 258 and 259 are closest to private land. Unit 258 is approximately 1,600 feet (.3 mile) south of private property and approximately 3,700 feet (.7 mile) southeast from human habitation[18]. Unit 259 is approximately 3,200 feet (.6 mile) south of private property and approximately 5,300 feet (1 mile) southeast from human habitation. These units are approximately 4,200 to 5,300 feet (.8 to 1 mile) southeast of the High Desert Museum. Remaining units proposed for herbicide application are 1 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. Dispersed recreation would include Off Highway Vehicle (OHV) use and hunting. The Kelsey Planning Area is not open to public woodcutting.

Alternative 1 – No Action

Direct, Indirect, and Cumulative Effects

There would be no effects other than those described for the broader no action alternative.

Alternative 2 (Modified Proposed Action) and Alternative 3

Hazard Evaluation

Overview: The SERA risk assessment describes hazards associated with the use of hexazinone. The following are excerpts are from the hazard overview (SERA 1997, Page 3-1).

The toxicity of hexazinone is relatively well characterized in experimental mammals. The acute toxicity[19] of hexazinone is low, with oral LD_{50}[20] values in experimental mammals ranging from approximately 500 to 3500 mg/kg. There are no

[17] a.i. lbs/acre (Definition) – Active ingredient pounds per acre.

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

[19] Acute Toxicity (Definition) – the amount of a substance, as a single dose, to cause poisoning in a test animal (USDA 1992).

remarkable or systemic differences in sensitivity among various species. The effects observed in mammals after subchronic[21] or chronic[22] exposure to hexazinone are generally limited to decreases in body weight, increases in liver weight, and changes in blood enzyme levels associated with liver toxicity. At doses that are substantially greater than the threshold for systemic toxic[23] effects, hexazinone may cause reproductive effects, including kidney abnormalities and/or delayed ossification[24] as well as decreases in the survival rate of offspring in experimental mammals.

There are limited data suggesting that hexazinone may be a carcinogen. These data are limited to a 2-year bioassay in mice in which females but not males had a slight increase in the total number of malignant tumors. The U.S. EPA judged that this dose-response pattern is equivocal evidence (*not entirely negative, but not convincingly positive*) for carcinogenity and designated hexazinone as Class D not classifiable as to human carcinogenicity.

Both powdered and liquid formulations of hexazinone as well technical grade hexazinone are shown to be moderate to severe eye irritants. The available human data suggest that dust associated with the application of some batches of granular formulations may be sufficiently dense to cause symptoms of eye and respiratory irritation in workers.

Dermal exposure is the primary route of concern for workers. The available data indicate that the dermal toxicity of hexazinone is relatively low and that hexazinone is not well absorbed after dermal exposure. Nonetheless, an occupational study of workers applying a granular formulation of hexazinone indicates that dermal absorption will occur.

Mutagenicity
There is a lack of mutagenic activity of hexazinone in several *in vivo*[25] and *in vitro*[26] bioassays, although 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). The following are excerpts from this report.

<u>*Neurogical Effec*</u>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)

<u>Immunologic Effects</u>
Immunotoxicants are chemical agents that disrupt the function of immune system. These agents can impair immune responses *(immune suppression)* or produce inappropriate 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

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[20] LD_{50} (Definition) – Lethal Dose – The dose of a chemical calculated to cause death in 50% of a defined experimental animal population over a specified observation period. The observation period is typically 14 days. (SERA 1997).
[21] Subchronic Exposure (Definition) – An exposure duration that can last for different periods of time, but 90 days is the most common test duration (SERA 1997).
[22] Chronic Exposure (Definition) – Long-term exposure studies often used to determine the carcinogenic potential of chemicals (SERA 1997).
[23] Systemic Toxicity (Definition) – Effects that require absorption and distribution of a toxic agent to a site distant from its entry point at which point effects are produced (SERA 1997).
[24] Ossification (Definition) – The natural process of bone formation (Webster 1984)
[25] In vivo (Definition) – Occurring in the living organism (SERA 1997)
[26] In vitro (Definition) – Isolated from the living organism and artificially maintained, as in a test tube (SERA 1997).

