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Environmental Impact Statement
Draft

Deadlog Vegetation Management Project

Bend/Ft. Rock Ranger District, Deschutes National Forest
Deschutes County, Oregon

Legal: Township 22S Range 15E and Township 23S Ranges 14E and 15E
Willamette Meridian

Ponderosa Pine

Draft Environmental Impact Statement

Deschutes National Forest

Deschutes County, Oregon

Lead Agency: **USDA Forest Service**

Responsible Official: **John Allen, Forest Supervisor, Deschutes National Forest,**

For Information Contact: **Terry Craigg, Project Leader**
1230 N.E. 3rd St., Suite A-262
Bend, OR 97701
(541) 548-7749

Abstract: This Draft Environmental Impact Statement (DEIS) contains the Forest Service's proposal to implement treatments that would reduce the risk of high intensity, stand replacement wildfire and the risk of heavy tree mortality from insects and disease. The project units are located within an approximately 16,055 acre project area of Deschutes National Forest Lands within Deschutes County, Oregon. The project area is located approximately 35 miles southeast of the city of Bend. This project proposes to treat areas that will promote and sustain late and old structured forest stands, reduce susceptibility to bark beetles and dwarf mistletoe infestation, and reduce fuel loading within the Deadlog planning area. Three alternatives were analyzed in this DEIS, a no action alternative and two action alternatives. Approximately 10,752 acres would be treated under Alternative 2 (Proposed Action) and approximately 11,281 would be treated under Alternative 3. Alternative 3 is the preferred alternative.

Comments: This DEIS is made available for a 45-day Comment Period, under the provisions of the National Environmental Policy Act (40 CFR 1500-1508), and Notice, Comment, and Appeal Procedures for National Forest System Projects and Activities, (36 CFR 215). The Forest Service will accept comments as provided in §215.6(a)(4), beginning on the day following the date of publication of the Notice of Availability (NOA) in the Federal Register. The official comment period timelines will be posted in the Federal Register, and on the Deschutes and Ochoco National Forests' Web site http://www.fs.fed.us/r6/centraloregon/projects/units/bendrock/index.shtml.

Mail Comments to: **John Allen, Forest Supervisor**
c/o Shane Jeffries, District Ranger
1230 N.E. 3rd St., Suite A-262
Bend, OR 97701

E-mail Comments to: **comments-pacificnorthwest-deschutes-bend-ftrock@fs.fed.us**

Fax: **541-383-4700**

Important Notice: Comments received in response to this solicitation, including names and addresses of those who comment, will be considered part of the public record on this proposed action and will be available for public inspection. Comments submitted anonymously will be accepted and considered; however, those who only comment anonymously will not have standing to appeal the subsequent decision under 36 CFR Part 215. Reviewers must provide the Forest Service with their comments during the review period of this Draft Environmental Impact Statement. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewer's position and contentions. Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement. City of Angoon, v. Hodel (9th Circuit, 1986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the draft environmental impact statement should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Reader's Guide

This Draft Environmental Impact Statement (DEIS) contains information about a project proposal that will create forest conditions that: restore or maintain fire-dependent ecosystems and move toward Historic Range of Variability (HRV), and maintain the forest in a healthy condition as anticipated in the Deschutes National Forest Land and Resource Management Plan (LRMP).

The information in this DEIS is organized to facilitate consideration of the environmental effects by the public, and by the Forest Supervisor of the Deschutes National Forest who is responsible for deciding whether or not to implement the Proposed Action or another alternative considered for this proposal.

Understanding the structure of this document is important to an overall understanding of the information required in an Environmental Impact Statement (EIS). The following provides an overview of the components of this document.

Executive Summary: The summary of the DEIS provides a concise overview of the Purpose and Need for action, Key Issues that were determined from scoping, and a comparison of three alternatives.

Table of Contents: A table of contents is presented at the beginning of the document. Lists of tables and figures are also included.

Chapter 1 – Purpose and Need: Chapter 1 describes the Purpose and Need for the proposal, and the Proposed Action. It includes Management Direction for the project, and the Decision Framework. Public Involvement and the Issues generated by public comments are also discussed.

Chapter 2 – Alternatives: Chapter 2 includes a description of the developed alternatives, and a discussion regarding any potential alternative that was considered but eliminated from detailed analysis. The focus of this chapter is Alternatives Considered in Detail, including the No Action (Alternative 1), the Proposed Action (Alternative 2), developed by the Forest Service that drove analysis for this project, and Alternative 3, developed by the Forest Service following public scoping. Alternative 3 was developed after consideration of all public comments, including field trips with interested organizations, and further review and internal discussion by Forest Service specialists. Alternative 3 responds to the issue of the need for more fuels reduction and the economic concern regarding cable logging. Resource Protection Measures that would reduce impacts to resources are documented in this chapter. This section includes a summary of data and a comparison of alternatives considered in detail, in a table format.

Chapter 3 – The Affected Environment and Environmental Consequences: Chapter 3 describes current physical, biological, and social and economic environments within the area of influence of the proposed activities. This current information provides the baseline for assessing and comparing the potential impacts of the alternatives. In addition, this chapter provides a comprehensive scientific and analytical comparison of the potential environmental impacts of the action alternatives to the No Action Alternative and the effects that would occur with no Forest activities proposed in this EIS. In order to facilitate comparison of the information that is provided, this chapter is organized and subdivided into resource disciplines in a manner appropriate to the affected environment for this area.

Chapter 4 – List of Preparers and Coordination: Chapter 4 lists the individuals, Federal, State and local agencies and tribes that the Forest Service consulted during the development of this DEIS. It also discloses the distribution of the document including Federal Agencies, federally recognized tribes, State and local governments and organizations representing a wide range of views. The references, glossary, and index are also included in this chapter.

Appendices: The appendices provide more detailed information to support the analyses presented in Chapter 3 of this DEIS.

Appendix A – Displays tables of units proposed in Alternative 2 (Proposed Action) and Alternative 3.

Appendix B – Soils: Displays tables of units with the percent of soil disturbance, current and post-activity.

Appendix C – Fire and Fuels: Displays tables of units with the type of fuel reduction activity.

Appendix D – Forest Plan Consistency provides resource tables that display project consistency with Standards and Guides.

Additional documentation, including more detailed analyses of project area resources, may be found in the project planning record located at the Bend/Ft. Rock Ranger District in Bend, Oregon.

FREQUENTLY USED ACRONYMS

ABSPC	After Burning Precommercial Thinning
BA	Basal Area
BA	Biological Assessment
BE	Biological Evaluation
BLM	Bureau of Land Management
BMP	Best Management Practices
CCF	Hundred Cubic Feet
CEQ	Council on Environmental Quality
CF	Cubic Feet
CFR	Code of Federal Regulations
CT	Condition and Trend
CWD	Coarse Woody Debris
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
DEQ	Oregon Department of Environmental Quality
DMTR	Dwarf Mistletoe Rating
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1973
FEID	Idaho Fescue
FEIS	Final Environmental Impact Statement
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
GBA	Growth Basal Area
GIS	Geographic Information Systems
GPS	Global Positioning System
GTR	Green Tree Replacement
HOR	Overstory Removal
HP	Handpile
HPSB	High Priority Shorebirds
HSV	Commercial Salvage
HRV	Historical Range of Variability
HTH	Commercial Thin
IU	Implementation Unit
LFR	Ladder Fuels Reduction
LOS	Late and Old Structure
LRMP	Deschutes National Forest Land and Resource Management Plan (1990)
MBF	Thousand Board Feet
MIIH	May Impact Individuals or Habitat but Will Not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species
MIS	Management Indicator Species
MM	Mitigation Measure
MMBF	Million Board Feet
MP	Mechanical Pile
MPP	Maximum Population Potential
MR	Management Requirement
MST	Mechanical Shrub Treatment
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act

NLAA	May Affect, but Not Likely to Adversely Affect
NOI	Notice of Intent
ODFW	Oregon Department of Fish and Wildlife
OGMA	Old Growth Management Area
PAG	Plant Association Group
PDC	Project Design Criteria from the 2006-2009 Programmatic Biological Assessment
PUTR	Antelope Bitterbrush
ROD	Record of Decision
S&G	Standard and Guide
SDI	Stand Density Index
SPC	Pre-commercial Thin
TES	Threatened, Endangered and Sensitive
TPA	Trees per Acre
UB	Underburn
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
WRHU	Winter Range Habitat Unit

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EXECUTIVE SUMMARY

This section is a brief summary of the contents of the Draft Environmental Impact Statement (DEIS) in accordance with 40 CFR 1502.12.

INTRODUCTION

The Responsible Official of this DEIS proposes to implement treatments that would reduce the risk of high intensity, stand replacement wildfire and the risk of heavy tree mortality from insects and disease. The project units are located across approximately 16,055 acres of Deschutes National Forest Lands within Deschutes County, Oregon. The project area is located approximately 35 miles southeast of the city of Bend. Refer to Figure 1, page 7. This project proposes to treat areas that will promote and sustain late and old structured forest stands, reduce susceptibility to bark beetles and dwarf mistletoe infestation, and reduce fuel loading within the Deadlog planning area.

BACKGROUND

The project area is located approximately 35 miles southeast of Bend, Oregon. The area is primarily accessed by Forest Roads 22 and 23. Elevations range from approximately 4,800 feet to 6,260 feet. Precipitation is relatively low. and supports xeric plant communities including ponderosa pine, lodgepole pine, and mountain shrub communities including bitterbrush, sagebrush, mountain mahogany, green manzanita, ceanothus, and mixed associations. Topography is variable with the primary feature being Quartz Mountain which has a series of ridges radiating from a central area of higher elevation. Other prominent terrain features include Sixteen Butte, Deadlog Butte, Dry Butte, Roger’s Butte, and the No Name Buttes.

The Deadlog area is dominated by ponderosa pine plant associations, but also includes about 3,000 acres of lodgepole pine plant associations. Large diameter ponderosa pine trees older than 160 years and having old tree characteristics are common on the Deadlog landscape. Brush is common in the understory and usually comprised of bitterbrush or ceanothus and manzanita.

Most ponderosa pine stands in the project area have a well-established understory of young ponderosa pine and lodgepole pine trees. These stands currently are sustaining a higher density of understory trees than they would historically. This higher density of understory trees increases the demand for limited resources like availability of limited water. This in turn places a stress on trees and increases their susceptibility to bark beetle mortality. Large diameter trees are unable to compete with the younger, more vigorous trees for available resources.

Ponderosa pine forest are well adapted to frequent low intensity surface fire. Young ponderosa pines have an outer corky bark that helps them resist the heat from light intensity surface fires. The bark of mature ponderosa pine is thick and exfoliates or sloughs off helping to protect the tree cambium tissue. Ponderosa pines also have deep roots that are protected from fire and a crown structure that allows dissipation of heat during a fire. While these forest are well adapted to frequent low intensity surface fire the conditions for this type of fire no longer exist due to decades of fire suppression. Increases in the numbers of understory trees and brush combined with a high degree of buildup of natural debris on the forest floor provide fuels, including ladder fuels that contribute to an increasing risk of high intensity wildfire.

DESIRED FUTURE CONDITIONS

Actions proposed for this project are intended to move the project area toward the desired future condition. Forest health treatments would reduce stand densities to discourage infestation by bark beetles. Forest treatments would also slow the rate of spread of dwarf mistletoe. Forest thinning associated with these treatments would enhance the health and growth of existing large trees as well as the development of future large trees that will contribute to late and old forest structure. Thinning and furl treatments would also reduce forest fuels in areas where fuel models indicate a high to moderate risk for stand replacement fire.

PURPOSE AND NEED

There is a need to reduce the density of forest vegetation to reduce the risk of high intensity, widespread disturbance events, such as insects, disease, and wildfire that could lead to large-scale loss of forested habitat.

As with many areas on the Deschutes National Forest, forest density has increased and species composition has changed with the forest becoming more at risk to and less resistant to wildfire. Other areas nearby have exhibited high intensity wildfire with little subsequent successful reforestation.

Many forest stands in the project area are sustaining a higher density of understory trees than would have historically occurred. These stands are susceptible to substantial bark beetle mortality. Large diameter trees are unable to compete with the younger, more vigorous trees for available resources. Also, understory trees and brush combined with a high degree of buildup of natural fuels on the forest floor are contributing to the risk of uncharacteristically severe fire behavior, should a wildfire start in the planning area. The Forest Plan (as amended) supports proactive maintenance and enhancing the vigor of the forest in preventing a stand replacement event from occurring (4-36).

There is a need to contribute to the local and regional economies by providing timber and other wood fiber products and associated jobs. The Forest Plan (as amended) supports management of timber resources and recognizes the value in a way that is consistent with other resource objectives, environmental constraints, and economic efficiency (4-37).

PUBLIC INVOLVEMENT

On April 4, 2008 the Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) to document and disclose the potential environmental effects of proposed thinning and fuels reduction treatments appeared in the Federal Register (Volume 73, No. 66, April 4, 2008, pages 18493-18494).

Public involvement and collaboration has occurred throughout the National Environmental Policy Act (NEPA) process. The project has been included in the Schedule of Proposed Actions distributed by the Deschutes and Ochoco National Forests since the April 2008.

The proposal for this project was presented in a scoping letter that was sent to approximately 170 individuals, organizations, tribes and other agencies. It summarized the Purpose and Need for the proposal, introduced the Proposed Action, and invited interested parties to submit written, facsimile, or electronic comments. The scoping letter was also placed on the Forest website for wider distribution.

Through early public involvement and collaboration, potential issues have been discussed and a third alternative developed to address key issues. Field trips and discussion with some of those voicing their concerns have occurred on several occasions.

KEY ISSUES

The following issues were identified through public scoping and internal evaluation and are studied in detail in this EIS and used to compare the alternatives. These issues are discussed in Chapter 1. These issues also led to the development of Alternative 3.

Shelterwood Harvest / Overstory Removal: Some members of the public expressed concerns with doing shelterwood or overstory removal type treatments. A description of shelterwood harvest and overstory removal is provided in Chapter 2.

Cable Logging: There is a concern with the economics of doing cable logging, as well as the need for road reconstruction and temporary road construction that it would require.

Biomass Utilization within Plantations*:* Older plantations (approximately 40 years) would be thinned, producing substantial amounts of biomass that would not be of sawlog size. There may be an opportunity to utilize this material; the tradeoff would be the additional soil disturbance that would result from removal of this material.

Other Issues Analyzed: The DEIS also analyzes the effects of treatments to wildlife species and habitat, vegetation, soils, botany, range, cultural resources, scenery, recreation, and economics.

ALTERNATIVES

In addition to the No Action Alternative (Alternative 1) and the Proposed Action (Alternative 2), one additional action alternative, Alternative 3, was developed. Both Alternative 2 (Proposed Action) and Alternative 3, the Preferred Alternative, are designed to meet the Purpose and Need for the project addressing the buildup of fuels and insect and disease Forest health concerns. Alternative 3 would implement more fuels treatments on additional acres.

Alternative 1 (No Action): This alternative is legally required and provides the basis for comparison with the action alternatives. Under this alternative, there would be no change in current management direction or in the level of ongoing management activities. For example, road maintenance, hazard tree removal, fire suppression, and livestock grazing would continue whether or not this project is approved.

Alternative 2 (Proposed Action): This alternative was described in the Notice of Intent published in the Federal Register on April 4, 2008 and the scoping letter sent out for public review and comment on April 9, 2008. To achieve the objectives of the Purpose and Need, approximately 10,752 acres would be treated using a combination of project activities that include commercial thinning of trees up to 21” in diameter at breast height, non-commercial thinning of trees, lopping and scattering slash, pruning, hand piling and burning, underburning to reduce ground fuels, and mechanical shrub treatment (mowing). On slopes greater than 30 percent trees would be cable logged. Temporary roads and landings would be rehabilitated. Approximately 39 miles of Forest roads would be closed and left available for administrative use or would be decommissioned.

Alternative 3 (Preferred Alternative) – This alternative proposes to meet the same objectives as Alternative 2, but increases the number of acres to treat to approximately 11,271. To more fully meet the objectives and to address issues raised during scoping:

- The acreage was increased to provide more protection of areas from stand replacement fire;
- Areas proposed for thinning on steep slopes would not occur under this alternative because the economic efficiency of cable logging;
- Biomass utilization is proposed in this alternative.

FOREST PLAN AMENDMENT

Deer hiding cover: Within the Deadlog planning area, the existing deer hiding cover in summer range is approximately 18 percent, below the Forest Plan standards (WL-54) of 30 percent. A Forest Plan Amendment is proposed that would allow the hiding cover to be reduced to approximately 4.2 percent for each action alternative.

DECISION FRAMEWORK

The Forest Supervisor of the Deschutes National Forest is the official responsible for deciding the type and extent of management activities in the Deadlog project area. The responsible official can decide on several courses of action ranging from no action, to one of the action alternatives or combinations of treatment options. The responsible official will also identify which mitigation measures will apply to project implementation.

The responsible official will base his decision on review of the Final Environmental Impact Statement (FEIS) and consideration of the following factors: 1) How well the alternatives meet the purpose and need of the project; 2) How well the alternatives respond to the issues; 3) The likely environmental effects of the proposed fuels reduction, thinning, and connected actions; 4) If the purpose and need of the project can be adequately met without a Forest Plan amendment; and 5) Which is the most economical fully analyzed alternative that meets the purpose and need of the project.

CHAPTER 1

PURPOSE AND NEED

CHAPTER 1 – PURPOSE AND NEED

INTRODUCTION

The Deadlog planning area, 16,055 acres, is located in the southeastern part of the Bend/Ft. Rock Ranger District of the Deschutes National Forest, approximately 36 miles southeast of Bend, Oregon. Within the planning area are interesting geologic features including Sixteen, Rogers, and Deadlog Buttes and Quartz Mountain. The planning area is bounded by Forest Road 22 on the north and west, and Forest Road 23 on the east and south.

The legal description is:

- T 22 S, R 15 E, Sections 21, 22, 26-29, 31-36
- T 23 S, R 14 E, Sections 11-14
- T 23 S, R 15 E, Section 1-18

The planning area lies outside the range of the Northwest Forest Plan boundaries. As classified by the Deschutes National Forest Land and Resource Management Plan (1990), no inventoried (RARE II) roadless areas exist within the planning area, the nearest being approximately 12 miles to the northwest. There are no threatened or endangered species present within the planning area. There are no perennial or fish bearing streams, lakes, or other water bodies within the planning area.

This project proposes to treat areas that will promote and sustain late and old structured forest stands, reduce susceptibility to bark beetles and dwarf mistletoe infestation, and reduce fuel loading within the Deadlog planning area.

DESIRED CONDITION

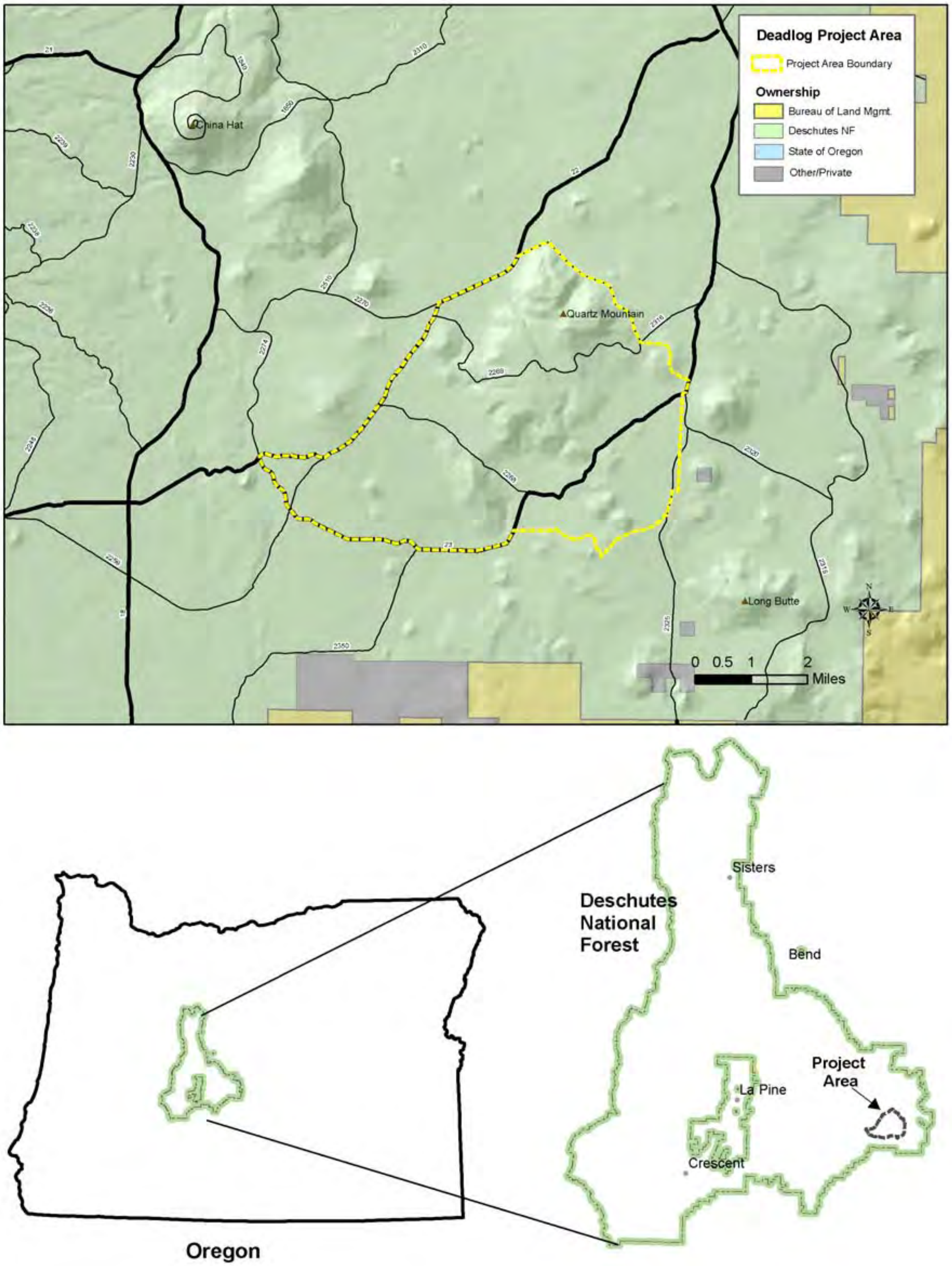
The desired condition is a healthy forest with a significant amount of late and old structured stands. Desired characteristics include:

- Stand densities that reduce tree susceptibility and mortality related to widespread insect infestations and dwarf mistletoe infections, while retaining a minor component these agents as a part of a healthy functioning ecosystem;
- Stand densities that encourage the development and maintenance of large diameter trees with spacing between trees to allow for openings between tree crowns;
- An arrangement of natural fuels such that in the event of a wildfire, the fire intensity and rate of spread would allow opportunities for either fire suppression or allowing low intensity fire to be utilized to maintain low levels of natural fuels, ground and ladder fuels.