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. Nonetheless, 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

The following are excerpts from the SERA risk assessment.

Hexazinone is metabolized extensively in plants and animals, with little parent product recovered in tissue. There is relatively little information available regarding the toxicity of the metabolites. The relative paucity of information about the toxicity of these metabolites does not have a significant impact on this risk assessment. The toxicity studies on which the hazard identification and subsequent dose-response assessment are based involve *in vivo* exposure to hexazinone, and, presumably, the subsequent formation of hexazinone metabolites. 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

The following are excerpts from a discussion on herbicide formulations in the Pesticide Fact Sheet for hexazinone (Information Ventures, Inc 1995).

Commercial hexazinone products generally contain one or more inert ingredients. An inert ingredient is anything added to the product other than an active ingredient. The U. S. Environmental Protection Agency (EPA) announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52 FR 13305). The EPA's strategy for the implementation of this policy included the development of four lists of inerts based on toxicological concerns. Inerts of toxicological concern were placed on List 1. List 1 inerts must be identified on the product label. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3 and inerts of minimal concern were placed on List 4.

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).

The following excerpts are from the SERA risk assessment.

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
Workers: Occupational exposure generally involves inhalation and dermal exposure, with the dermal route generally contributing far more to exposure than the inhalation route (SERA, 1997, Page 3-11).

With the proposed application of hexazinone, workers would likely be exposed to doses less than those assumed in the SERA risk assessment. The proposed application rate of .26 to .32 pounds active ingredient per acre is less than the application rate (1 a.i. lb/acre) assumed in the
SERA risk assessment (SERA 1997, Page 3-15).

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. The tool used for applying the herbicide would direct the herbicide down to the ground, minimizing potential for the herbicide to come in dermal contact with the worker. Herbicide would be applied on a relatively small percent of each site (approximately 13 to 16% of an acre). In a treatment area there would be 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 sites proposed for application of herbicide are on relatively flat ground, with 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
In the FEIS Characterization and Management of Risk (USDA Forest Service 1988) it was identified that members of the public may be exposed to herbicide drift, to vegetation with herbicide residues, and to accidental spraying. It also identified they could eat food or drink water with herbicides residues. These routes of exposure are similar to those analyzed in the SERA risk assessment. Under normal conditions, members of the general public should not be exposed to substantial levels of hexazinone (SERA 1997, Page 3-18).

With the proposed spot application of granular hexazinone, exposure of the public to the herbicide would be limited. There would be no potential for the public to receive a dermal dose of the herbicide from drift or from accidental direct spraying. Following herbicide application, 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 would be applied on a small percent of each site (approximately 13 to 16% of an acre). 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 proposed method of herbicide application and 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 on water, page 20).

Risk Evaluation
Overview: The U.S. Environmental Protection Agency (EPA) has conducted risk assessments for hexazinone as part of the reregistration process and 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). 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 residential exposure and all other non-occupational sources of pesticide exposure for which there is reliable information (U.S. EPA, 2002).

The SERA risk assessment (SERA 1997) used a hazard quotient to characterize risk for workers and the general public. The following excerpts from the assessment describe how the hazard quotient was determined and what interpretation can be made regarding the quotient.
Risk is characterized as the hazard quotient, the ratio of the anticipated level of the exposure to some index of acceptable exposure or exposure associated with a defined risk. Thus, if the hazard quotient is less than unity[27], concern for the exposure is minimal. As the hazard quotient increases above unity, concern also increases.
The index used in the hazard quotient is the reference dose (RfD[28]) for hexazinone.

Workers
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). Proposed spot application of hexazinone would be most similar to the treatment method displayed in the table titled "directed foliar and spot treatments". In the assessment, the hazard quotient calculated for this treatment method is 0.3 (with a range of 0.004 – 18). In the assessment, an application rate of 1 lb a.i./acre is assumed. Given the lower application rate proposed with this treatment (.26 - .32 lb a.i./acre), the hazard quotient would no be higher than results displayed in the assessment.

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). For granular formulations, the assessment considered 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 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. As discussed in the exposure analysis for this herbicide application, there would be no potential for this type of exposure to occur.

In characterizing the risk of hexazinone, the SERA risk assessment (SERA 1997, Page 3-33) identified a sensitive subgroup of people. The following excerpt is from the assessment.
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. Nonetheless, this does not negate the possibility that 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). Potential for trail users to be exposed to herbicide would be minimized. There would be no change in the risk evaluation done for members of the general public (Page 15, Section 6.1.3.3.3).

Terrestrial Plants
Affected Environment
Areas proposed for herbicide application are in the following plant associations (Volland 1985):
Ponderosa pine/bitterbrush/fescue (CPS2-11),

[27] Unity (Definition) – the number 1 (Webster 1984).
[28] Reference Dose (RfD) (Definition) – a daily dose which is not anticipated to cause any adverse effects in a human population over a lifetime of exposure. These values are derived by the U.S. EPA. (SERA 1997)

Ponderosa pine/bitterbrush-manzanita/needlegrass (CPS2-13), and
Ponderosa pine/bitterbrush-manzanita/fescue (CPS2-17).
Greenleaf manzanita, snowbrush, Idaho fescue, and Ross Sedge are the dominant species with potential to be competing and unwanted vegetation (See Prevention Analysis, Page 1 to 3).

Alternative 1 (No Action)
Direct, Indirect, and Cumulative Effects
There would be no effects other than those described for the broader no action alternative.

Alternative 2 (Modified Proposed Action) and Alternative 3
Hazard Evaluation
The following excerpt is from the SERA risk assessment.
The toxicity to terrestrial plants is well characterized, as is true for most herbicides. Hexazinone acts by inhibiting photosynthesis. In addition, hexazinone also inhibits the synthesis of RNA, proteins, and lipids. Hexazinone is absorbed readily by plant roots, and once absorbed, is translocated readily in most species. Although some foliar absorption may occur, the major route of exposure involves the washing of hexazinone from the soil surface to the root system of plants, where hexazinone is absorbed readily. 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% of each unit proposed for herbicide application would be exposed to the herbicide. Nontarget terrestrial plants may be exposed to the herbicide through unintended direct deposition and soil transport (SERA 1997, Page 4-9).

Risk Evaluation
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 areas also receive relatively low levels of precipitation. 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).

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.

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

Terrestrial Animals

Affected Environment
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, Indirect, and Cumulative Effects
There would be no effects other than those described for the broader no action alternative.

Alternatives 2 (Modified Proposed Action) and Alternative 3
Hazard Analysis
The following excerpts are from the SERA risk assessment (SERA 1997, Page 4-1):

The toxicity of hexazinone to terrestrial wildlife species, particularly invertebrates, is not well characterized. Consequently, the assessment of effects on terrestrial species is based primarily on the available data on experimental mammals. Exposure to hexazinone is associated with decreased weight gain and reproductive effects in several standard test species, including rats, dogs, and rabbits.

The SERA risk assessment (SERA 1997, Page 4-2) reported there is some evidence suggesting that soil microarthropods may be sensitive to hexazinone treatments. Two recent studies assessed the direct (toxic) and indirect (removal of vegetation) effects of herbicide application on soil microorganisms and arthropods. The following excerpts are from preliminary findings assessing the direct effects of hexazinone on soil biota and processes (Busse et al 2001).
No evidence was found of detrimental effects of hexazinone on microbial and arthropod populations when applied at the recommended field rate. Hexazinone had little or no measurable effect on microbial community size, activity, or function. There were no significant differences in numbers of mites, spiders, beetles, or springtails between hexazinone and control treatments. There were minor shifts in arthropod assemblage structure, but all appear to be transitory and none were statistically significant. 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).