The actions that are proposed for this project are intended to move the project area toward the desired condition. Forest health treatments would reduce stand density to discourage infestation by beetles and slow the rate of spread within areas that are infected with dwarf mistletoe. Forest thinning associated with these treatments would enhance the health and growth of existing large trees as well as the development of future large trees that will contribute to late and old forest structure.

Figure 1: Project Area Vicinity

EXISTING CONDITION



The Deadlog area is dominated by ponderosa pine plant associations, but also includes about 3,000 acres of lodgepole pine plant associations. Large diameter ponderosa pine trees older than 160 years and having old tree characteristics are common on the Deadlog landscape. Shrubs are common in the understory and usually comprised of bitterbrush or ceanothus and manzanita.

Most ponderosa pine stands in the project area have a well-established understory of young ponderosa pine and lodgepole pine trees. These stands currently are sustaining a higher density of understory trees than they would historically, and are susceptible to mountain pine beetle and western pine beetle mortality. Large diameter trees are unable to compete with the younger, more vigorous trees for available resources. In addition, understory trees and shrubs combined with a high degree of buildup of natural debris on the forest floor provide fuels, including ladder fuels, which contribute to the risk of a high intensity wildfire.

Figure 2: Ponderosa Pine Stand in the Deadlog Project Area

PURPOSE AND NEED FOR ACTION

As with many areas on the Deschutes National Forest, changes in forest dynamics have occurred within the Deadlog planning area landscape during the past 100 years. Although fire exclusion has been a primary factor in these changes, other management practices have contributed as well. As a result, forest density has increased and species composition has changed with the forest becoming more at risk to and less resistant to wildfire and insect and disease problems. Other areas nearby have exhibited high intensity wildfire with little subsequent successful reforestation, such as the Aspen Fire of 1959 (15,575 acres), that touches deadlog in the southeast part of the planning area. The goal of this proposed project is to move toward a more stable forest ecosystem by creating conditions that are resilient and resistant to disturbance.

The purpose and need for this project is to restore and maintain fire dependent ecosystems and maintain the forest in a healthy condition as directed by the Deschutes National Forest Land and

Resource Management Plan as amended. Treatments would promote and sustain late and old structured forest stands, reduce susceptibility to bark beetles and dwarf mistletoe infestation, and reduce fuel loading within the Deadlog planning area.

1. There is a need to reduce the density of forest vegetation to reduce the risk of high intensity, widespread disturbance events, such as insects, disease, and wildfire that could lead to large-scale loss of forested habitat.

   Many forest stands in the project area are sustaining a higher density of trees than would have historically occurred. Mountain pine beetle and western pine beetle historically impacted different stand types throughout the Deadlog planning area. Mountain pine beetle morality is common in over stocked lodgepole pine, ponderosa pine, and mixed species stands. Mortality has occurred in large and small older and younger trees. Western pine beetle typically attack areas of high density larger diameter ponderosa pine. Large diameter trees are unable to compete with the younger, more vigorous trees for available resources. Also, understory trees and brush combined with a high degree of buildup of natural fuels on the forest floor are contributing to the risk of uncharacteristically severe fire behavior, should a wildfire start in the planning area. The Forest Plan (as amended) supports proactive maintenance and enhancing the vigor of the forest in preventing a stand replacement event, rather than waiting (LRMP 4-36). The purpose of the project is to:

   - Manage stands of late old structure ponderosa pine to promote sustainability over the long term;
   - In dense stands dominated by ponderosa pine, return stands toward historic conditions addressing tree species composition, stocking levels and resistance to insects, disease and fire mortality;
   - Address stand conditions in both ponderosa pine and lodgepole pine to improve resistance and resilience to bark beetles and dwarf mistletoe;
   - Reduce fuels throughout the planning area, including surface and ladder fuels, to levels that will not sustain stand replacing fires;
2. There is a need to contribute to the local and regional economies by providing timber and other wood fiber products and associated jobs. The Forest Plan (as amended) supports management of timber resources and recognizes the value in a way that is consistent with other resource objectives, environmental constraints, and economic efficiency (LRMP 4-37).

PROPOSED ACTION

This is the alternative that was provided for comment during scoping in April 2008. Approximately 10,752 acres are proposed for treatment within the 16,055 acre planning area. The Forest Service proposes to employ overstory removal, shelterwood, commercial thinning harvests, small-diameter thinning, mowing, underburning and piling in different combinations across the planning area. Alternative 2 (Proposed Action) proposed activity areas and treatment types and activity summaries are explained in more detail in Chapter 2.

Wood fiber that is removed from units would be hauled offsite and utilized for: wood products, energy production, habitat improvements, or firewood. Fiber that remains, and is above the amount that is determined necessary for soil and wildlife objectives, would be piled and burned.

In mixed conifer and ponderosa pine stands, treatments are proposed to reduce the risk of surface fires moving into the upper canopy level and initiating crown fires or torching of individual trees. Live trees in the lower and middle layers would be targeted for removal. Thinning would preferentially leave fire resistant species. Additional reductions in stocking level would be achieved by thinning from below, targeting trees in the lower and middle layers for removal.

No permanent, system roads would be created. Road reconstruction and road work would be required to maintain acceptable conditions for hauling forest products. Temporary roads would be needed to access treatment areas and then would then be obliterated and rehabilitated following treatments.

The project would be implemented through a combination of service contracts, stewardship contracts, government account crews, timber sales and partnerships.

The management themes contained in the Eastside Screens and the Forest Plan that relate to this project may conflict with the Forest Plan goals for management of big game habitat. Forest Plan Standard and Guide (S&G) WL-54 (Forest Plan page 4-58) may not be met if the other management themes for this project are addressed. This S&G provides for deer hiding cover in summer range to "be present over at least 30 percent of National Forest land…" Presently cover is at 18 percent and would be reduced further within this project area. A Forest Plan amendment that addresses this S&G for big game hiding cover in summer range is proposed.

SCOPING AND PUBLIC INVOLVEMENT

The proposal for this project was presented to the public for comments during April 2008. A notice of intent to prepare an environmental impact statement was published in the Federal Register on April 4, 2008. Through early public involvement and collaboration, potential issues have been discussed and a third alternative developed. Alternative 3 is the result of key issues that were identified during the scoping process; these are provided in the next discussion under Identification of Issues. Field trips and discussion with those that voiced their concerns have occurred on several occasions.

Various Tribal groups and State and Federal Agencies have been contacted and include The Confederated Tribes of Warm Springs (Warm Springs, Oregon), The Burns Paiute Tribe (Burns, Oregon), and the Klamath Tribe (Chiloquin, Oregon). Federal and State Agencies contacted include the Oregon Department of Fish and Wildlife (ODFW) and the U.S. Fish and Wildlife Service (USFWS).

Several individuals or groups have expressed interest in this project. The Fire Learning Network (FLN), which is comprised of various groups and individuals, has been involved in a collaborative process through meetings and field trips.

IDENTIFICATION OF ISSUES

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

Many of the public comments have been used to focus the analysis in areas where the public desired a specific resource to be addressed. Some comments were used to formulate issues and to design alternative activities and mitigations. Many comments that did not change the alternatives and were noted to be important have been addressed in the analysis of the effects of actions. Internal Forest Service comments were also used in the development of alternatives and subsequent analysis. Some comments were used to explore alternatives that were not developed in detail.

Comments were placed into categories to help track issues and responses. The issues are categorized as Key Issues or Analysis Issues.

KEY ISSUES

Key issues represent a point of debate or concern that cannot be resolved without consideration of the trade-offs involved. These issues are the basis for the design of alternatives to the proposed action that provide a different path to achieve project objectives. Trade-offs can be more clearly understood by displaying the relative impacts of the alternatives weighed against the proposed action. Key Issues provide the primary focus for alternative development and comparison.

The following is a list of key issues related to the proposed action that have been identified.

- ***Key Issue #1: Shelterwood Harvest / Overstory Removal***

  Some members of the public expressed concerns with doing shelterwood and overstory removal harvest in lodgepole stands. Shelterwood is a regeneration harvest proposed in mature lodgepole stands that are susceptible to high mortality from mountain pine beetles. Overstory removal is proposed in lodgepole where the overstory is infected with mistletoe and is in poor condition. These types of treatments leave a simplified stand structure and public comments expressed a desire to have an alternative without these treatments. This issue is addressed with the design of an alternative that modifies these treatments. The indicators used to measure this issue will be:

  - Acres of regeneration harvest.
  - Acres of lodgepole pine at risk to mountain pine beetle mortality.

- ***Key Issue #2: Costs of Cable Logging and Associated Access***

  The Proposed Action includes 420 acres of cable yarding on steeper slopes. Cable logging smaller diameter trees may not be economically feasible in the units where this is proposed because of the cost of providing this type of harvest system - contractors would need to bring the equipment from the west side of the Cascade mountain range, as there are no equipment capable of cable logging on the east side of the Cascade mountains. Cable logging would also increase the amount of road reconstruction and temporary road construction required. This issue is addressed with the design of an alternative that eliminates commercial harvest activities in units that would require cable logging. Indicators used to measure this issue will be:

  - Total cost per CCF of cutting and removing timber.
  - Acres of ponderosa pine at higher risk of loss to insect and disease based on stand density.
  - Acres of cable logging.

- ***Key Issue #3: Biomass Utilization within Plantations***

  The proposed action calls for thinning in older plantations (approximately 40 years). This would produce substantial amounts of biomass that would not be of sawlog size. Under the proposed action, the material would be piled and burned. The potential for the utilization of the biomass that results from thinning could provide product that would benefit the local economy. Even though the market for biomass is not guaranteed, the interdisciplinary team developed an alternative that includes utilizing the material. This alternative would create more soil disturbance as a result of the removal of this material. The indicators used to measure this issue will be:

  - The amount (CCF – hundred cubic feet) of biomass that would be utilized.
  - Acres of detrimental soil impacts.
  - Tons of particulate emissions (PM10).

ANALYSIS ISSUES

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

Wildlife: The following items were analyzed and compared by alternative:
- Threatened, Endangered, Candidate and Sensitive Species
- Management Indicator Species
- Late and Old Structure Forest Habitat
- Late and Old Structure Connectivity
- Snags, Coarse Woody Material, and Green Tree Snag Replacements

Recreation: Proposed activities would provide for public safety for those utilizing dispersed areas of the project area. The EIS considers potential impacts to the recreational use.

Botany and Invasive Plants: Potential effects to Proposed, Endangered, Threatened, and Sensitive (PETS) plant species were considered and no PETS plants were found in the project area. Proposed management activities have the potential to spread invasive plants or create disturbed ground that could allow the introduction of invasive plants into areas that have not previously had a recent history of invasive plants.

Cultural Resources: Proposed activities may have an effect on cultural resources. Portions of the analysis area have been identified with cultural resource sites. Proposed ground-disturbing activities such as commercial harvest have been designed to avoid sites. Burning, thinning, and mowing would be conducted to avoid adverse effects.

Water Quality: There is no surface water in the project area, including 303(d) streams. The closest body of water is approximately 15 miles from the project area boundary.

PLANNING FRAMEWORK

Current Laws and Regulations

Development of this Environmental Assessment follows implementing regulations of the National Forest Management Act (NFMA); Title 36, Code of Federal Regulations, Part 219 (36 CFR 219); Council of Environmental Quality, Title 40; CFR, Parts 1500-1508, National Environmental Policy Act (NEPA). Federal and state laws, including the Forest and Rangeland Renewable Resources Act (RPA), The National Historic Preservation Act of 1966, Endangered Species Act, and Clean Air Act also guide this analysis. A list and brief explanation of applicable laws may be found in Appendix C of this DEIS.

National Fire Plan

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

Deschutes National Forest Land and Resource Management Plan (LRMP)

The LRMP, as amended by the Revised Continuation of Interim Managemnt Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (Eastside Screens 1995), guides all natural resource management activities and provides standards and guidelines for the Deschutes National Forest. The project area is entirely within the following management areas as identified in the LRMP (Refer to Figure 3, page 15):

- **General Forest (approximately 14,439 acres; LRMP MA-8, pages 4-117 through 4-120):** Within the General Forest MA, timber production is to be emphasized while providing forage production, visual quality, wildlife habitat, and recreational opportunities for public use and enjoyment. The objective is to continue to convert unmanaged stands to managed stands with the aim of having stands in a variety of age classes with all stands utilizing the site growth potential (Forest Plan, page 4-117).
- **Old Growth (approximately 938 acres; LRMP MA-15, 4-149 through 4-151):** Old Growth Management areas are intended to provide naturally-evolved old growth forest ecosystems for (1) habitat for plant and animal species associated with old growth forest ecosystems, (2) representations of landscape ecology, (3) public enjoyment of large, old tree environments, and (4) the needs of the public from an aesthetic spiritual sense. They will also contribute to the biodiversity of the Forest (Forest Plan, page 4-149).
- **Deer Habitat (approximately 587 acres; LRMP MA-6, pages 4-113 through 4-116):** The goal of the Deer Habitat management area is to manage vegetation in order to provide optimum habitat conditions on deer winter and transition ranges, while providing some domestic livestock forage, wood products, visual quality, and recreation opportunities (Forest Plan, page 4-113).
- **Scenic Views (approximately 91 acres; LRMP MA-9, pages 4-121 through 4-131):** The project area contains a small amount of foreground and middleground scenic views. The goal of scenic views management areas is to provide high quality scenery representing the natural character of central Oregon. Landscapes seen from selected travel routes and use areas are to be managed to maintain or enhance their appearance. To the casual observer, results of activities either will not be evident, or will be visually subordinate to the natural landscape (Forest Plan, page 4-121).

Table 1: Deadlog Forest Plan Management Areas

Management Area Description	Acres
General Forest	14,439
Old Growth	938
Deer Habitat	587
Scenic View Partial Retention Middleground	57
Scenic View Partial Retention Foreground	34
Total	**16,055**

Revised Continuation of Interim Management Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (Eastside Screens)

The project area lies east of the spotted owl range, and is subject to this amendment, also known as the Eastside Screens. This amendment was the result of a large-scale planning effort to determine the best approach for maintaining future options concerning wildlife habitat associated with late and old structural stages, fish habitat, and old forest abundance. The Eastside Screens contain guidelines for management of timber sales in LOS relative to the Historic Range of Variability (HRV), wildlife corridors, snags, coarse woody debris, and goshawk management.

The Eastside Screens are not applicable to fish habitat for this project; there is no perennial streams or fish habitat present within the project area..

DECISION TO BE MADE

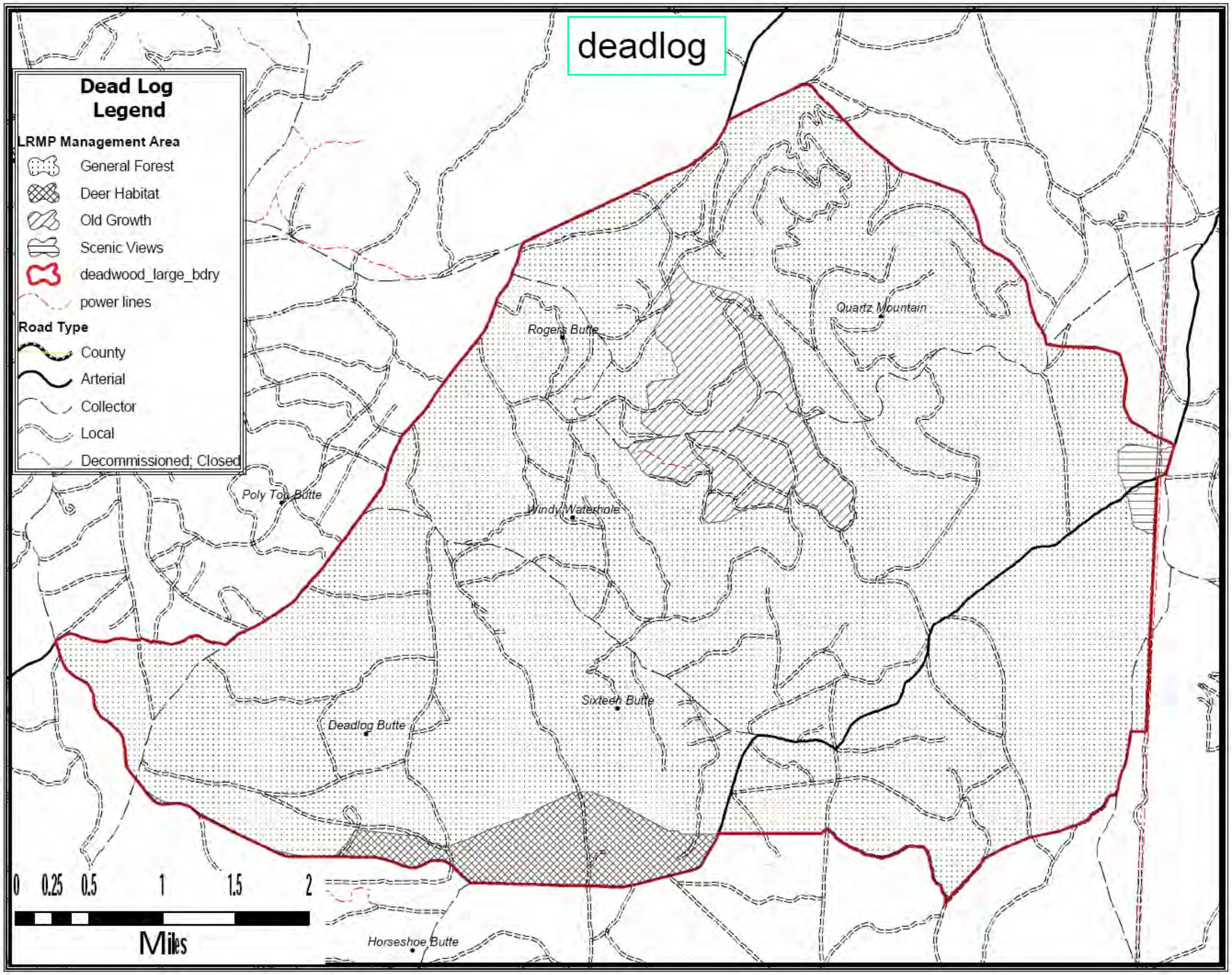
The Forest Supervisor of the Deschutes National Forest is the official responsible for deciding the type and extent of management activities in the Deadlog project area. The responsible official can decide on several courses of action ranging from no action, to one of the action alternatives or combinations of treatment options. The responsible official will also identify which mitigation measures will apply to project implementation.

The decision would determine if the LRMP would be amended so that proposed activities would be allowed to not only meet the Purpose and Need, but in doing so would allow big game hiding cover to be further reduced below the LRMP Standard and Guidelines.

The responsible official will consider the following factors in making his decision:

- How well the alternatives meet the purpose and need of the project;
- How the alternatives respond to the issues;
- The likely environmental effects of the proposed fuels reduction, thinning, and connected actions;
- If the purpose and need of the project can be adequately met without a Forest Plan amendment;
- And, which is the most economical fully analyzed alternative that meets the purpose and need of the project.

Figure 3: Deadlog LRMP Management Areas



CHAPTER 2

ALTERNATIVES

CHAPTER 2 – ALTERNATIVES

INTRODUCTION

This chapter describes and compares the developed alternatives. A description of each of the actions, or design elements of those actions is provided. Maps of each action alternative are also included. This chapter also discloses any alternative that may have been considered but not further developed because it would not meet the purpose and need.

At the end of the chapter, alternatives are presented in comparative form, defining the differences between each alternative and providing a clear basis for choice among options to the decision maker and the public. The information used to compare the alternatives is based upon the design of the alternative (such as unit location and treatment differences).

Precision of Information and Adjustments

Quantifiable measurements, such as acres and miles, and mapped unit boundaries used to describe the alternatives and effects are based on the best available information. The analysis presented in this document is based on consideration of the full extent of the acres, miles, and other quantities depicted in the alternatives. Information used in designing the alternatives was generated from a mix of field reconnaissance, aerial photos, satellite remote sensing, Global Positioning System (GPS) technology, Geographic Information Systems (GIS), and various resource-specific databases.

Adjustments have been made to the original proposal primarily based on additional site-specific information derived from ongoing field verification. Site-specific information is subject to change over time with any further information that could come forward.

DESCRIPTION OF PROPOSED ACTIVITIES

The Forest Service proposes to implement the following activities in order to meet project objectives: overstory removal, shelterwood, commercial thinning harvests, small diameter thinning, mowing shrubs, underburning and piling in different combinations across approximately 10,752 acres of the 16,055 acre planning area. The following is a brief description of the planned treatments:

- **Harvest Commercial Thin (HTH, Prescriptions 1-5, 8, 10)** is thinning of trees over 7 inches diameter at breast height (dbh) to reduce susceptibility to bark beetle outbreaks, stabilize dwarf mistletoe infections, reduce competition with larger, older trees, and decrease the continuity of crowns to reduce the likelihood of crown fires. Commercial thinning in the Deadlog project area would be a thinning from below which favors leaving the largest healthy ponderosa pine trees. The maximum diameter to cut is 21”.

- Within stands where the slope is less than 30 percent, commercial harvest will include cutting of trees with mechanical tracked harvester and removal with ground based logging systems. Within stands where the slope is more than 30 percent, commercial harvest would be accomplished with hand falling of trees and removal with cable logging systems (Alternative 2 – Proposed Action), which elevate at least one end of the logs removed. Landings where logs are de-limbed and sorted will be needed at a rate of one acre per ten to fifteen acres. Whole tree yarding will occur and down dead firm wood lodgepole will be removed. Average skid trails will be located 100 feet apart.

Logging systems will include temporary roads. Temporary roads are roads used to access further reaches of timber sale units to extract timber more efficiently. Temporary roads are built to low specification, just enough to get equipment into landings and are obliterated at the end of the timber sale activity.

- **Harvest Shelterwood (HSH, Prescription 7)** is planned in stands where natural regeneration of the stand is desired. Overstory trees left in a shelterwood harvest are intended to provide seed and some amelioration of heat and frost for natural regeneration. Within the Deadlog project area, shelterwood harvest is proposed in lodgepole stands. Due to large numbers of mature trees these stands are susceptible to mountain pine beetle outbreaks that would result in high tree mortality.

- **Harvest Overstory Removal (HOR, Prescription 6)** is planned on areas that are intended to be single story stands but currently have an understory of saplings or seedlings. In the Deadlog project area, overstory removal is proposed in lodgepole pine stands where the overstory is infected with mistletoe and is in poor condition. Removing the mistletoe infected over story trees will allow the understory saplings and seedlings to grow without being infected by mistletoe that would falling from infected overstory trees.

- **Harvest Salvage (HSV)** is planned in areas where down and dead lodgepole pine has been killed by mountain pine beetle. the removal of down firm wood lodgepole pine in excess of wildlife and soil productivity standards. In the Deadlog project area salvage is proposed in areas where amounts of down wood exceed the amount needed for wildlife and soil productivity.

- **Precommercial Thin (SPC, Prescription 20)** is used in two different situations. One is in regeneration stands which are now stocked with saplings. The second situation is in stands where there is an overstory and an understory that competes with the overstory. These stands also act as ladder fuels in the event of a wildfire. Precommercial thinning in the Deadlog area will be used in both these situations. Within plantations which were planted two to three decades ago the stocking of the trees is at a level where there is inter-tree competition which is causing reduced growth and self-pruning of lower branches. These stands also would not likely survive a light underburn or wild fire due to the lower tree densities and wide spatial arrangement of other fuels including brush. Thinning in these stands would leave trees on 16 to 25 foot spacing in order to increase growth. This would be followed-up with fuel treatments that would also increase the chance of these managed stands surviving fires.

  In the Deadlog project precommercial thinning would also be used to manage the understory in over stocked stands that have multi-canopy characteristics. Thinning treatments would reduce competition and leave the biggest trees on a 20 to 30 foot spacing. In stands where underburning is planned, burning may occur prior to thinning. Trees that are killed by the underburn would then be removed thus reducing the chance of killing desired trees following the thinning treatment.

Biomass Removal (BIOMASS, Prescription 9) is planned in some of the action alternatives. This will be done in plantations with large enough material for utilization and in commercial harvest units where less than commercial size material occurs and could be removed in conjunction with the commercial harvest. Biomass removal will use similar technologies as ground based logging except for landings which will not sort logs but will chip onsite the material for removal. Within commercial harvest units including commercial thinning, overstory removal and shelterwood the logging infrastructure of skid trails, temporary roads and landings will be the same. Within plantations landings and skid trails will be required. Temporary roads will not likely be required since all plantations currently are accessed by system roads. In some instances units in which biomass has been removed may still require treatment of the remaining fuels to reduce the risk of fire to an acceptable level.

Whip Falling (Prescription 20) is planned in shelterwood harvest units. Following a shelterwood harvest whip falling would remove non-merchantable trees that are undesirable due to disease or poor condition including small crowns, bole damage or very poor growth. Whip falling treatments also remove trees that have been suppressed for long periods of time that are unlikely to respond to reduced stand density following the removal of overstory trees.

- **Underburning (UB, Prescription 20)** consists of burning natural fuels and slash in forest stands, and is accomplished during specific weather conditions in order to minimize tree mortality. Underburning would occur as a sole treatment and in combination with other treatments.

  Prescribed fire treatments will need to be maintained over time to manage natural fuels to levels which are conducive to low intensity surface fire. The need for maintenance treatments will be based on fuels accumulations. It is anticipated that prescribed fire units will need additional treatments 3 years to 10 years following the initial prescribed fire treatment. Maintenance treatments will focus primarily on reducing natural fuels in the 0.0 to 3.0 inch dbh size classes and reducing the amount of understory seedlings and saplings.

  A published photo series guide with pictures showing different levels of fuel loading will be used to determine optimum natural fuel loadings for different land allocations (Maxwell 1980). In Deer Winter Range optimum natural fuel loadings will be guided by photo series 8PP4 and 3PP3. General Forest fuel loadings will be guided by photo series 3PP3 and 2PP3. The Old Growth Area fuel loadings will be guided by photo series 5PP4 and 8PP4.

- **Mechanical Shrub Treatment (MST, Prescription 20)** consists of mowing brush in and around ponderosa pine stands. On flatter ground a rubber tired tractor equipped with a rotary mower will be utilized for MST treatments. Slopes over 20 percent will require a light tracked machine with a front mounted mow deck in order to access the steeper slopes. The targeted brush species are bitterbrush and manzanita. Brush is mowed to a height of 8 inches and may occur on up to 70 to 80 percent of the area within units.

- **Piling (Pile, Prescription 20)** – Two types of slash piling are proposed:
  - **Hand Piling (HP)** consists of piling natural fuels and activity created fuels by hand. Completed pile dimensions will be approximately 6’ long by 6’ wide by 5’ in height. The amount of piles per acre will fluctuate along with fuel loadings and are expected to occur at a rate of 18 to 24 piles per acre. Piles will be burned in the late fall or winter season when moisture levels prevent fire spreading to surrounding areas.
  - **Machine Piling (MP)** consists of piling natural fuels and activity created fuels utilizing a Grapple Machine. Pretreatment fuel loading will generally be greater than 16 tons per acre where machine piling occurs and completed pile dimensions will be approximately 12 feet long by 12 feet wide by 8 feet in height and will occur at a rate of 6 to 10 piles per acre. Piles will be burned in the late fall or winter season when moisture levels prevent fire spreading to surrounding areas.

- **Ladder Fuel Reduction (LFR, Prescription 20)**
    - **Thinning** involves mechanically cutting understory trees 7 inch dbh and less at a predetermined spacing. The desired residual stocking of trees less than 7 inch dbh varies and is dependant on the overall stand density and structure. LFR treatments are designed to reduce ladder fuels, thus reducing the potential for crown fire initiation.
    - **Lop and Scatter** typically occurs in light thinning slash where prescribed fire will be used as a final fuels treatment. Lopping consists of cutting the limbs off of thinned trees rearranging the fuel bed to 15 inches or less off the ground. Lopped slash located beneath residual trees will be manually scattered out from below tree canopies to ensure low fire intensities in these areas during prescribed fire operations.
    - **Pruning** removes the lower branches of trees and lifts the crown. This is done to reduce mistletoe infection levels and improve future wood quality.

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

METHODOLOGY FOR SELECTING FUELS TREATMENTS AREAS

Stands selected for fuels treatments have been identified as stands which, if treated, would bring the landscape back into a more frequent fire interval and stands which in their current fuels condition would not survive a wildfire. These stands were selected using the methodology of location and stand characteristics which would lend a stand to high mortality with a wildfire. The fuels characteristics assessed were surface fuels, ladder fuels and crown fuels. The fuels in that order affect the fire resistance for dry forests (Agee 2005). Many of these stands in order to facilitate the implementation of fuels treatments were identified as having a need to commercially reduce the stocking level of the stand in order to reduce crown and ladder fuels.

Fuel treatments are designed to produce the following:

- Flame lengths of 4 feet or less (Agee et al. 2000)
- Crown base height of 6 feet or greater (Agee et al. 2000)
- Crown bulk density of 0.037 kg/m³ or less (Sando and Wick, 1972)

The minimum crown base height needed varies depending on foliar moisture content. The crown bulk density at which crown fires will not initiate or spread is more difficult to define since it is more species specific, but current crown fire models use 0.0023 lbs per cubic foot (Carlton 2001). As a rough guide, this crown bulk density represents tree crowns that are just touching.

The Fire Behavior Prediction System Fuel Models most commonly associated with such low flame lengths are (Anderson 1982):

- 2 (timber or brush with grass understory),
- 5 (low brush)
- 8 (short needle conifer litter, light loading), and
- 9 (long needle conifer or hardwood litter).

ALTERNATIVE DESCRIPTIONS

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

ALTERNATIVE 1 (NO ACTION)

Alternative 1 is the No Action alternative. This alternative is required by law and serves as a baseline for comparison of the effects of all of the alternatives. Under Alternative 1, current management plans would continue to guide management. There would be no change in the level of ongoing management activities within the project area. All custodial activities such as road maintenance, law enforcement, and response to emergencies, including wildfire, would continue. No additional treatment would be implemented to accomplish project goals.

ALTERNATIVE 2 (PROPOSED ACTION)

This alternative was developed following pre-analysis within the planning area. Included in the pre-analysis was the use of Geographic Information Systems (GIS), fieldwork and surveys, and historical use of the area. The proposed action includes vegetation management activities across approximately 10,752 acres. Refer to Figure 2-1 for locations of Alternative 2 units. There have been minor adjustments to the proposed action since scoping. Primarily, the changes were with additional fuels reduction prescriptions in units proposed for underburning. Additionally, some unit boundaries were adjusted to utilize roads as boundaries. Approximately 14.8 miles of temporary road (Figure 7) would be needed for the removal of logs from the following commercially thinned and harvested units: 3, 4, 6, 9, 21-23, 29-31, 35, 38, 41, 43, 46, 47, 49, 52, 54, 59, 60, 63, 65, 66, 72, 80, 82-87, 91, 99, 106, 110, 117, 130, 132, 141, 143, 144, 147, 171, 174, 189, 192, and 206. These roads would be subsoiled following completion of harvest and associated activities

Table 2: Alternative 2 (Proposed Action) Acres of Treatment Type

Alternative 2 (Proposed Action): Treatments and Acres	
Harvest Type [1]	**Acres**
Overstory Removal (HOR)	157
Shelter Wood (HSH)	332
Commercial Thin (HTH)	6,430
Total Harvest Acres	**6,919**
Stand Improvement Type [2]	**Acres**
Precommercial Thinning (SPC)	7,985
Whipfell	458
Pruning	50
Total Stand Improvement Acres	**8,493**
Fuel Treatment Type [3]	**Acres [4]**
Lop Branches	765

Alternative 2 (Proposed Action): Treatments and Acres	
Harvest Type [1]	**Acres**
Hand Pile Slash and Burn	2,334
Machine Pile Slash and Burn	5,061
Mow Shrubs	5,874
Underburn	8,912

1. No fuels treatment on 688 acres. In addition, approximately 420 acres of skyline logging in commercial thin units is proposed on slopes greater than 30 percent
2. Timber Stand Improvement Type: Whipfell = in regeneration units to remove remaining non-merchantable trees; Pruning = removing lower limbs.
3 Fuel Treatment Type: Mow = mechanical mowing of shrubs; UB = burning under trees; Pile = piling slash; Burn = burning slash piles.
4. Harvest, stand improvement, and fuel treatments would be conducted and arranged in combinations across the project area. .

Figure 4: Deadlog Alternative 2 (Proposed Action) Harvest Units

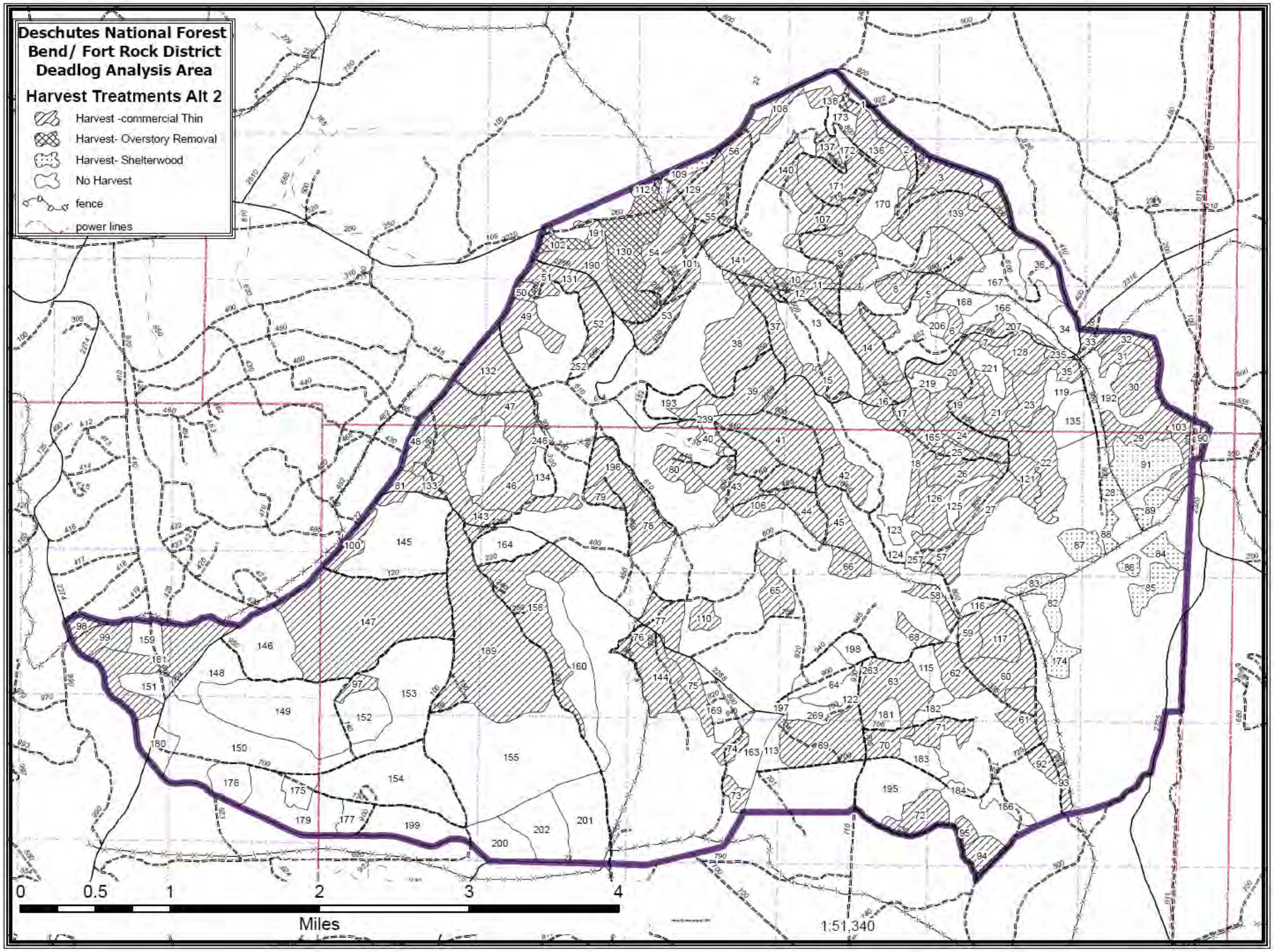


Figure 5: Deadlog Alternative 2 (Proposed Action) Fuels Treatment Units

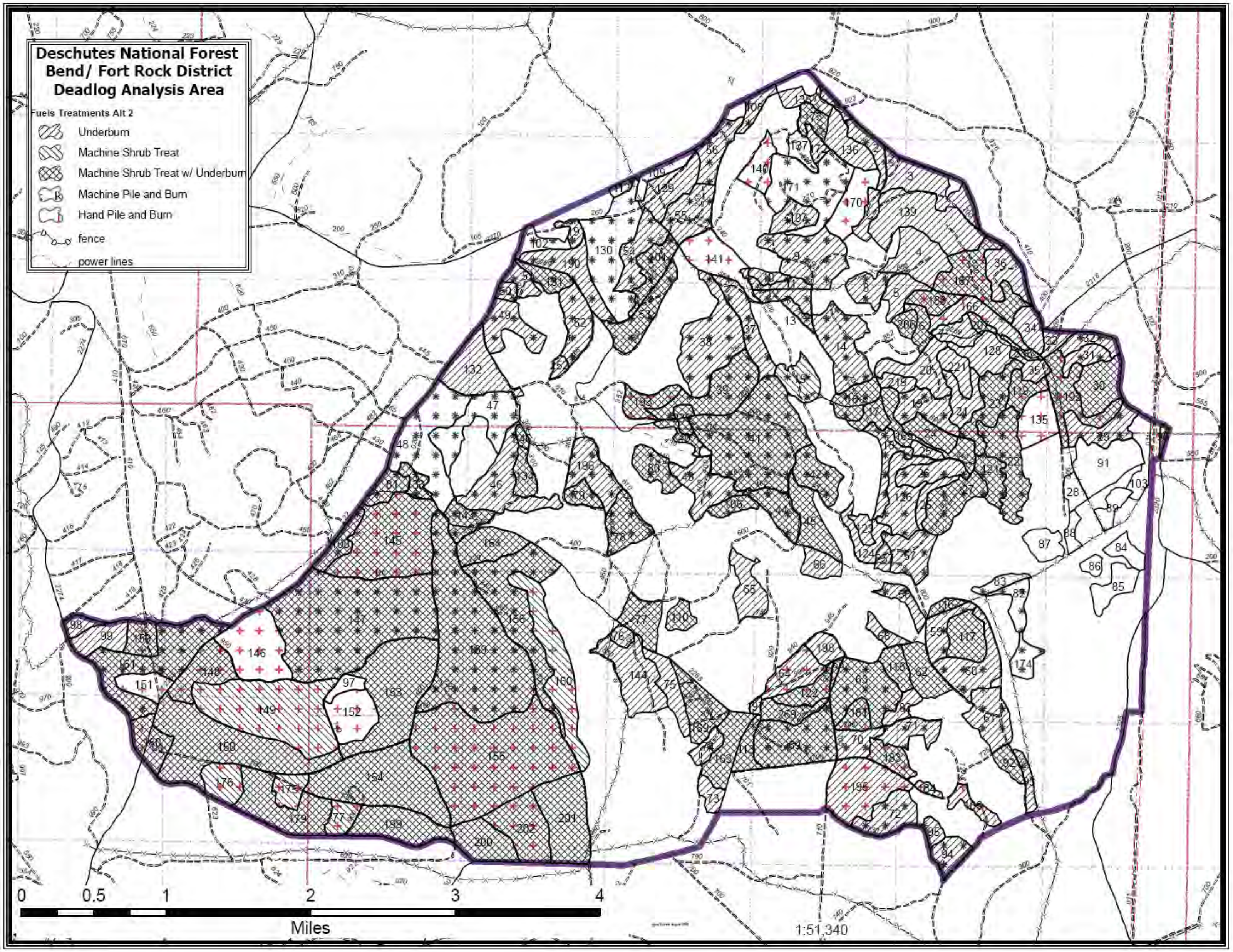


Figure 6: Deadlog - Alternative 2 (Proposed Action) Timber Stand Improvement (TSI)