Exposure Analysis
The following excerpts are from the SERA risk assessment:
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 conducted risk assessments for hexazinone as part of the reregistration process and 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). The following excerpt is from the SERA risk assessment (SERA 1997, Page 4-18).
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.

A potential exception to this exposure assessment involves a scenario in which birds consume hexazinone granules immediately after application; in which case, reproductive effects and possibly overt signs of toxicity might occur. The plausibility of this risk for birds, however, is questionable. There are no data indicating that birds will consume any of the granular formulations that contain hexazinone. Thus, a lower limit on the exposure assessment is zero. If birds were to consume these granules preferentially, exposure levels could be much higher. In that case, toxic effects including mortality could occur. Without additional information with which to improve the exposure assessment, this risk cannot be characterized further.

The minor reduction of vegetation associated with proposed herbicide application would have little to no effect on wildlife populations. Proposed application of herbicide would reduce vegetation on approximately 51 acres (Alternative 2) to 39 acres (Alternative 3). This is approximately 15% of each unit proposed for herbicide treatment. This acreage is less than 1 percent (0.1%) of the portion of the planning area that isn't in lava flows.

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

Aquatic Species

Affected Environment
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, Indirect, and Cumulative Effects
There would be no effects other than those described for the broader no action alternative.

Alternative 2 (Modified Proposed Action) and Alternative 3
Hazard Analysis
The following excerpt is from the SERA risk assessment (SERA 1997, Page 4-1).
The toxicity of hexazinone to aquatic species is well-characterized. 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, which is also the most sensitive effect in experimental mammals. Only one study regarding amphibians was located, and it suggests that amphibians are less sensitive than fish or aquatic invertebrates to hexazinone.

Exposure Analysis
In the aquatic environment, exposure levels can be characterized simply as concentrations of hexazinone in water (SERA 1997, Page 4-14). With the proposed application of herbicide, there is limited to no potential for hexazinone to be transported into the Deschutes River. Aquatic species within the Deschutes River would not be exposed to the herbicide. There would be limited potential for amphibians to be exposed to hexazinone. 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
Affected Environment
The Deschutes River is adjacent to the northwest boundary of the Kelsey Planning Area. Within the planning 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[29], 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.

Hexazinone is persistent and mobile in soils and therefore could contaminate groundwater (Information Ventures, Inc. 1995). 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. Within the Kelsey Planning Area, movement of hexazinone through the soil profile is expected to be similar to that found in the demonstration project.

Alternative 1 (No Action)
Direct, Indirect, and Cumulative Effects
There would be no effects other than those described for the broader no action alternative.

[29] Approximately 15 inches annual precipitation (Larsen 1976)

Alternative 2 (Modified Proposed Action) and Alternative 3
Direct and Indirect Effects
No effects on water quality are expected with the proposed application of herbicide.

Surface ground water contamination is not expected to 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. After application there would be limited to no potential for the herbicide to come in contact with the river. This is due to the distance of the units from the river and the limited potential for herbicide to be transported by overland flow of water.

Groundwater contamination is not expected to occur. 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.

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

Soil
Affected Environment
Soil types in areas proposed for herbicide treatment were identified using the Deschutes National Forest Soil Resource Inventory (Larsen 1976). They include the following map units:
64, 65, 6B, 6J, LE, LG, LK, and LX. These soils are similar to those described in the Plantation Herbicide Environmental Assessment (USDA Forest Service 2000).

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. Others have volcanic ash directly over bedrock.

Water infiltration rate in these soil types is rapid[30]. Permeability is rapid[31] to very rapid[32] in the surface layers and rapid in subsurface layers. Organic matter contents in surface horizons ranges from 2 to 4 percent. Non of the soil types are considered sensitive as defined in the Deschutes LRMP, Appendix 14. Productivity on these soil types is generally moderate. Concern for reforestation includes frost, drought, and competition with brush, grasses, sedges.