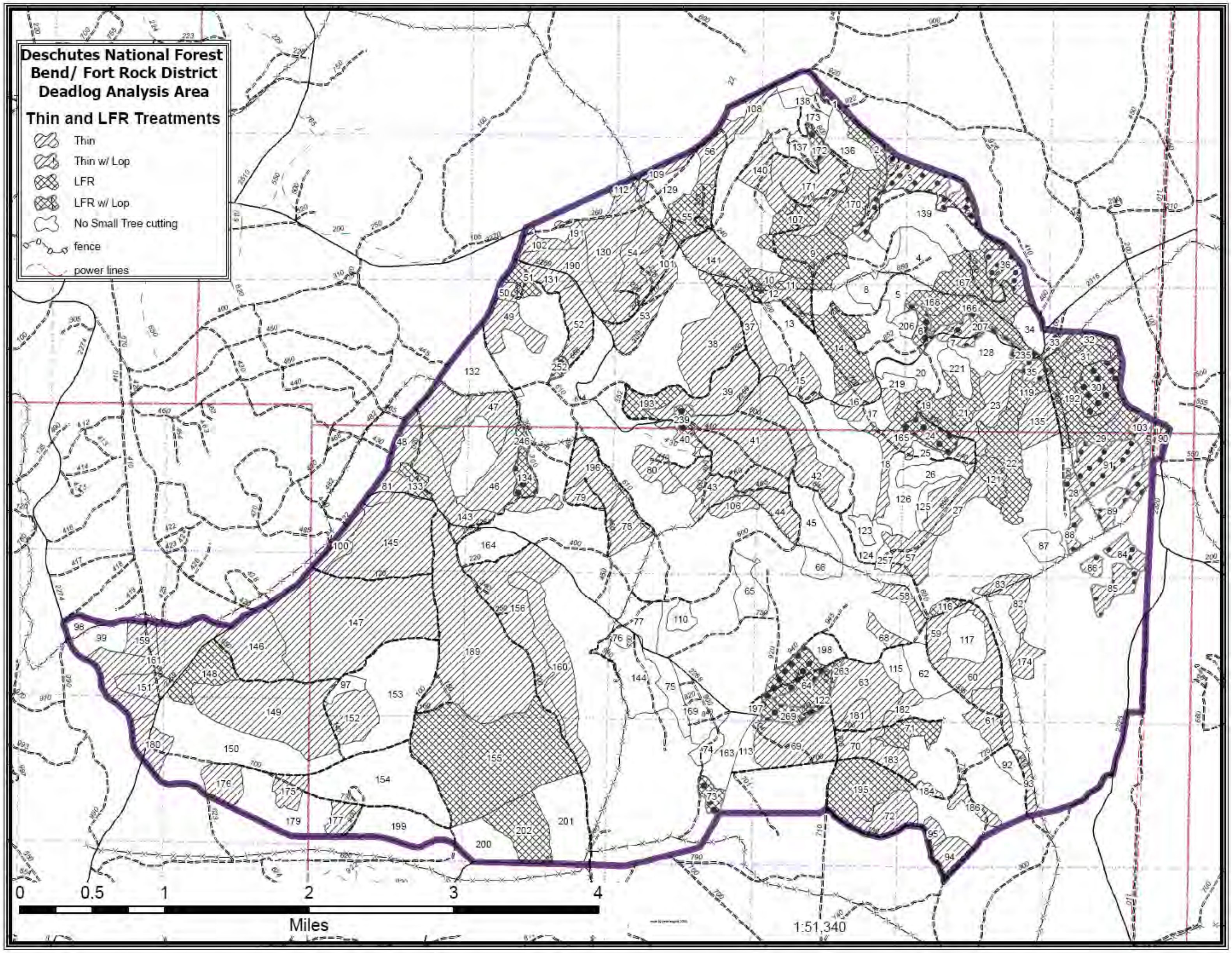
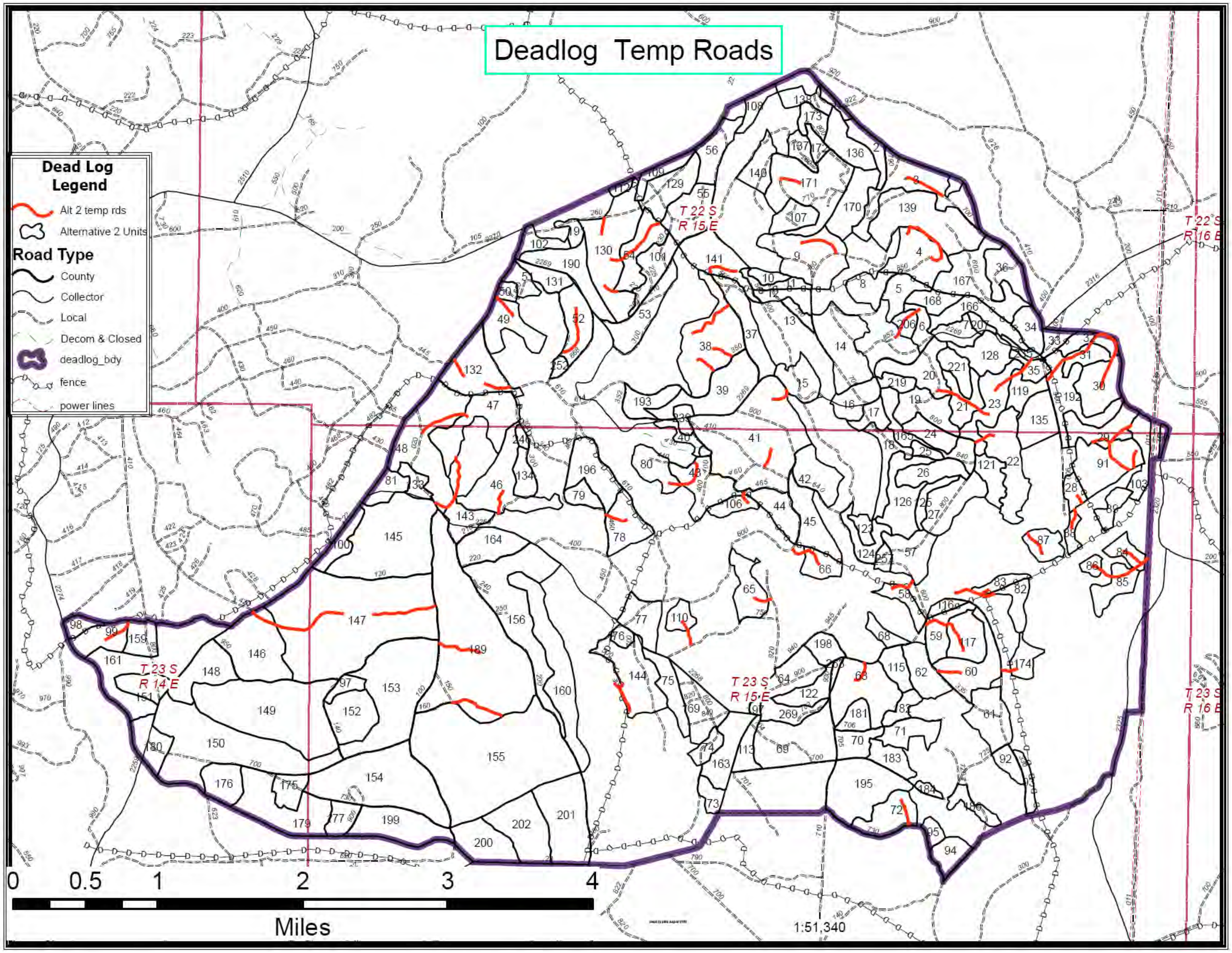


Figure 7: Deadlog Alternative 2 Temporary Road Placement



ALTERNATIVE 3 (PREFERRED ALTERNATIVE)

This alternative was developed to address the key issues as discussed in Chapter 1. Approximately 11,281 acres would be treated through various project activities.

Key Issue #1: Shelterwood Harvest / Overstory Removal: In this alternative, the shelterwood treatments are changed to commercial thinning.

Key Issue #2 Cable Logging & Access: Eliminates commercial harvest activities in 420 acres of units requiring cable logging; these units become fuels treatment only (136, 137, 138, 139, 140, 141, 144).

Key Issue #3: Biomass Utilization within Plantations: With this alternative, on 899 acres of plantation thinning and within 417 acres of commercial thinning units, the material would be removed for utilization, rather than being piled and burned.

Approximately 15.3 miles of temporary (Figure 11) road would be needed for the removal of logs from the following commercially thinned and harvested units: 3, 6, 9, 21-23, 29-31, 35, 38, 41, 43, 46, 47, 49, 52, 54, 59, 60, 63, 65, 66, 72, 80, 82-87, 91, 99, 106, 110, 117, 130, 132, 143, 147, 149, 152, 156, 160, 171, 174, 189, 192, and 206. These roads would be subsoiled following completion of harvest and associated activities.

Table 3: Alternative 3 Acres of Treatment Type

Alternative 3: Treatments and Acres	
Harvest Type	**Acres**
Overstory Removal (HOR)	157
Shelterwood (HSH)	0
Commercial Thin/Salvage (HTH/HSV)	592
Commercial Thin (HTH)	5,489
Commercial Thin (HTH)/Biomass	417
Biomass	899
Total Harvest Acres	**7,554**
Timber Stand Improvement Type [1]	**Acres**
Precommercial Thinning (SPC	8,586
Whipfell	535
Pruning	50
Total Stand Improvement Acres	**9,171**
Fuel Treatment Type [2]	**Acres [3]**
Lop Branches	928
Hand Pile Slash and Burn	1,691
Machine Pile Slash and Burn	6,114
Mow Shrubs	6,668
Underburn	9,443

1. Timber Stand Improvement Type: SPC = precommercial thin; ABSPC = precommercial thinning after burning; Whipfell = in regeneration units to remove remaining non-merchantable trees; Pruning = removing lower limbs.
2 Fuel Treatment Type: Mow = mechanical mowing of shrubs; UB = burning under trees; Pile = piling slash; Burn = burning slash piles.
3 Harvest, stand improvement, and fuel treatments would be conducted and arranged in combinations across the project area. No fuels treatment on 46 acres

Figure 8: Alternative 3 Harvest Units

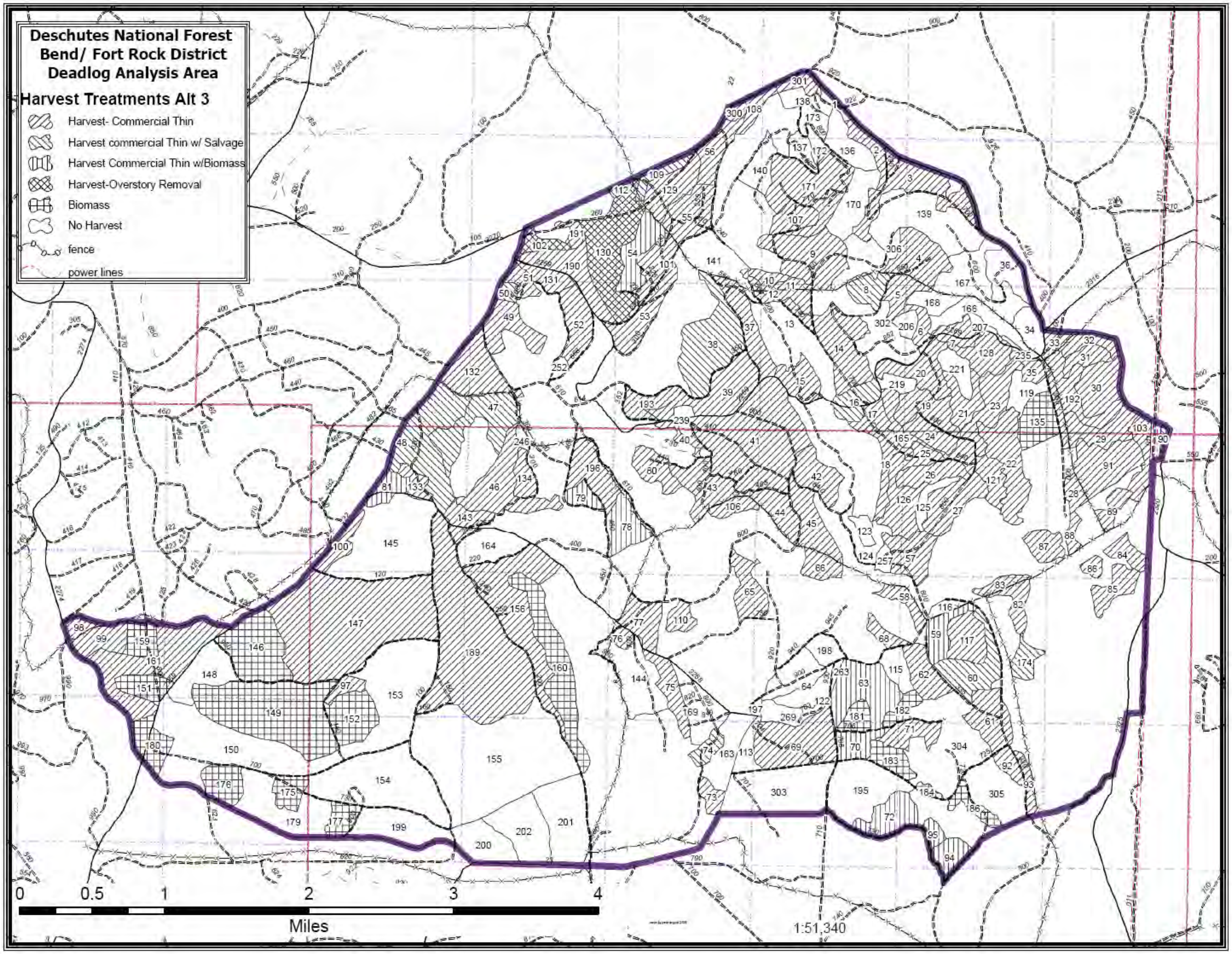


Figure 9: Alternative 3 Fuels Treatment Units

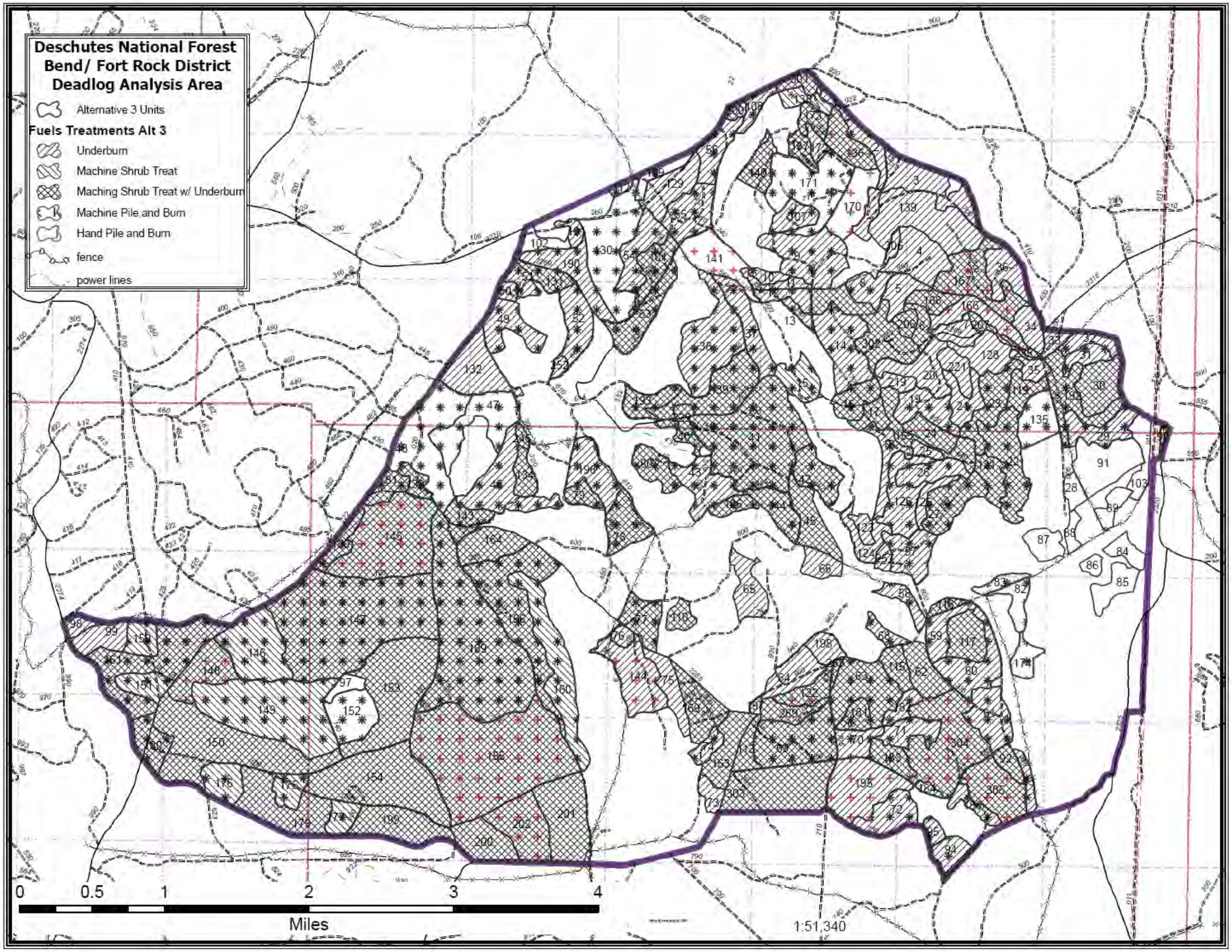


Figure 10: Deadlog - Alternative 3 Stand Improvement

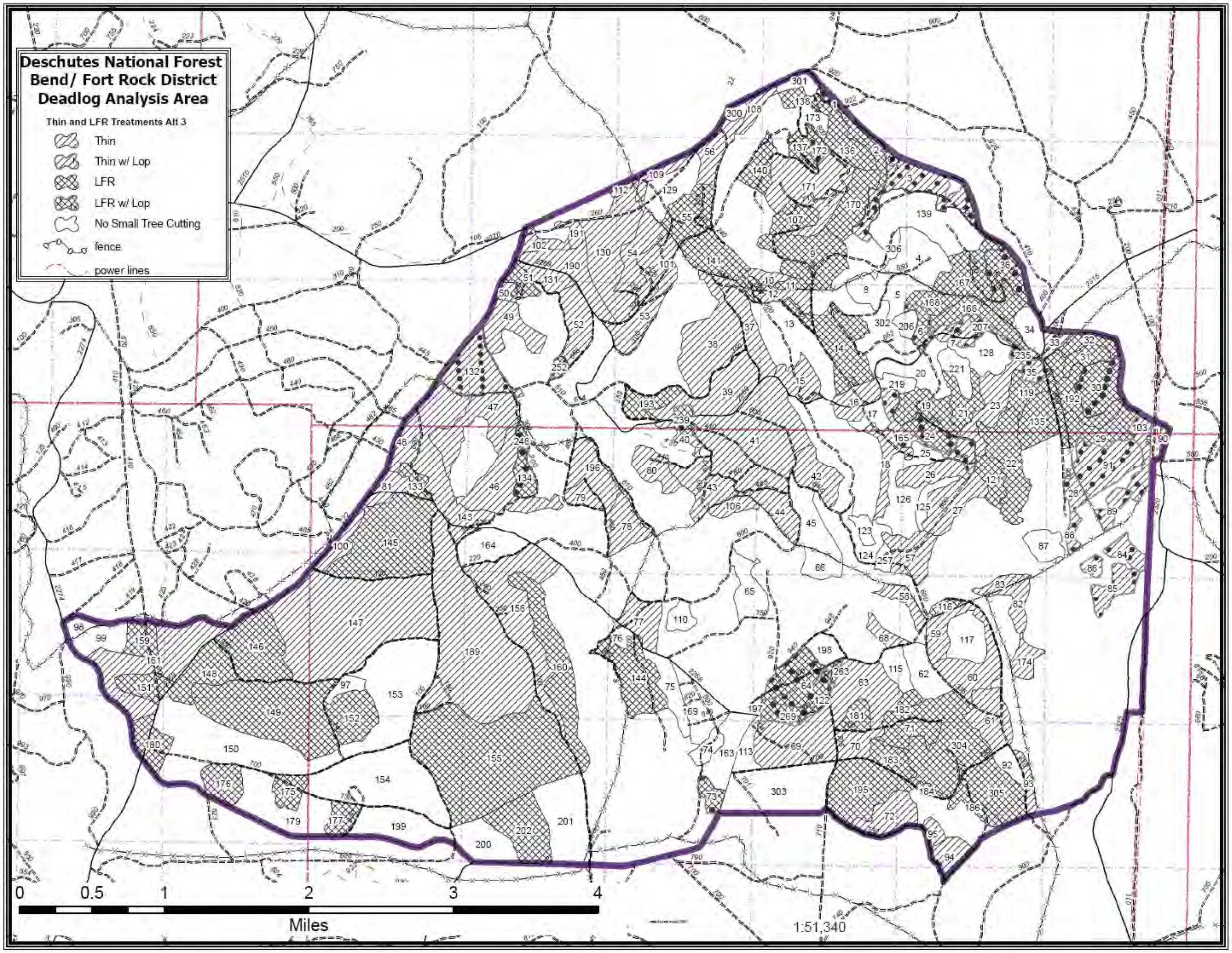
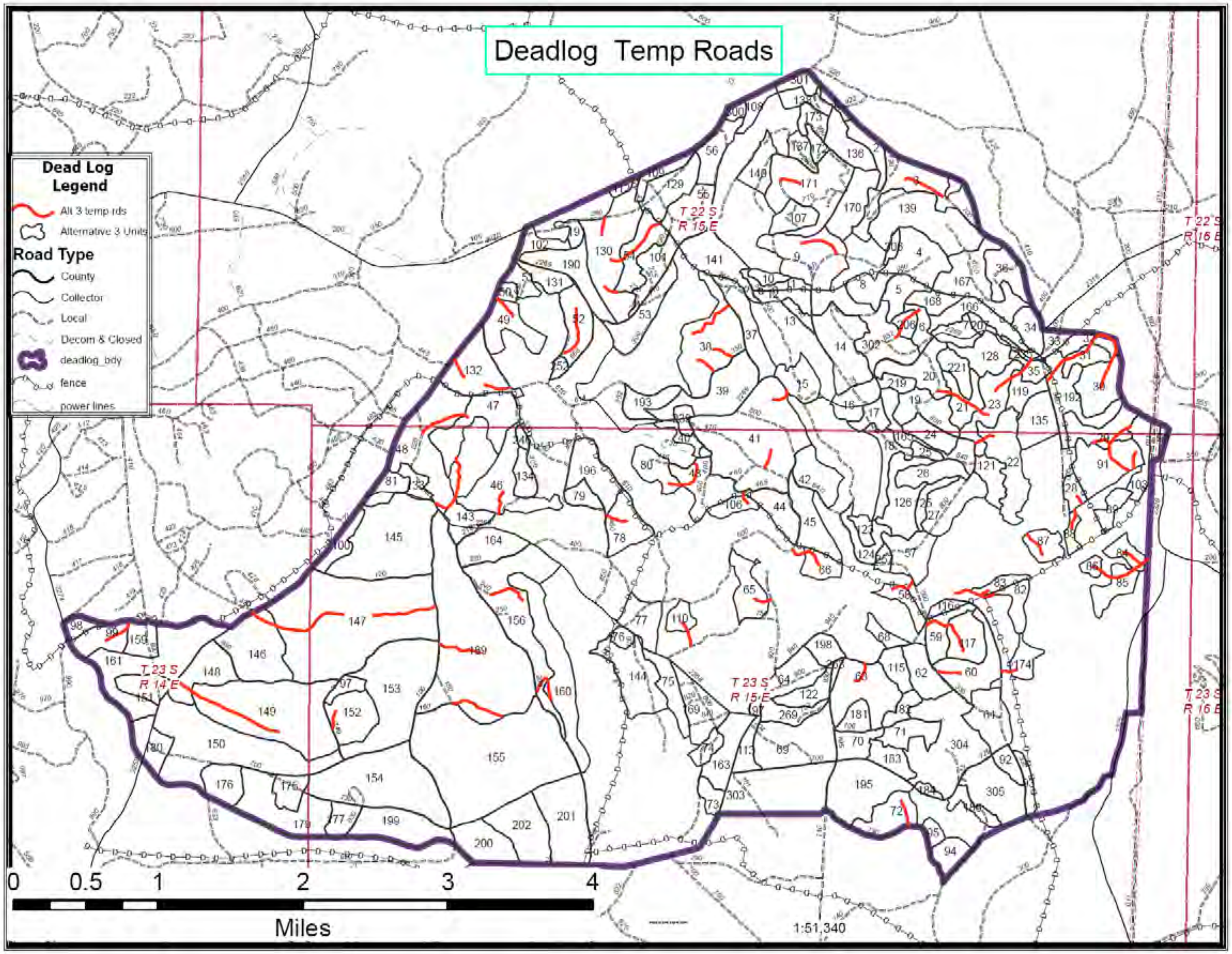


Figure 11: Deadlog Alternative 3 Temporary Road Placement



CONNECTED ACTIONS COMMON TO BOTH ACTION ALTERNATIVES

Connected actions are actions associated with other proposed activities. These activities would not occur unless the activities proposed in Alternative 2 (Proposed Action) or Alternative 3 occur. Road reconstruction and temporary road development would not occur unless commercial harvest activities would occur.

- **Openings:** Openings caused by treatment activities larger than 6 acres will be evaluated for planting. (**MR**).
  An area is considered an opening when:
  - It is wider than 250 feet
  - Stocking is less than a stand density index (SDI) of 36.5
    - 100 trees per acre for seedlings
    - 31-69 trees per acre with 7–11 inch dbh or 20 basal area for trees greater than 12 inches dbh (Deschutes National Forest 1991)

- **Stand Reentry:** To reduce the spread of mistletoe, 3 years following thinning and prescribed burning treatments, girdle remaining live infected trees that are greater than or equal to 21” dbh above gaps and smaller tree cohorts. Girdled trees would remain as snags. **(PDC)**

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

- **Road Reconstruction:** Approximately 3.0 miles of open Forest system roads would be reconstructed. Road reconstruction activities would include the restoration of drainage features, slope stabilization, guardrail replacement, applying spot surfacing, a multi-layer bituminous surface treatment, or resurfaced with crushed aggregate prior to hauling products from commercial harvest activities on identified roads.

- **Road Maintenance:** In addition to road reconstruction work, other roads that would be used for timber haul would require maintenance, primarily blading and shaping of the roadbed and brush removal. Some roads would require more extensive maintenance using engineering methods to protect natural resources. All activities would remain within the road prism and all affected areas would be restored upon project completion.

- **Road Closure and Decommissioning:** Table 4 and Table 5 display miles of Forest roads proposed for closure and decommissioning.

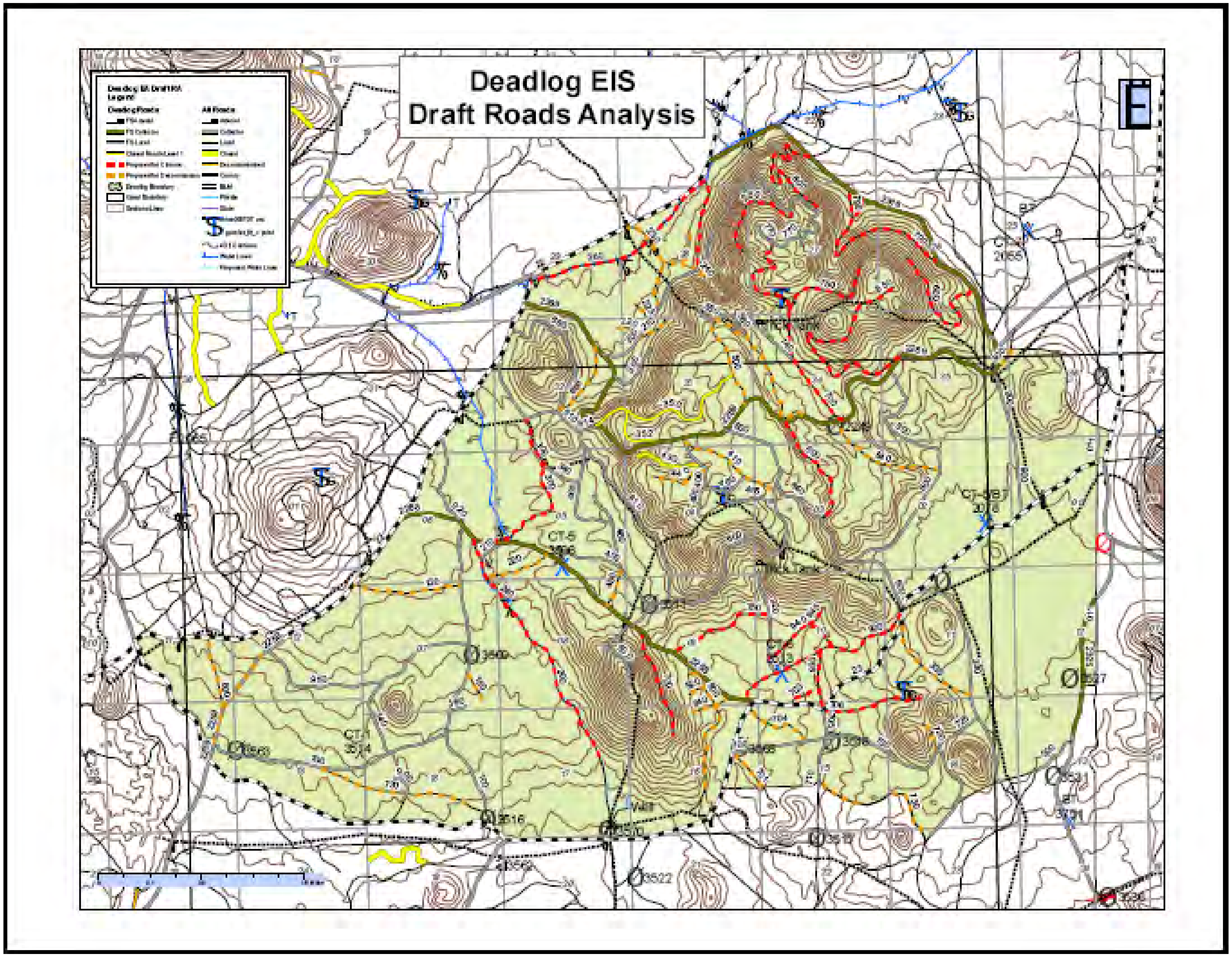
Table 4: Deadlog Forest Road Closure

Road Number	Road Closure (Miles)	Road Number	Road Closure (Miles)
2268200	2.710	2269850	2.000
2268300	1.330	2269852	0.061
2268668	0.600	2300705	0.230
2268700	0.910	2300706	0.910
2268750	0.930	2316600	1.160
2268920	0.500	2316700	1.520
2269260	1.190	2316790	0.200
2269280	0.840	2316800	1.400
2269750	0.930	**Total Miles**	**17.421**

Table 5: Deadlog Forest Road Decommissioning

Road Number	Road Decommissioning-(Miles)	Road Number	Road Decommissioning-(Miles)
2259000	1.100	2269230	0.400
2259730	1.360	2269240	0.141
2259800	0.590	2269255	0.270
2259950	1.080	2269260	1.330
2268020	0.550	2269410	0.840
2268120	0.950	2269440	0.490
2268150	0.200	2269460	0.420
2268220	0.570	2269560	0.200
2268450	0.380	2269600	0.950
2268800	1.300	2269840	1.000
2268810	0.101	2300701	0.570
2268820	0.130	2300703	0.190
2268900	1.840	2300704	0.680
2268920	0.055	2300720	0.270
2268930	0.470	2300730	0.585
2268940	0.300	2300300	0.380
2268945	0.265	2300335	0.810
2269210	0.300	**Total**	**21.487**
2269220	0.190		
2269225	0.230		

Figure 12: Deadlog Alternative 2 (Proposed Action) and Alternative 3 Proposed Road Closures and Decommissioning



FOREST PLAN AMENDMENT

Both action alternatives will require a non-significant Forest Plan Amendment to waive Standard and Guide WL-54, which requires that 30 percent of the National Forest System land within summer range of big game within each Implementation Unit (IU) be in hiding cover. Hiding cover is defined as a stand capable of hiding 90 percent of a standing adult deer from view of a human at a distance of 200 feet (Thomas 1979). Generally, this will result in 70 percent of each implementation unit existing either as a hiding area or within 600 feet of a hiding area. The calculation of cover excludes the acres of 50 to 80 year old ponderosa pine (aka black-bark pine) within each implementation unit as well as MA-7, which is addressed with a different standard and guideline.

Preliminary analysis determined that the cover standard WL-54 will not be met within the IUs (Table 6) because the three implementation units are currently short on big game hiding cover and the proposed thinning and underburning will further reduce the hiding cover ratio. Thinning will target densely stocked stands that, as expected, provide the hiding cover. The existing proportion of hiding cover within the Deadlog planning area is similar to the proportion in the IUs, at 11 percent. The Record of Decision for either action alternative would amend the Forest Plan, so that the WL-54 standard requiring 30 percent hiding cover in an IU would not apply to the Deadlog Project. Some mitigation through managing open road density and retaining 10 to 20 percent of units untreated is also included in both alternatives.

Table 6: Implementation Unit (IU) Hiding Cover Assessment outside of Black-bark Pine, MA-7, and Non-NFS Land.

Implementation Unit	Implementation Unit Analysis Acres	Implementation Unit Hiding Cover Acres	Implementation Unit Percent Hiding Cover
IU #62	10,602	1,920	18%
IU #63	6,919	759	10%
IU #69	3,037	425	13%
Totals	**20,558**	**3,104**	**15%**

RESOURCE PROTECTION MEASURES COMMON TO ACTION ALTERNATIVES

Resource Protection Measures are an integral part of each of the action alternatives. As such, they are considered when determining effects in Chapter 3. They fall into one or more of the following three categories.

- **Management Requirements (MR):** represent standard operating procedures that are required practices. Requirements are to comply with guidance provided typically by LRMP standards and guidelines, Best Management Practices (BMPs), State, Regional, and National direction.

- **Project Design Criteria (PDC):** Considered routine and have been used on similar projects and proven effective. These are not specifically required by LRMP direction, although they have previously been utilized to reduce or eliminate environmental concerns.

- **Mitigation Measures (MM)**: are site specific actions that could be taken to minimize, avoid or eliminate potentially significant impacts to resources affected by proposed activities, or rectifying the impact by restoring the affected environment (40 CFR 1508.02).

Mitigation Measures are generally unit-specific protection measures. They are rated as high, moderate, or low for effectiveness in preventing or reducing impacts, considering the following criteria: a) Literature and Research, b) Administrative Studies (local or within similar ecosystem), c) Experience (judgment of qualified personnel by education and/or experience, and d) Fact (obvious by reasoned, logical response).

High: Practice is highly effective (greater than 90 percent), meets one or more of the rating criteria, and documentation is available.

Moderate: Documentation shows that practice is 60 to 90 percent effective; or Logic indicates that practice is highly effective, but there is little or no documentation. The practice will be modified if necessary to achieve the mitigation objective.

Low: Effectiveness is unknown or unverified, and there is little or no documentation; or applied logic is uncertain and practice is estimated to be less than 60 percent effective. This practice is speculative and needs both effectiveness and validation monitoring.

The proposed action alternatives would comply with direction in relevant laws and policies, and the standards and guidelines in the Deschutes National Forest Land and Resource Management Plan as amended by the Eastside Screens. In addition, the Alternatives either comply with the Deschutes and Ochoco National Forests Programmatic Biological Assessment (2006 – 2009), or, if there are proposed deviations from the Biological Assessment, were reviewed by US Fish and Wildlife Service.

SMOKE MANAGEMENT

1. The Forest Service (USFS) is required by law to follow State air quality guidelines when conducting burning operations. The Oregon Smoke Management Plan and the Operational Guidance for the Oregon Smoke Management Program provides smoke management weather forecasts and instruction guidelines (Directive 1-4-1-601) as follows: Burning would be conducted under the State of Oregon Smoke Management System to track smoke and would be coordinated through Oregon Department of Forestry (**MR**).

FOREST VEGETATION

1. No trees greater than 21 inches dbh will be cut. (**MR**).
2. Openings caused by treatments within Late Old Structure (LOS) stands will not be planned to exceed 0.5 acre in size (Eastside Screens Scenario B-3) **(MR)**
3. To reduce potential for long-term growth loss and bark beetle induced mortality of ponderosa pine following proposed underburns, conduct burns in a manner that will result in retention of at least 40 percent live crown ratio on dominant and codominant trees. This should generally result in crown scorch less than 50 percent. **(PDC)**

WILDLIFE

Table 7: Summary of Operating Season Restrictions

Mitigation	O = Open Season; X = Closed Season											
	J	F	M	A	M	J	J	A	S	O	N	D
Goshawk	O	O	X	X	X	X	X	X	O	O	O	O
Cooper's Hawk	O	O	O	X	X	X	X	X	O	O	O	O
Sharp-Shinned Hawk	O	O	O	X	X	X	X	X	O	O	O	O
Golden Eagle	O	X	X	X	X	X	X	O	O	O	O	O
Red-Tailed Hawk	O	O	X	X	X	X	X	X	O	O	O	O

Big Game – Management Area 7 (Deer Habitat)

1. Limit the amount of annual prescribed burning treatments to no more than 338 acres per year in **Units 199, 200, 201, and 202** to meet the annual 2.0-2.5 percent limitation within Deer Habitat, MA7 (**MR**). The Forest has determined that this restriction applies to ODFW deer herd units (South Paulina).

Retention Areas

1. Provide 20 percent retention in non-black bark stands in the following **(Units: 10, 15, 22, 28, 39, 41, 47, 80, 82, 83, 84, 86, 88, 89, 97, 102, 109, 112, 191, 174)**. Retain 10 percent retention in all other stands. Retain cover in patches of 6 acres or larger or if advanced regen one-half acre or larger. Clumps of un-thinned forest in treated black bark stands of one-half acre or larger. (MR)

2. Maintain all remnant late and old seral and/or structural live trees >,= 21" dbh (note: proposed large tree girdling must be coordinated with wildlife to document the benefits); manipulate vegetative structure that does not meet late and old structure (LOS) conditions; maintain open, parklike stands where this condition occurred historically; manipulate vegetation in a manner to encourage the development and maintenance of large diameter, open canopy structure (keeping understory trees for future stands); and maintain connectivity (extensive detailed requirements including maintenance of minimum canopy levels). Reference corridor maps and silviculture report. **Note:** the corridors cross dozens of units, so it is imperative to address their protection and treatment during layout**,** marking, and implementation. This includes both silvicultural and fuels treatments**.**

3. Within the OGMA travel corridors, maintain where available all hiding cover up to 20 percent of the corridor in clumps from 0.25 to 0.5 acre, if overlapped by harvest or natural fuels units (PDC).

4. To prevent losing cover within retention areas, options will be coordinated during prescribed fire operations. Options include, but are not limited to: lining, burning in such a way to maintain cover, and avoidance.

5. Within the OGMA, larger patch sizes are preferable for the benefit of goshawk.**(Units: 15, 37-43, 53, 141, 193, 239**) (PDC)

6. Distribute retention patches across the unit and avoid skid trails, landings, roads, etc. Placement on slopes is acceptable provided that it has cover or the best available. Retention areas should be strategically located to retain desired wildlife habitat elements (such as unique

habitats, cover patches) and other resources (such as cultural heritage sites, or allotment improvements). (PDC)

7. Providing cover patches of at least 10 acres at nest sites will meet the direction for sharp-shinned hawk and 15 acres will meet the direction for Cooper’s hawk within General Forest allocations **(Units 40, 43, 139)**. (MR).

Shrub Habitat and Special or Unique Habitats

1. Avoid burning mature shrubs in the ecotone between the forest habitat and adjacent rock outcrops or cliffs (PDC). (**Units 77, 117, 124, 170, 304, 305** or where encountered). All notable rock outcrops or cliffs within or adjacent to unit boundaries that have vertical height of 8 feet or more. Buffer them by a minimum of 50 feet.

2. Remove ponderosa pine from around mountain mahogany and do not burn through mountain mahogany patches **(Units 77, 117, 124, 170, 304, 305**). (**PDC**).

Snags, Logs, Down Wood, Green Tree Replacements

1. Retain **all** soft and hard snags (**MR**), except where snags must be felled for temporary and Maintenance Level 1 roads, log landings, or occupational safety. Protect large snags and logs (greater than or equal to 20 inches dbh) from prescribed fire by avoiding ignition within 50 feet of a snag or lining around it. Avoid direct ignition of smaller size classes.

2. Maintain, where available, logs and down wood at the prescribed minimum levels. Reference Table 53, page 133in the Wildlife Report for levels which are specific for both ponderosa pine and lodgepole pine habitat types. (**MR**)

3. Within lodgepole regeneration units (**Units: 28, 82-89, 91, 102, 109, 112, 130, 174**) retain green tree replacements for future snag and log recruitment as follows: 24 per acre with a minimum diameter of 10 inches dbh. Coordinate layout with wildlife biologist (**MR**).

4. Where monitoring shows that down logs and wood are below the minimum requirements retain available slash piles of 100 square feet or slash concentrations covering 200 square feet. (**MR**).

5. Create snags where needed to mitigate losses from treatment activities, leaving live replacement trees in groups preferred. GTRs must meet the 100 percent maximum population potential level in the long-term at levels specified by DecAID for the forest type. All units.

Road Management

1. Restrict logging operations and other management activities on administratively closed roads during the Fox Butte Cooperative Travel Management period (i.e. Green Dot closures) for deer (Entire project area). (**PDC**).