Alternative 1 – No Action
Direct, Indirect, and Cumulative Effects
There would be no effects other than those described for the broader no action alternative.

Alternative 2 (Modified 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).

The following information on soil effects is excerpted from the Plantation Herbicide Environmental Assessment (USDA Forest Service 2000a):
Hexazinone is broken down primarily by soil microorganisms and may also be degraded by light. Degradation rates for hexazinone depend on temperature and precipitation as well as soil type. According to the label, hexazinone is expected to degrade to one-half its concentration in one to six months. Soil sampling data collected in the Herbicide Grass Control

[30] Rapid Infiltration: water rarely ponds, enters soil surface very rapidly (Larsen, 1976).
[31] Rapid Permeability: water or air moves in and through the soil material at a rate of 5 to 20 inches/hour (Larsen, 1976)
[32] Very Rapid Permeability: water or air moves in and through the soil material at a rate greater than 20 inches/hour (Larsen, 1976)

Demonstration Project, Deschutes National Forest, confirmed that hexazinone was decomposing at this rate on soil types and under climatic conditions in the analysis area.

Absorption of hexazinone by the soil varies by soil texture from immobile to intermediate as classified by the Environmental Protection Agency. The coarse textured soils associated with proposed treatment areas can be expected to result in intermediate absorption. Absorption by the soil affects that movement of the chemical in the soil. Sampling was done in the Herbicide Grass Control Demonstration Project, Deschutes NF, to see if the hexazinone was moving down into lower soil layers over time. Based on the results, chemical residues of hexazinone did not appear to be moving into lower soil layers one year after application.

Rainfall is necessary for hexazinone to move from the ground surface into the soil. Although hexazinone is highly soluble in water, accumulation of this herbicide in overland or subsurface flows would be minimal. 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, as well as 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.

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

Air Quality

Alternative 1 (No Action)
Direct, Indirect, and Cumulative Effects
There would be no effects other than those described for the broader no action alternative.

Alternative 2 (Modified Proposed Action) and Alternative 3
Direct, Indirect, and Cumulative Effects
No effects on air quality are expected as a result the application of hexazinone. Hexazinone does not evaporate easily (Information Ventures, Inc. 1995). The burning of hexazinone-treated wood does not create additional toxic byproducts (compared to the burning of untreated wood) (Information Ventures, Inc. 1995).

Monitoring

Monitoring Item 1: Effectiveness of Treatment
Monitoring Type: Effectiveness. 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 1-2 years of vegetation treatment. As needed following that until plantation is certified as reforested.
Responsible Individual: Silviculture operations (Reforestation Forester or Technician)

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APPENDIX G

HYDROLOGY
RIPARIAN HABITAT CONSERVATION AREA (RHCA)

RIPARIAN HABITAT CONSERVATION AREA WIDTH STANDARDS

The entire planning area follows the Forest Plan standards and guidelines and interim widths for RHCAs. RHCA standard widths are applied based on the category of stream as defined by INFISH. Interim widths that apply to the planning area are:

- Category 1 areas (fish-bearing streams) will consist of an 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 an 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 an 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. The area from the edges of the stream channel, wetland, landslide, or landslide-prone area shall be the distance equal to the height of one-half site potential tree, or 50 feet slope distance, whichever is greater.
- In non-forested rangeland ecosystems, the interim RHCA width for permanently flowing streams is the extent of the 100-year floodplain.

Riparian Management Goals and Objectives (RMOs): RMO, 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. Water quality, to a degree that provides for stable and productive riparian and aquatic ecosystems;

1. Stream channel integrity, channel processes, and the sediment regime (including the elements of timing, volume, and character of sediment input and transport) under which the riparian and aquatic ecosystems developed;
2. Instream flows to support healthy riparian and aquatic habitats, the stability and effective function 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:
    a. Provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems;
    b. Provide adequate summer and winter thermal regulation within the riparian and aquatic zones;
    c. Help achieve rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed.
6. Riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved with the specific geo-climatic region; and
7. Habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

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.

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