2. Temporary road placement will avoid goshawk, sharp-shinned hawk and Cooper’s hawk nest sites **(Units 1, 138, 301, 40, 43, 139)**. **(MR).**

Raptors

1. Goshawk habitat: Potentially disturbing activities (e.g. equipment operation, log trucks, chain saws etc.) near known or discovered raptor nests (0.25 mile radius) must observe the seasonal restrictions (3/1-8/31) within habitat (430 acres) and disturbance protection of active nests (As needed if found). There is one site located adjacent to project boundary **(Site affects Units 1, 138, 301)**. The nest core area is partially within project (30 acres) will require protection. The post-fledgling area (PFA) (400 acres) is located outside project area. No temp road construction through sites. (**MR**).

2. Cooper's hawk habitat: Potentially disturbing activities (e.g. equipment operation, log trucks, chain saws etc.) near known or discovered raptor nests (0.25 mile radius) must observe the seasonal restrictions (4/1-8/31) within habitat (15 acres) and disturbance protection of active nests. There are two sites that affect **Units 40, 43 and 139**. No temp road construction thru sites. (**M**R)

3. Golden eagle and red-tailed hawk habitat: Potentially disturbing activities (e.g. equipment operation, log trucks, chain saws etc.) near known or discovered raptor nests (0.25 mile radius) must observe the seasonal restrictions (2/1-7/31 and 3/1-8/31 respectively) within habitat (300 acres) and disturbance protection of active nests (As needed if found). There are currently no known sites within the project area. (**MR**).

4. Sharp-shinned hawk habitat: Potentially disturbing activities (e.g. equipment operation, log trucks, chain saws etc.) near known or discovered raptor nests (0.25 mile radius) must observe the seasonal restrictions (4/1-8/31) within habitat (15 acres) and disturbance protection of active nests. There are currently no known sites within the project area. No temporary road construction through sites. (**MM**).

5. Minimize smoke that could impact documented active raptor nests. (**PDC**)

Wildlife Guzzlers

1. Protect the three guzzlers within the project boundary with a buffer of 100 feet where tree canopy and structure will be managed for complexity (birds) and for cover (deer and elk) **(Units 9, 43, 71, 304)** (**PDC** summer range, **MR** winter range).

SOILS

Management Requirements

Apply appropriate Best Management Practices (BMPs) to all ground-disturbing management activities, as described in General Water Quality BMPs (Pacific Northwest Region, 1988). Specific BMPs commonly used to minimize the effects of road systems, fuels and timber management activities on the soil resource are briefly described for this project proposal.

1. Use old landings and skidding networks whenever possible. Assure that water control structures are installed and maintained on skid trails that have gradients of 10 percent or more. Ensure erosion control structures are stabilized and working effectively (LRMP SL-1; Timber Management BMP T-16, T-18) (**Effectiveness**: *High*).

2. In all proposed activity areas, locations for new yarding and transportation systems would be designated prior to the logging operations. This includes temporary roads, spur roads, log

landings, and primary (main) skid trail networks. (LRMP SL-1 & SL-3; Timber Management BMP T-11, T-14 & T-16) (**Effectiveness**: *Moderate*).

3. *Surface Drainage on Temporary Roads* – minimize the erosive effects of concentrated water through the proper design and construction of temporary roads (Road BMP R-7) (**Effectiveness**: *Moderate*).

4. *Road Maintenance* – conduct regular preventive maintenance to avoid deterioration of the road surface and minimize the effects of soil erosion (Road BMP R-18, R-19) (**Effectiveness**: *Moderate to high*).

5. *Protect Soils during prescribed burn operations* – A burn plan addressing compliance with all applicable LRMP standards and guidelines and BMPs will be completed before the initiation of prescribed fire treatments in planned activity areas. Prescribed burn plans need to include soil moisture guidelines to minimize the risk of intense fire and adverse impacts to the soil resource (LRMP SL-1 & SL-3; Timber BMP T-2, T-3 & T-13; Fuels Management BMP F-2, F-3) (**Effectiveness**: *Moderate to high*).

6. *Coarse Woody Debris (CWD)/Down Wood* **-** Retain adequate supplies of coarse woody debris (greater than 3 inches in diameter) to provide organic matter reservoirs for nutrient cycling following the completion of all project activities (LRMP SL-1). It is recommended that a minimum of 5 to 10 tons per acre of CWD be retained on Ponderosa Pine sites, and 10 to 15 tons of CWD per acre should be retained on mixed conifer and lodgepole pine sites to help maintain long-term site productivity. These amounts are less than the recommended levels to be left for wildlife habitat objectives (**Effectiveness**: *Moderate*).

7. *Maintain duff layer* – Strive to maintain fine organic matter (organic materials less than 3 inches in diameter; commonly referred to as the duff layer) over at least 65 percent of an activity area (pertains to both harvesting and post-harvest operations). If the potential natural plant community (i.e., site) is not capable of producing fine organic matter over 65 percent of the area, adjust minimum amounts to reflect potential vegetation site capabilities (LRMP SL-6; Fuels Management BMP F-2; Timber Management BMP T-13). (**Effectiveness**: *Moderate*).

Project Design Criteria

A. Minimize the extent of new soil disturbance from mechanical treatments by implementing appropriate design elements for avoiding or reducing detrimental soil impacts from project activities. Options include using some or all of the following:

1) Use existing log landings and skid trail networks (whenever possible) or designate locations for new skid trails and landings.

2) Maintain spacing of 100 to 150 feet for all primary (main) skid trail routes, except where converging at landings. Closer spacing due to complex terrain must be approved in advance by the Timber Sale Administrator. Main skid trails spaced 100 feet apart would limit soil impacts to 11 percent of the unit area. For the larger activity areas (greater than 40 acres) that can accommodate wider spacing distances, it is recommended that distance between main skid trials be increased to 150 feet to reduce the amount of detrimentally disturbed soil to 7 percent of the unit area (Froehlich, 1981, Garland, 1983). This would reduce the amount of surface

area where restoration treatments, such as subsoiling, would be required to mitigate impacts to achieve soil management objectives.

3) Restrict grapple skidders to designated areas (i.e., roads, landings, designated skid trails) at all times, and limit the amount of traffic from other specialized equipment off designated areas. The use of harvester machines will be authorized to make no more than two equipment passes on any site-specific area to accumulate materials.

4) Avoid equipment operations during times of the year when soils are extremely dry and subject to excessive soil displacement.

5) Avoid equipment operations during periods of high soil moisture, as evidenced by equipment tracks that sink deeper than during dry or frozen conditions.

6) Operate equipment over frozen ground or a sufficient amount of compacted snow to protect mineral soil. Equipment operations should be discontinued when frozen ground begins to thaw or when there is too little compacted snow and equipment begins to cause soil puddling damage (rutting).

7) Prevent additional soil impacts in random locations of activity areas, between skid trails and away from landings, by machine piling and burning logging slash on existing log landings and skid trails that already have detrimental soil conditions.

Objective: Reduce displacement and compaction damage to soils by limiting the amount of surface area covered by logging facilities, and limiting equipment operations to specified areas and ground conditions.

B. Restrict mechanical disturbance to existing roads and skid trails at all times on portions of activity areas that contain slopes greater than 30 percent. Prohibit any new development of temporary roads and/or designated skid trails on sensitive soils with steep slopes. Require operators to winch logs to skidders with at least 75 feet of bull line. Hand felled trees shall be directionally felled toward pre-approved skid trails, and the leading end of logs shall be suspended while skidding. Sustained slopes longer than 200 feet would be excluded from mechanized harvest. Exceptions for areas that make up less than 10 percent of an activity area would be subject to Forest Service approval.

The following activity areas are proposed for conventional ground-based logging and portions of these EIS Units contain slopes over 30 percent:

Alternative 2: EIS Units 4, 9, 117, 165 and 171.
Alternative 3: EIS Units 4, 9, 117, 152, 160, 165, 171 and 193.

Under Alternative 2, partial suspension of logs would be achieved through cable (skyline) yarding systems. Disturbed areas in skyline corridors shall be stabilized by applying appropriate erosion control treatments.

The following activity areas are proposed for cable (skyline) yarding: on slopes over 30 percent:

Alternative 2: EIS Units 136–141 and 144.

Objective: Reduce displacement and compaction damage to soils by limiting equipment operations to specified areas and ground conditions (**Effectiveness:** *High*).
Enforcement Mechanism: Timber Sale Contract

Basis: Forest Plan Standards and Guidelines (SL-1 and SL-3); Timber Management BMPs T-2, T-4, T-9, T-11 and T-12; Forest Service Soil and Water Conservation Practices Handbook (FSH 2509.22); Froehlich et al 1981; Clayton, 1990; Experience

C. Under Alternative 2, ensure that surface runoff from roads and landing areas is not directly channeled into skyline corridors within EIS Units 136-141 and 144. Stabilize disturbed areas within skyline corridors by any or all of the following treatments: water barring, check dams, or slash placement (various diameter classes) into areas of exposed mineral soil.

Objective: Reduce accelerated surface erosion and prevent rill and gully formations in disturbed areas of skyline corridors (**Effectiveness:** *Moderate*).

Enforcement Mechanism: Timber Sale Contract

Basis: Experience

Mitigation Measure

Reclaim specific segments of local system roads, all temporary roads, and some log landings and primary (main) skid trails by applying appropriate rehabilitation treatments in activity areas where detrimental soil conditions are expected to exceed the Regional Policy guidelines. Decommission (obliterate) logging facilities that will not be needed for future management. Options for mitigating the effects of project activities include the use of subsoiling equipment to loosen compacted soils on temporary roads and logging facilities, redistributing humus-enriched topsoil in areas of soil displacement damage, and pulling available slash and woody materials over the treated surface to establish effective ground cover protection.

Reclaim all temporary roads and some of the logging facilities in portions of the following activity areas which are expected to exceed allowable limits of detrimental soil conditions following the mechanical treatments proposed with this project.

Alternative 2 and Alternative 3 EIS Units (Commercial Harvest):

EIS Units 3-27, 30, 31, 34, 36, 38-45, 48-58, 61, 63, 65, 66, 68, 69, 73-78, 80, 81, 98-103, 106-110, 112, 126, 128-133, 143, 147, 156, 161, 165, 171, 190, 191, and 196.

Alternative 2 units only: 136-141 and 144.
Alternative 3 units only: 134, 146, 159, 160, 175-177, 180-184, and 186.

Alternative 2 and Alternative 3 EIS Units (Forest system road decommissioning with subsoiling): 15 (0.4 miles), 19 (0.3 miles), 20 (0.4 miles), 23 (0.1 miles), 37 (0.1 miles), 41 (1.1 miles), 48 (0.4 miles), 55 (0.4 miles), 56 (0.6 miles), 61 (0.2 miles), 63 (0.2 miles), 69 (0.5 miles), 74 (0.3 miles), 80 (0.1 miles), 101 (0.5 miles), 133 (0.2 miles) and 161 (0.1 miles).

Objectives: Reduce the extent of detrimentally disturbed soil to meet management objectives. Restore and stabilize detrimentally disturbed soils prior to seasonal runoff events (**Effectiveness:** *High*).

Basis: Forest Plan Standards and Guidelines for Soil, Water and Riparian Resources (SL-1 and SL-4); Watershed Management BMP W-1; Cafferata, 1983; Garland, 1983; Experience.

RANGE

Fences

For more specific location, refer to the Project File, Range Report, Table 5E, pages 53-55.

1. Mechanical Shrub Treatment: Avoid all fences (**PDC**).

2. Prescribed Fire: Wood components of fences such as posts, corner braces, and tree scabs should be avoided and/or protected during burning operations by lining the braces and trees as needed (**PDC**).

3. Leave all live trees that are part of the existing fence (wires, tree scabs, etc. attached to the tree). With leave tree marking (LTM), mark trees with orange paint. Shear all dead or dying trees that are part of the fence at 50 inches or higher above the ground (**PDC**).

   Fences are located in units 4, 5, 8, 9, 11, 12, 28, 29, 32-35, 43-45, 47, 48, 54, 55, 58, 59, 66, 76-78, 82, 83, 88, 89, 91, 93, 98, 99, 101, 106, 109,112, 116, 129, 130, 141, 144, 166-168, 174, 192, 196, 201, 235, 306;

Condition and Trend (CT) Plots

For more specific location, refer to the Project File, Range Report, Table 2A, page 11 and Table 5D, page 52.

1. The range manager on the Forest must flag the CT study plots prior to treatment to avoid disturbance to plot stakes and should be on site during implementation if possible (**MM,** Units 64, 150, 156).

2. Mechanical Shrub Treatment: Avoid the site specific flagged CT plot to protect stakes used to locate the plot and transects. The area can be treated at low intensity, if the ground identifiers are not compromised (**MM,** Units 64, 150, 156).

3. Prescribed Fire: No burning would occur on CT plot. Protect by providing a three acre buffer centered on the actual transect (**MM,** Units 64, 150, 156).

Allotment Access

1. If vegetation project activities occur during an active grazing season, any gates must be closed by contractors and administrative personal on pastures where livestock are present (**PDC**).

2. Avoid dragging surface materials such as dirt, cinders or gravel into or over cattleguard decks or grates that would cause them to “fill-up” and require additional future work (**PDC**).

3. Where access is needed through an existing fence by equipment (**PDC**):

   a. Cut fence at strategic locations where there is a tree or other solid support to maintain fence strength and allow for a tight fence when repaired.

   b. Repair all fences prior to livestock grazing in the area.

   c. Reclaim temporary roads that go through fences in a manner that does not encourage the public to “re-cut” fences following repair.

Waterlines

1. In units where the waterline is present, where access to units is needed that would require crossing or traveling over the waterline, and on roads where the waterline is buried beneath them, it is recommended that the waterline would not be crossed or used by any mechanized equipment in these areas unless (**MM**):

   a. Fill material is placed on top of the waterline at designated crossings or along the length of any travel routes to mitigate potential damage. To be effective, this material should be a minimum of 12" in depth.

   b. Any waterline damage during project activities is repaired prior to the grazing season. Testing of the waterline for damage can only be done between June and September, when the China Hat system is operational.

   c. Following treatments where waterlines are present, no subsoiling would occur over any waterline.

   Waterlines are located in units 46-48, 56, 102, 109, 129, 130, 132, 143, 156, 164, 189, 191, 300; For more specific location and mitigation information, refer to the Project File, Range Report, Table 5A, pages 46-48.

Water Sets and Water Troughs

1. If cheatgrass is present, leave a 25 foot buffer around the water set and troughs to prevent spread under all treatment methods (**MM**). Otherwise, treatment can occur up to water sets and troughs. Watersets are located in units 16, 65, 77, 113, 150, 154, 180, 195, 199, 201, 303; Water troughs are located in units 46, 65, 129, 130, 143, 156; for more specific location and mitigation information, refer to the Project File, Range Report, Tables 2A an 2B, pages 11, 18, and 19 and Tables 5A-C, pages 47-51.

Other

1. Schedule harvest activities when grazing is not occurring within units, if possible (**PDC**).

2. Where vegetation treatments require a period of rest from livestock grazing a precise treatment schedule needs to be developed and the exact period of rest needs to be specified by treatment unit. The individual treatment unit(s), with their associated period of rest, will need to be grouped by pasture and allotment to evaluate the effect on grazing operations on the affected pasture(s)/allotment(s) (**PDC**).

3. Manage treatment activities so that no more than one pasture a year would require non-use by the permittee during a given grazing season (**PDC**).

4. To maintain healthy rangeland conditions, do not treat non-forested southern or southeastern facing slopes of buttes and mountains with fall burning or with burning intensities that would alter vegetation conditions and cause exotics such as cheatgrass to invade and takeover the site (**PDC**).

CULTURAL RESOURCES

1. Prescribed burning over prehistoric sites will only occur during the coolest burning conditions available. Make every attempt to avoid needing fire lines. Build them outside of site boundaries to the extent practical. Cultural resource sites will be monitored and/or re-recorded by archaeologists prior to burning or other thinning activities. All significant artifacts will be collected using standard field techniques during the monitoring/re-recording activities. Sites will be re-monitored after burning to locate newly identified and exposed artifacts, burials, or features (**PDC**).

2. Burn piles will not be placed within site boundaries, eliminating extreme heat on sites and artifacts (**PDC**).

3. Coordination between fuels and heritage staff will occur on all levels, especially in relation to researching predicted vs. achieved burn temperatures. Burn plans will be reviewed by the District archaeologist prior to implementation to provide awareness of cultural resource values. (PDC)

4. Minor thinning and pruning of small diameter brush and trees on heritage sites will be conducted using hand crews. No piling of fuel or woody materials will occur within cultural resource site boundaries. Activities will be implemented over the course of several years utilizing a conservative fuel removal approach rather than heavy loading of ground fuels (completed within a single year) resulting in prescribed burns that reach temperatures over 300 degrees F. Alternatively, a “light on the land” approach will be used (**PDC**).

5. Danger trees within known sites will be directionally felled towards access routes. Lifting a tree in its entirety is a preferred method of preventing displacement, churning, and mixing of site sediments and artifacts. If this is not feasible, smaller lengths that can be completely suspended is another method of limiting effects on site integrity.

6. Undiscovered and unrecorded cultural resources that are discovered during project implementation will be protected and evaluated by the Bend-For Rock District Archaeologist (**PDC**).

7. In locations of commercial timber operations, cultural resource sites can be managed through a program of avoidance using standard site avoidance techniques. Cultural resource site boundaries will be identified and flagged by the project archaeologists, their on-ground locations provided to the project manager, and avoided by project activities. There will be no effect on these sites if the site avoidance practices are appropriately implemented (**PDC**).

8. In units identified for mechanical brush treatment (mowing), the equipment will not make turns within site boundaries, eliminating the impacts from turning the equipment around **(MM).**

9. Place a layer of geotextile cloth directly on the waterline/temporary road surface where FR 2268.200 crosses one site. Placement of the foreign (gravel) material would reduce the potential for intruding into site deposits and helps contain the gravel to the desired footprint, lessening the amount of soil displacement. **(MM)**

10. Since equipment will be prohibited from entry to sites, road maintenance that adds gravel or drainage features to a previously native surfaced road through a site should not occur. (PDC)

Site buffers will initially be flagged using Heritage program flagging. Prior to project implementation, this flagging will be replaced by the appropriate flagging or signs (harvest or fuels related). This method will protect sites during harvest, slash piling, mowing, subsoiling, or other operations involving mechanical equipment while retaining greater anonymity from the general public because of law enforcement issues in the area. (MM)

INVASIVE PLANT PREVENTION

1. Use clean-equipment contract clauses (local and regional) to minimize the introduction and spread of noxious weeds by contractors (**PDC**)

2. Known weed sites will be shown on the Sale Area Map. Do not locate landings, skid trails, parking or staging areas within knapweed or Canada thistle sites (**PDC**).

3. Any fill materials should be gathered only at weed-free quarries or other weed-free source sites (Refer to the Pacific Northwest Region Invasive Plant Program, Preventing and Managing Invasive Plants, Record of Decision, 2005, Appendix 1, Standard 7, page 1-4 (**MR**).

4. Before ground-disturbing activities begin, and annually during multi-year projects, prioritize and treat weed infestations in or near project operating areas and along access routes within the project area (refer to Appendix C, Invasive Plant Report, Project Record). (**PDC**)

5. Minimize soil disturbance and retain native vegetation, in and around project activity areas, to the extent possible consistent with project objectives (**PDC**).

6. To the extent possible, do not locate landings, skid trails, parking or staging areas within bull thistle sites; consult with District Weed Coordinator if this appears impractical (**PDC**).

7. To the extent possible, avoid the use of machinery, including mowers, in obvious patches of cheatgrass, or other invasive plant sites, documented or newly discovered, within project treatment units (**PDC**).

8. To the extent possible, avoid patches of cheatgrass during prescribed burning operations. In units with a burn-under-tree prescription, do not intentionally ignite areas under trees where cheatgrass occurs (**PDC**).

RECREATION & SCENERY

1. Slash clean-up within view of dispersed campsites on main roads (two or four digit) should be done with a low impact machine, or by hand piling (**PDC**). Dispersed campsites should be left in a safe condition. Safety hazards created from vegetation treatment, such as “widow makers” and other hazards should be removed (**PDC**).

2. Design fuel and vegetation units to minimize ground disturbance and damage to vegetation in foreground treatment areas for the first 300 feet in units 90 and 103 (First 300 feet) (**MM**, **Effectiveness**: *High*).
3. Minimize the amount of marking paint that is visible from dispersed recreation sites on Forest Road 23 (**MM**, **Effectiveness**: *High*).

4. Clean-up activities in foreground treatment areas, including landings, skid trails, and slash piles, should be completed within two years post-treatment in units 90 and 103 (**MM**, **Effectiveness**: *High*).
5. Locate slash piles for burning in areas that will minimize scorching within foreground treatment areas in units 90 and 103. Severely damaged or burned trees (more than two-thirds live crown scorch) shall be removed as part of post-treatment activities within two years. Locate grapple piles on logging facilities (**MM**, **Effectiveness**: *High*).
6. Remove flagging that is visible from roads when unit activities are completed in units 90 and 103 (**MM**, **Effectiveness**: *High*).

MONITORING

Wildlife

- All applicable Management Requirements and approved Project Design Criteria to determine effectiveness and to implement adaptive management in the event that changes are needed.
- Coordination with implementation staff on: unit boundary layout, tree marking, retention patch identification and marking, prescribed and pile burn plans, sale contracts, corridor protection, and/or restrictive prescriptions, etc.
- Snag/log transects to document increases and/or decreases relative to different treatment prescriptions and to quantify the net snag losses to meet the specified management requirements.
- Field checks to confirm raptor site activity prior to management activities.
- Field checks to confirm effectiveness of road/trail closures.

Soils

Project monitoring focuses primarily on implementation monitoring to ensure the selected alternative, including mitigation measures, are properly implemented on the ground as designed and achieve the desired results.

Soil Quality Objective: To determine if post-project subsoiling mitigation was effectively accomplished and reduced the extent of detrimentally compacted soil in a representative sample of EIS Units.
Monitoring Elements: Surface area treated on temporary roads and primary logging facilities.
Area of Consideration: Individual activity areas (EIS Units).
Suggested Methodology: Combination of visual survey and shovel probing.

Heritage

Coordination with other resource departments and Heritage Program personnel will ensure protection of all eligible or unevaluated sites within the project boundary. Table 8 lists whether monitoring or coordination or both is required to be fully successful with the goals of site protection and mitigation.

Table 8: Heritage Coordination and Monitoring Activities

Heritage Coordination and Monitoring Activities			
Alternative	**Activity Description**	**Coordination**	**Monitoring**
Alternative 2 - (Proposed Action) and Alternative 3	Heavy equipment/machinery	Y	Y
	Mower turns	Y	Y
	Temporary road development	Y	Y
	Burn piles	Y	Y
	Underburning **	Y	Y
	Danger tree felling	Y	Y
	Fire line construction by hand	Y	N
	Mowing - visibility increased	Y	Y
	Range - covering waterlines	Y	Y
	Erosion/sedimentation below units	Y	Y
	Subsoiling temporary roads	Y	N
	Road maintenance through sites	Y	N
	Adding gravel to native-surfaced roads	Y	N
	Adding drainage to roads	Y	N
	Harvest in plantations	Y	N
Alternative 2 only	Cable yarding on steep slopes	Y	N
Alternative 3 only	Biomass removal	Y	Y

** One of the monitoring aspects of fuels treatments that will be conducted in coordination with the fuels specialists is the determination of actual temperatures reached during an initial and any subsequent entry for underburning of slash on cultural resource sites. Selected sites and non-site areas (as a control sample) will have temperature gauge sensors placed prior to conducting the prescribed burns. They will be collected following each burn and compared with each other. This information may provide useful documentation of our approach towards underburning over sites with light fuel conditions present.

On-the-ground monitoring would occur for cultural resource sites that are flagged for protection. A list of these sites and specific monitoring needs will be included in the cultural resource inventory/consultation report. Part of the monitoring would occur through coordination with other specialists. Monitoring will also occur following project implementation for compliance with the mitigations.

COMPARISON OF ALTERNATIVES

The total number of acres proposed for treatment would increase from approximately 10,752 acres in Alternative 2 to approximately 11,281 acres in Alternative 3. Approximate commercial volume would be 61,309 CCF in Alternative 2 and 58,403 CCF in Alternative 3. The expression of volume is in CCF or hundred cubic feet.

Table 9: Deadlog Alternative Harvest Prescriptions (Rx)

Prescription	Description of Harvest Prescriptions 1 Through 10 [1]	Alternative 2 Acres [2]	Alternative 3 Acres [2]
1	Commercial thin (HTH) from below ponderosa pine (PP), removing lodgepole pine (LP). This will leave 40 square feet of basal area per acre (BA/A), retaining approximately 30 to 50 trees per acre with openings less	657	626

Prescription	Description of Harvest Prescriptions 1 Through 10 [1]	Alternative 2 Acres [2]	Alternative 3 Acres [2]
	than 5 acres through the stands.		
2	Commercial thin (HTH) from below PP, removing all LP and white fir (WF) leaving 40 BA/A. Where mistletoe is present, reduce to minimum stocking levels (as low as 20 (BA/A). Remove trees with heaviest dwarf mistletoe infection (DMTR greater than or equal to 3). Removing trees with DMTR greater than or equal to 4, openings less than 4 acres will occur within the stands.	2,309	1,955
3	Commercial thin (HTH) from below PP to 40 BA/A removing LP and WF (within 22' of PP under 12" dbh and 30' of trees greater than 12" dbh). Thin from below LP and WF to 60 BA/A (25 foot spacing). Healthiest trees with the most full crowns will be left.	573	573
4	Commercial thin (HTH) from below in ponderosa pine stands with large structure. Thin from below to 40 BA/A in younger cohort less than 150 years old cut all lodgepole pine. Thin from below leaving largest older cohort to 60 BA/A. Space smaller younger trees at least 35 feet from larger old trees. (thin in LOS)	661	633
5	Commercial thin (HTH) from below in ponderosa pine stands with large structure. The term cohort is used to represent trees of different age classes within a stand. Thin from below to 40 BA/A in younger cohort less than 150 years old. Where mistletoe is present, reduce mistletoe infection by removing trees with the heaviest dwarf mistletoe infection (DMTR greater than or equal to 3) and spacing infected trees at least 30 feet. Reduce stocking levels to minimum stocking levels (as low as 20 BA/A) to remove trees with DMTR greater than or equal to 4 openings less than 1/2 acre will occur through the stands. Thin from below leaving largest older cohort to 60 BA/A. Space smaller younger trees at least 35 feet from larger old trees or 50 feet where larger trees contain mistletoe. (thin in LOS with DMT)	2,230	2,023
6	Harvest overstory (HOR) lodgepole pine leaving 3-5 overstory trees per acre (wildlife direction).	157	157
7	Harvest Shelterwood (HSH) lodgepole pine leaving 35 trees per acre for seed source and temperature modification leave all ponderosa pine spacing lodgepole pine 35 feet from manageable ponderosa pine.	332	0
8	Lodgepole pine commercial thin (HTH) leaving largest healthiest crowns on a 25 foot spacing Leave all ponderosa pine and space lodgepole pine 30 from manageable ponderosa pine. (HTH in LP)	0	332
9	Biomass (BIOMASS) removal of material which is less than merchantable size thinning of this material will meet SPC specifications thinning from below and harvesting the material cut.	0	899
10	Commercial thin(HTH) from below to 40 basal area per acre and remove all lodgepole pine and white fir. Where mistletoe is present, reduce mistletoe infection by removing trees with the heaviest dwarf mistletoe infection (DMTR greater than or equal to 3). Reduce	0	289

Prescription	Description of Harvest Prescriptions 1 Through 10 [1]	Alternative 2 Acres [2]	Alternative 3 Acres [2]
	stocking levels to minimum stocking levels (as low as 20 basal area per acre) to remove trees with DMTR greater than or equal to 4 openings less than 4 acres will occur through the stands. BIOMASS removal of material which is less than merchantable size thinning of this material will meet SPC specifications thinning from below and harvesting the material cut. (Blackbark with DMT & LP with biomass removal)		
20	Fuels or thinning activity only	3,833	3,794
Total Treatment Acres		**10,752**	**11,281**

1. All harvest activities will remove down dead firm lodgepole pine to reduce down fuels levels. DMTR = dwarf mistletoe rating; BA/A = Basal area /acre
2. Acres displayed for treatments are gross unit acres. Gross acres will be reduced for wildlife leave areas and protection of other resources

Table 10 provides an overall comparison of Alternative 2 (Proposed Action) and Alternative 3 in relation to the proposed activities.

Table 10: Comparison of Treatments by Alternative

Treatment	Alternative 1 (No Action)	Alternative 2 (Proposed Action	Alternative 3
Total Treatment Acres	**0**	**10,752**	**11,281**
Harvest Type		Acres	
Overstory Removal (HOR)	0	157	157
Shelterwood (HSH)	0	332	0
Commercial Thin/Salvage (HTH/HSV)	0	0	592
Commercial Thin (HTH) (Cable Logging)	0 (0)	6,430 (941)	5,489 (0)
Commercial Thin (HTH)/Biomass	0	0	422
Biomass	0	0	899
Total Acres	**0**	**6,919**	**7,559**
Total Volume – Hundred Cubic Feet (CCF)	**0**	**61,309 (6,919 acres)**	**58,403 (6,660 acres)**
Timber Stand Improvement Type [1]		**Acres**	
Precommercial Thinning (SPC)	0	7,985	8,586
Whipfell	0	458	535
Pruning	0	50	50
Fuel Treatment Type [2]		**Acres**	
Lop Branches	0	765	928
Hand Pile Slash and Burn	0	2,334	1,691
Machine Pile Slash and Burn	0	5,061	6,114
Mow Shrubs	0	5,874	6,668
Underburn	0	8,912	9,443
Road Activity		**Miles**	
Road Closure	0	17.4	17.4
Road Decommissioning	0	21.5	21.5
Temporary Road Development	0	14.8	15.3

Acres are approximate. More than one activity may occur on a single unit. Actual acres treated within a unit would be reduced by no thinning retention areas and the percent of a unit that can be mowed or burned.

SUMMARY TABLE – COMPARISON OF ALTERNATIVES

Table 11: Comparison of Alternatives to Purpose and Need and Key Issues

Purpose & Need	Alternative 1	Alternative 2	Alternative 3
Manage stands of late old structure ponderosa pine to promote sustainability over the long term	High stand density would continue to provide the opportunity for large scale stand replacing events to occur.	LOS ponderosa pine to be treated with stocking reduction and fuels treatments for long-term sustainability.	LOS ponderosa pine to be treated with stocking reduction and fuels treatments for long-term sustainability.
In dense stands dominated by ponderosa pine, move stands toward historic conditions by addressing tree species composition and stocking levels	Dense stands of ponderosa pine and mixed conifer would continue. Areas that once supported large ponderosa pine with dispersed stands of younger trees and ground vegetation of grass would not have the opportunity to develop into those desired characteristics.	Dense stands of ponderosa pine would be thinned to allow for greater and quicker diameter growth. Thinning would reduce the risk of bark beetle mortality and increase the tree resistance. Thinning and fuels reduction activities would reduce the potential for loss from wildfire.	Dense stands of ponderosa pine would be thinned to allow for greater and quicker diameter growth. Thinning would reduce the risk of bark beetle mortality and increase the tree resistance. Thinning and fuels reduction activities would reduce the potential for loss from wildfire.
Address stand conditions in both ponderosa pine and lodgepole pine to improve resistance and resilience to bark beetles and dwarf mistletoe	No stand density reduction would occur that would improve stand resilience. Mistletoe would continue to spread. It is likely that bark beetles would continue to increase populations to epidemic proportions. Tree mortality would increase fuels.	Reducing stand density would substantially reduce the risk of loss from pine beetle outbreak by improving tree resistance. Reducing density would reduce the spread of mistletoe to younger cohorts of trees.	Reducing stand density would substantially reduce the risk of loss from pine beetle outbreak by improving tree resistance. Reducing density would reduce the spread of mistletoe to younger cohorts of trees.
Reduce fuels throughout the planning area, including surface and ladder fuels, to levels that will not sustain stand replacing fires	There would be no planned fuels reduction treatments. High intensity, stand replacing wildfires could substantially alter the forest and associated wildlife habitat and other resources.	Thinning 7,894 acres of dense stands, mowing 5,890 acres of highly flammable shrubs, and underburning 8,912 acres would substantially reduce the risk of a high intensity, stand replacement wildfire.	Thinning 8,580 acres of dense stands, mowing 6,684 acres of highly flammable shrubs, and underburning 9,443 acres would substantially reduce the risk of a high intensity, stand replacement wildfire.
There is a need to contribute to the local and regional economies by providing timber and other wood fiber products and associated jobs.	There would be no wood fiber cut that would be used for would products. No jobs would be created that would provide wages that would be spent in the local communities.	61.3 CCF wood fiber. Approximately 294 jobs would be created or maintained. Income generated would be approximately $9.3 million.	58.4 CCF wood fiber and biomass. Approximately 278 jobs would be created or maintained. Income generated would be approximately $8.8 million.
Key Issues	**Alt. 1**	**Alt. 2**	**Alt. 3**
Regeneration Harvest in Lodgepole Pine Stands	No treatments would occur.	489 acres of regeneration harvest.	157 acres would have the overstory removed.

Cable Logging	No treatments would occur.	941 acres would be cable logged. Stand density would be reduced. The cost would be $200 per CCF.	No cable logging would occur. Stand density would not be reduced. Understory fuels would be reduced.
Biomass Utilization	No Biomass Utilization would occur. No benefits would occur, such as jobs and associated income that would help sustain the local economy.	Biomass Utilization could occur. Unmerchantable material will be piled and burned.	Biomass Utilization would occur on 899 acres. Depending on market wood fiber would be utilized at regional/local mills providing jobs, power and/or products.

ALTERNATIVES NOT CONSIDERED IN DETAIL

DIAMETER LIMIT OF 14”

During scoping the Sierra Club raised an issue about the size of trees that would be cut and removed within the Deadlog planning area. The Sierra Club asked that a limit of 14” diameter at breast height (dbh) be placed on trees to be cut and removed following their walkthrough surveys and observations. An alternative was considered to address public concerns regarding the diameter of trees to be removed, but was not analyzed in detail for the following reasons:

Estimates from stand exams indicate the majority of trees that would need to be removed for density management and/or due to disease are less than 14” dbh. However, because old growth stands within the planning area are heavily infected by dwarf mistletoe, imposing a 14” diameter limit would make it difficult to meet the objective of stand resistance to dwarf mistletoe and insects because overstory trees infected by mistletoe provide a source of continued inoculation of dwarf mistletoe. Imposing a 14” diameter limit impedes the forester’s flexibility to remove a tree between 14” and 21” dbh that has mistletoe high in the crown and where the tree is topping other trees that are being left for future old growth recruitment.

CHAPTER 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

CHAPTER 3 - AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section of the environmental assessment considers the environmental consequences of implementation of the various alternatives. The following discussion of effects follows The Council on Environmental Quality (CEQ) guidance for scope (40 CFR 1508.25(c)) by categorizing the effects as direct, indirect, and cumulative. The focus is on cause and consequences. For this analysis, in general, direct and indirect effects have been discussed in the context that most readers are accustomed to: those consequences which are caused by the action and either occur at the same time and place, or are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR 1508.8). Cumulative effects are discussed where there is an effect to the environment which results from the incremental effect of the action when added to other past, present, or reasonably foreseeable future actions (40 CFR 1508.7).

Measures to mitigate or reduce adverse effects caused by the implementation of any of the actions proposed are addressed in Chapter 2, Resource Protection Measures. Effective mitigation avoids, minimizes, rectifies, reduces, or compensates for potential effects of actions. After mitigation is applied, any unavoidable adverse effect to each resource area is addressed in the section titled “Other Disclosures” in this chapter of the DEIS. The temporal and spatial scale of the analysis is variable depending upon the resource concern being evaluated, particularly for cumulative effects. The landscape within the Deadlog project area boundary is the focus of this EIS, but adjacent lands are considered in this analysis process.

BASIS FOR CUMULATIVE EFFECTS ANALYSIS

Cumulative Effects Considerations of Past Actions (40 CFR 1508.7): In accordance with the CEQ Guidance Memorandum on Consideration of Past Actions in Cumulative Effects Analysis dated June 24, 2005:

The Environmental Consequences disclosures in this DEIS include discussion of cumulative effects. The cumulative effects discussion is based on the Forest Service NEPA regulations at 365 CFR 220 and Forest Service Handbook, 1909.15.

The analysis of cumulative effects begins with consideration of the direct and indirect effects on the environment that are expected or likely to result from the alternative proposals for agency action. Agencies then look for present effects of past actions that are, in the judgment of the agency, relevant and useful because they have a significant cause-and-effect relationship with the direct and indirect effects of the proposal for agency action and its alternatives. CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment.

With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making. (36 CFR 220.4 (f))

Table 12 displays those projects that are in the planning process and those that have been wholly or partially implemented, as well as other human-caused events that have affected the landscape. Effects of these projects are considered in the cumulative effects analysis for each resource.

Table 12: Past, Present, and Reasonably Foreseeable Actions

Actions	Timing of Actions	Activity Description
Aspen Project Vegetation Treatments	Implementation	The nearest activities are within 2 miles of the Deadlog project boundary. Prescribed burns, mowing, and thinning of plantations – In progress
Opal mine	Ongoing	Located in SW portion of Quartz Mountain. Active annually. Includes camp site.
Wildlife Improvement Maintenance	Ongoing and part of the existing condition	Maintenance on two wildlife guzzlers.
Road Maintenance	Ongoing and part of the existing condition	Ongoing road maintenance. Danger tree removal, roadside brushing, drainage repair, spot surfacing.
BPA power line Maintenance	Ongoing and part of the existing condition	Power line maintenance every 3-5 years, including mowing brush and seedlings and scattered tree and snag removal. Removing trees that are a potential hazard to power lines..
Cluster II Grazing Allotment. Grazing allotment Maintenance and Improvement	Ongoing and part of the existing condition	Grazing, fence maintenance, water sets, waterline repair and reconstruction.
Green Dot road Closure	Ongoing and part of the existing condition	Administrative closure of roads during Hunting season
KO Timber Sale	Implementation	Plantation Fence Maintenance and removal and Big Game Repellant application. Dwarf Mistletoe control activities (pruning and girdling). Past harvest and thinning.
Travel Management	Future Decision	Travel Management EIS possible signature within 2 years. Shared use roads.

FIRE AND FUELS REPORT

INTRODUCTION

Fire has been a disturbance factor in the Deadlog Planning Area for thousands of years.
Fire Suppression over the last century has eliminated most of the naturally occurring low intensity fires. As a result the amount of fuel loadings and the density of forest stands have increased.

While fire occurrence within the area has not changed substantially from pre-settlement times, the area burned and size of fires has been significantly reduced. Fire may occur in a variety of ways ranging from low intensity, creeping ground fire to high intensity stand replacement fires encompassing large acreages.

MANAGEMENT DIRECTION

DESCHUTES NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN

Forest-wide Standards and Guidelines

The emphasis in the Deadlog area is identified by the General Forest, Old Growth, Scenic Views and Deer Habitat management areas. These management areas do not preclude managing for other resource objectives common throughout forest lands yet they do give direction for the desired outputs and conditions. Emphasis for each of the management areas is as follows.

Deer Habitat MA7
M7-26 The prescribed use of fire will be necessary to maintain diversity within the plant communities. Burning prescriptions will provide for the reestablishment of bitterbrush within 20 years. Approximately 2.0 – 2.5 percent of this Management Area could be burned annually.
M7-27 In that portion of the Management Area designated nonsuitable for timber, the preferred slash treatment method is to lop and scatter. In areas of heavey slash, machine piling and burning may be necessary. Crushing is the least preferred method for treating slash.

General Forest MA8.
M8-25 Prescribed fire may be used to protect, maintain, and enhance timber and forage production. The broadest application of prescribed fire will occur in the ponderosa pine type.
M8-26 The lowest cost option which meets the Silvicultural, soil, water, and fire objectives should be selected.
M8-27 Slash will be treated to reduce the chances of fire starts and rates of spread to acceptable levels, but will not be cleared to the point that the forest floor is devoid of all slash and logs. Some slash and larger dead material will be left for ground cover for soil protection, microclimates for establishment of trees, and small mammal habitat.

Scenic Views MA9
M9-90 Low intensity prescribed fires will be used to meet and promote the desired visual condition within each stand type. Prescribed fire and other fuel management techniques will be used to minimize the hazard of a large high intensity fire. In foreground areas, prescribed fires will be small, normally less than 5 acres, and shaped to appear as natural occurrences. If burning conditions cannot

be met such that scorching cannot be limited to the lower one third of the forest canopy, then other fuel management techniques should be considered.
M9-91 If at any time during the course of the prescribed burn it appears that the objectives for the burn are not being met, all burning will cease.

Old Growth Reserve MA15
M15-19 Prescribed fire is not appropriate in lodgepole pine stands. In ponderosa pine and mixed conifer stands, prescribed fire may be used to achieve desired old growth characteristics. It may also be used there to reduce unacceptable fuel loadings that potentially could result in high intensity wildfire.
M15-20 Prescribed fire is the preferred method of fuel treatment. However, if prescribed fire cannot reduce unacceptable fuel loadings, other methods will be considered.
M15-21 Natural Fuel Loading will normally be the standard.

COHESIVE STRATEGY

The Cohesive Strategy addresses hazards and risks from the accumulations of fuels and wildfires that are more frequently burning at high intensities and severity and are outside of their historic range of variability (HRV). Page 30 of the Cohesive Strategy lists the federal laws and regulations used to guide National Forest management, including the Endangered Species Act, the Clean Water Act, the Clean Air Act, and the National Forest Management Act which together provide the legal basis for maintaining sustainability of ecosystems.

The Forest Service Government Performance and Results Act (GPRA) Strategic Plan (2000 revision) bridges law and Forest Service activities. The Cohesive Strategy anchors to the following specific objectives from the GPRA Strategic Plan.

- Improve watershed conditions and restore hydrological processes
- Improve habitat quality; and conserve fish, wildlife and plant populations
- Improve ecosystem resiliency associated with fire adapted ecosystems

HISTORIC CONDITION

Historic condition assumes that the compliment of native species and the vegetative conditions that existed prior to European settlement was viable; that is, the historic ecosystems possessed a high level of resilience to the effects of insects, disease, and fire. The pre-European settlement forest provides the most scientifically sound model because it was based on thousands of years of development, it existed during a period of similar climate, and is more easily documented than forests from any earlier time (Bonnicksen 2000).

Historic condition implies that the character of disturbance agents were different in the past. Historically, fire played the bigger role in influencing forest succession, and the influence of insect and disease agents was short-lived and patchy. But interfering with one disturbance agent (fire) has increased the influence of other disturbance agents (insect and disease) (Gara 2000). These agents now exhibit their influence over entire landscapes in episodes lasting decades, which is a result of replacing open stands of shade intolerant tree species with dense, closed stands of shade-tolerant species (Agee, 1993).

Historic condition does not imply the absence of human influence, i.e. “natural” forests, in which humans have played no significant role. According to MacCleery (USDA 1999), under that definition there would have been few natural forests, even in 1500 (at the beginning of European occupation). Humans have occupied and influenced America's forests (by, for example, their frequent application of fire) since the time these forests migrated northward behind the retreating continental glaciers at the end of the ice last age. In the Northwest, one of the common patterns of the Native American use of fire was widespread burning by inland (Columbia Plateau) tribes east of the Cascades (Langston 1995). So, "historic condition" strongly implies a human role in the shape of the landscape. According to Thomas (1993), in the fire-prone ecosystems of the west, Native American burning created an element of ecosystem stability that otherwise would not have existed without it. Frequent, low intensity, human-caused fires substantially reduced the amount and range of less frequent, high-intensity, stand replacing fires that otherwise would have occurred. So, historic conditions represent a reasonable point of reference to assess change caused by both nature and humans.

EXISTING CONDITION

On the Deschutes National Forest, deviations from historic conditions due to the interruption of fire cycles have displaced fire regimes out of their historic range of variability. Because of changes in species composition, stand structure, density and fuel loading, the existing levels of fire severity (low, moderate, stand replacement) are out of their historic proportion to each other. The fire effects that occur as a result of this imbalance are outside their historic range; fewer acres are burning at low intensities, and more acres are (or have the potential to burn) at moderate or high intensities.

To obtain and verify current conditions in the Deadlog Project area several ground reconnaissance have been performed as well as review of aerial photos, Geographical Information System (GIS) data, and past activity records. From a fire and fuels management perspective several key elements receive focused attention to adequately describe current condition.

Fire Regimes

Fire regimes describe the role fire plays in an ecosystem in terms of frequency and severity. Fire regimes are based on environmental gradients of temperature and moisture, similar to the way plant associations are grouped. The assignment of a specific fire regime to a specific seral/structure stage is a product of fire ecology literature, historical fire records and local fire experience. There are three levels of fire severity; non-lethal (low) severity, mixed (moderate) severity, and stand replacement (high) severity. Table 13 describes fire severities.

Table 13: Fire Severities

Fire Severity	Description of Effects on Vegetation
Non-lethal	More than 70% of the basal area or more than 90% of the canopy cover that existed prior to the fire still remains after the fire.
Mixed	Fires of intermediate effects, often resulting from a mosaic of varying conditions.
Stand Replacement	Less than 20% of the basal area or less than 10% of the canopy cover of the overstory remains after the fire.

There is a historic fire frequency associated with each level of severity. Frequency is divided into four categories, and each category is associated with a mean fire interval. Mean fire interval is the average number of years between two successive fire events in a given area. Table 14 describes fire frequencies.

Table 14: Fire Frequencies

Fire Frequency	Mean Fire Interval
Very Frequent	Less than 25 years
Frequent	26 - 75 years
Infrequent	76 - 150 years
Very Infrequent	151 – 300 years

A fire scar analysis has been initiated for the Deadlog area by Bend Chapter of The Nature Conservancy. Although incomplete at this time, early indications from the samples that have been analyzed indicates that there is an average return interval of 12.2 years (Waltz, 2009).

Plant Association Groups and Fire Regime Groups

The Deadlog area is dominated by approximately 13,024 acres of ponderosa pine stands and approximately 2,945 acres of lodgepole pine stands.

The ponderosa pine plant association group is best characterized as Fire Regime Group I, non-lethal fire severity with a frequency between 0 and 35 years (13,024 acres). Historically, the fires were mostly non-lethal severity fires, which maintained the open park-like stands dominated by Ponderosa Pine. Fire exclusion has changed the vegetation and structure. Currently these stands are dominated by dense thickets and storied structures with an increase in the lodgepole pine component.

The area also contains a significant amount lodgepole pine forest characterized as Fire Regime Group IV, stand replacement severity fire with a mean fire return interval between 35 and 100 years (2,945 acres). Historically, the fires were mixed and stand replacement fires, which contributed to fragmenting forested areas with varying seral/structure stages. Fire exclusion has changed the vegetation and structure. Currently much of the landscape is dominated by dense thickets and storied structures that are more continuous with fewer breaks in the canopy.

The fire regime groups are an extension of the plant association groups and have been identified for the area. Table 15 describes Fire Regime Groups.

Table 15: Natural Historic Fire Regime Groups

Fire Regime Group	Acres	PAG	Fire Return Interval (years)	Fire Severity
I	13,024	Ponderosa pine	0-35 (frequent)	Non-lethal
IV	2,945	Lodgepole pine	35-100 (infrequent)	Stand Replacement

Fire Occurrence

Large Fire history records indicate that there have been 2 large fires in the planning area since 1913. These include the Quartz Mountain Fire of 1913 which burned 138 acres, approximately 69 acres of which were in the planning area; and the South Ice Cave Fire of 1915 which burned 11,910 acres with 3,958 acres in the planning area.

Fire Occurrence Rate (FOR) is the probability of a fire occurring on a given area per year. For comparison reasons, it is referred to in terms of fires per thousand acres per year. The FOR is usually a fraction, with zero and one being the low and high range limits. Numbers close to zero indicate a low fire probability, and numbers closer to one are indicative of a high fire probability.

The FOR for Deadlog was figured by counting the number of recorded fires occurring within the planning area from 1983 thru 2001.

The FOR is: 31 fires/15.4 thousand acres/19 years = .1059FOR, or a 10.6 percent chance of a fire occurring within any 1,000 acre block of the Deadlog Planning Area each year.

Surface Fuels

Existing fuel conditions have been quantified and qualified (modeled) to estimate the current potential of surface fire behavior. Fuel Models were selected from the 13 Fire Behavior Prediction System (FBPS) models that are organized into four groups: grass, shrub, timber, and slash. They are further described by fuel load <3-inch, dead fuel load ¼ inch, live fuel load of foliage and fuel bed depth (Anderson 1982).

The following surface fuel models were used to characterize the range of surface fuel conditions in the project area:

Fuel Model 1 (276 acres) – Fire spread is governed by the fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third the area. Annual and perennial grasses are included in this fuel model.

Fuel Model 2 (1,652 acres) – Fire spread is primarily through the herbaceous fuels, either curing out or dead. These are surface fires where the herbaceous material, in addition to litter and dead-down stem wood from the open shrub or timber overstory, contribute to the fire intensity. Open shrub lands and pine stands or scrub oak stands that cover one-third to two-thirds of the area may generally fit this model; such stands may include clumps of fuels that generate higher intensities and that may produce firebrands. Some pinyon-juniper may be in this model.

Fuel Model 6 (13,056 acres) – Fires carry through the shrub layer where foliage is more flammable than fuel model 5, but this requires moderate winds, greater than 8 mph at mid-flame height. Fire will drop to the ground at low wind speeds or at openings in the stand. The shrubs are older, but not as tall as shrub types of fuel model 4, nor do they contain as much fuel as fuel model 4. This fuel model considers a broad range of shrub conditions.

Fuel Model 8 (560 acres) – Slow burning ground fires with low flame lengths are generally the case, although the fire may encounter an occasional “jackpot” or heavy fuel concentration that can flare up. Only under severe weather conditions involving high temperatures, low humidities, and high winds do the fuels pose a fire hazard. Closed canopy stands of short-needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and occasionally twigs because little undergrowth is present in the stand. Representative conifer types are white pine, and lodgepole pine, spruce, fir and larch.

Fuel Model 9 (168 acres) – Fires run through the surface litter faster than model 8 and have longer flame length. Both long-needle conifer stands and hardwood stands are typical. Closed stands of long-needle pine like Ponderosa, Jeffery, and red pines are grouped in this model. Concentrations of down-dead woody material will contribute to possible torching out of trees, spotting, and crowning.

Fuel Model 10 (172 acres) – The fires burn in the surface fuels with greater fire intensity than the other timber litter models. Dead-down fuels include greater quantities of 3 inch or larger limbwood resulting from over maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees is more frequent in this fuel situation, leading to potential fire control difficulties. Any forest type may be considered if heavy down material is present; examples are insect or disease-ridden stands, wind-thrown stands, overmature situations with deadfall, and aged light thinning or partial-cut slash.

Table 17 displays existing acres and potential fire behavior for each fuel model represented in the Deadlog area.

Table 16: Existing Fuel Models by Acres and Fire Severity

Deadlog Existing Fuel Models		
Fuel Model	**Acres**	**Fire Behavior Potential**
1	267	Moderate
2	1,652	Moderate
6	13,056	High/Extreme
8	560	Low
9	168	Moderate
10	172	High
99 Non-forested	175	

The majority of the project area is FM6, which exhibits a high/extreme fire behavior potential. These fuel models only account for the surface fuels by size classification and tons per acre of available fuel. There is a heavy bitterbrush component throughout the area which is classified as fuel model 6. Where bitterbrush occurs below ponderosa pine, the brush collects needle cast from the pine. These needles are an aerial component of dead fuel that is intertwined and draped over the brush which dramatically increases fire behavior in fuel model 6 beyond what is described in the preceding surface fuel descriptions.

Furthermore, much of the project area is dominated by ponderosa pine stands and lodgepole pine stands with dense understories. These understories provide an aerial fuel component that serves as a ladder of available fuel, which enables fire to move from the surface fuels to the canopy, thus resulting in crown fire. Densities associated with many stands in the project area provide a high probability of sustained crown fire under typical summer weather conditions.

METHODOLOGY FOR EFFECTS ANALYSIS

Stand information was collected from stand exam data and processed with Forest Vegetation Simulator (FVS) to generate canopy fuels information for comparing existing condition and the action alternatives. FlamMap, a fire behavior mapping and analysis program that computes fire behavior characteristics (rates of spread, flame length, crown fire potential, etc.), was used to determine the existing stand conditions potential fire behavior. Remote sensing satellite imagery from 2004 was analyzed in the computer model under specific fuel conditions. The data inputs necessary for FlamMap include aspect, slope, elevation, fuel model, canopy height, canopy base height, crown bulk density, and crown class. Fire Family Plus was used to determine 97th percentile weather conditions utilizing weather data from Cabin Lake weather station.

Existing Fire Behavior

Flame Length

As related to wildfire; as flame length and rate of spread increase the fireline intensity increases dramatically. Any thing that changes about a fire (fuel type as fire burns into new area, such as wind shift or increase) can result in dramatic changes in fire behavior. The following table displays flame lengths and associated fire suppression strategies.

Table 17: Appropriate Fire Suppression Strategies

Flame Length and Fireline Intensity	
Flame Lengths	**Fire Suppression Strategy**
< 4’	Fire can easily be attacked at head as well as flanks.
4’ - 8’	Head too intense for handtools. Dozers, engines and aircraft can be effective.
8’ - 11’	Fire could present control problem--especially in afternoon. Control very difficult. Attempting to control head of fire may be ineffective.
11’+	Control efforts on head will be ineffective. Crowning, long-range spotting and major runs are probable. Do not attack head--only the flank. Plan where and how you can control head at dusk and when flames become shorter or, at a barrier in front of the fire.

Table 18 illustrates that the complexity of suppressing wildfires increases and the probability of successful initial attack decreases as flame length and fireline intensity increase.

As flame length increases so does a fires resistance to control. Also increasing will be the severity of mortality to tree species that are normally known to be fire tolerant. The following table displays the probable flame lengths for the area.

Table 18: Existing Flame Lengths

Flame Length (Feet)	Existing Area (Percent)	Existing Area (Acres)
0 - 4	12	1,948
4 - 8	87	13,928
8 - 12	<1	143
12 +	<1	39

The Flame Lengths in Table 18 illustrate that the majority of the planning area has a probable flame length of 4 to 8 feet and fires burning in the 97th percentile weather conditions will likely require dozers, engines, and aircraft for successful initial attack. While the use of these types of mechanized equipment is necessary for the suppression of fires burning at high intensities there is generally more resource damage that occurs with equipment when compared to handwork.

Fire Type

The type of fire weighs heavily on successful suppression and the severity of tree mortality in ponderosa pine. The following table provides representation of existing fire type for Deadlog as analyzed with Flammap.

Table 19: Existing Fire Types

Fire Type	Existing Area (%)	Existing Area (ac)
Surface Fire	22	3,495
Passive Crown Fire	77	12,361

Fire behavior analysis is showing that 22 percent (3,495 acres) of the area is in a condition that supports surface fire. A surface fire is one that burns in the surface fuel layer, which lies immediately above the ground fuels but below the canopy, or aerial fuels. Surface fuels consist of needles, leaves, grass, dead and down branch wood and logs, shrubs, low brush, and short trees (Brown and others 1982). Surface fire behavior varies widely depending on the nature of the surface fuel complex.

A passive crown fire, also called torching, is one in which individual or small groups of trees torch out, but solid flame is not consistently maintained in the canopy. Passive crown fire encompasses a wide range of fire behavior, from the occasional tree torching out to a nearly active crown fire. The increased radiation to surface fuels from passive crowning increases flame front spread rate, especially at the upper end of the passive crown fire range. Embers lofted during passive crowning can start new fires downwind, which make containment more difficult and increase the overall rate of fire growth. Passive crowning is common in many forest types, especially those with an understory of shade-tolerant conifers (lodgepole pine and juniper).

The larger portion of the Deadlog area or 77 percent (12,361 acres), is in a condition that supports passive crown fire. Crown fires present special problems to fire managers. Crown fires are more difficult to control than surface fires. Their rate of spread is several times faster than surface fires (Rothermel 1983). Spotting is frequent and can occur over long distances. Larger flames from crown fires dictate larger firefighter safety zones (Butler and Cohen 1998). Spotting and increased radiation make structures more difficult to defend from crown fire than surface fire (Cohen and Butler 1998). Effects of crown fire are more severe and lasting than surface fire. Near total tree mortality should be expected. Smoke production will be greater, and foliar nutrients may be lost from the site.

Rate of Spread

A fire’s rate of spread (ROS) is the relative activity of a fire in extending its horizontal dimensions. For the Deadlog analysis, ROS is expressed as the forward rate of spread of the fire front and is expressed in chains per hour.

Table 20: Existing Fire Rate of Spread

Rate of Spread (chains per hour)	Existing Area (Percent)	Existing Area (Acres)
Less than 5	8	1,266
5-15	42	6,696
15 or greater	50	8,096

The rates of spread for this analysis were selected purely as benchmarks for alternative comparison. The ROS Chart shows that 50 percent (8,096 acres) has a ROS greater than 15 chains per hour. 92 percent (14,792 acres) of the area is in a condition that supports a ROS greater than 5 chains per hour.

PURPOSE OF FUELS TREATMENTS

Preliminary fire behavior analysis exhibits mortality to dominant and co-dominant trees which exceed acceptable levels during fire events occurring within typical fire season weather parameters. The Deadlog planning area is included in the Brothers Wildland Fire Use Plan. In the plan, natural ignition fires could be allowed to burn under prescribed conditions. The proposed treatments for the area are intended to reduce surface fuel loadings, increase canopy base heights, and decrease stand densities thus, setting the stage for low intensity fire during wildfire and fire use fire in the area. Table 21 outlines treatment principles, treatment effects to fire behavior, advantages related to fire behavior, and less desirable treatment effects.

Table 21: Principles of Fire Resistance for Dry Forests (adapted from Agee, 2002 and Hessburg and Agee, 2003)

Principle	Effect	Advantage	Concerns
Reduce surface fuels	Reduces potential flame length	Control easier; less torching[1]	Surface disturbance less with fire than other techniques
Increase height to live crown	Requires longer flame length to begin torching	Less torching	Opens understory; may allow surface wind to increase
Decrease crown density	Makes tree-to-tree crown fire less probable	Reduces crown fire potential	Surface wind may increase and surface fuels may be drier[2]
Keep big trees of resistant species	Less mortality for same fire intensity	Generally restores historic structure	Less economical; may keep trees at risk of insect attack

[1] Torching is the initiation of crown fire.
[2] Where thinning is followed by sufficient treatment of surface fuels, the overall reduction in expected fire behavior and fire severity usually outweigh the changes in fire weather factors such as wind speed and fuel moisture (Weatherspoon, 1996).

Fuels treatments in the Deadlog planning area are designed to reduce fire caused mortality within treated stands. This will be accomplished by reducing scorch heights and reducing the risk of crown fire by affecting one or more elements of the fuels complex that support greater flame lengths and crown fire development. These are *fuel loading, crown base height,* and *crown bulk density.* Fuel loading consists of the downed woody and live fuel available to support the start and spread of fires and is usually expressed as tons per acre. The greater the fuel loading, the more intense fire burns and the greater the associated flame lengths. Crown base height is the distance between the surface fuels and the average bottom level of tree crowns and is usually expressed in feet. The greater the crown base height, the longer the flame length needed to scorch or ignite the crowns. Crown bulk density is the amount of crown fuels within a given area and is usually expressed as pounds of foliage per cubic foot. The greater the crown bulk density, the easier for crown fires to ignite and propagate.

ASSUMPTIONS AND RATIONALE

During the development of proposed unit treatments and the treatment effects analysis the following assumptions were made:

- Wildland fire will not be eradicated in these ecosystems. A successful strategy will be built upon designing a vegetative environment, including species and structural characteristics that will produce desired, safely manageable fire behavior in the event of an unplanned ignition.
- There are no forest’s that are completely “fire safe.” Certain combinations of ignition, fuel moisture in the live and dead vegetation, wind, and relative humidity can combine under extreme circumstances to threaten any vegetated ecosystem.
- A reasonable target is for public and firefighter safety under 97th percentile weather conditions.

- Weather conditions at the 97th percentile are defined as the combination of temperature, relative humidity, and wind speed on a summer day that is warmer, drier, and windier than 97 percent of all other recorded summer days. "Fire season" is defined as the 122 day period between June 1st and September 30th, during which most fires and acres burn. Under 90th percentile conditions, there will be about 12 days on average that are hotter, drier, and windier than those 97th percentile conditions.
- Public and firefighter safety is the top priority in fuels and fire management. Treatments in the wildland urban interface will focus on creating a safe working environment for fire suppression forces.
- Ground suppression forces can operate safely adjacent to flames that are 4 feet in length and less. Extreme fire behavior, including crown fire, rapid surface spread and long range spotting, create an unsafe environment for the public and firefighters.

ENVIRONMENTAL CONSEQUENCES

All harvest activities would remove existing down dead firm lodgepole pine to reduce surface fuels levels. For a description of fuel treatment activities refer to Chapter 2, page 18. For a description of treatment prescriptions, refer to Table 9, page 48.

Treatments of surface and canopy fuels have been prescribed for units identified as being at risk in the planning area. Table 22 summarizes fuels treatment acres for the planning area for each action alternative. In the table, "Total Unit Acres" is displayed and represents the acres of the planning area proposed for treatment. Many of the units have multiple treatments prescribed to achieve desired fuel conditions. Because of these multiple treatments, the total for acres of fuels treatments exceeds the total unit acres.

Table 22: Treatment Acres by Alternative

Alternative	Total Unit Acres	LFR and PCT	Hand piling	Machine Piling	Lop And Scatter	Mechanical Shrub Treatment	Pile Burn	Under burn
2	10,752	7,985	2,334	5,061	765	5,874	7,395	8,912
3	11,281	8,586	1,691	6,114	928	6,668	7,805	9,443

Alternative 1 (No Action)

Direct and Indirect Effects: Under this alternative no management activities would occur, other than fire suppression.

In ponderosa Fire Regime Group I (approximately 81 percent of the project area) surface fuels and bitterbrush would continue to accumulate. These fuels are believed to have been historically kept at low levels in areas with frequent fire intervals. When excessive amounts of bitterbrush and surface fuels accumulate below ponderosa pine trees for many years, fires can burn with such intensity that mortality from crown scorch is likely. Fuel accumulations at the base of trees can cause mortality of ponderosa pine through cambium heating during less intense wildfires that might not have killed them otherwise. With no fuel treatments, fuel reductions will only occur during wildfires and these are likely to be large and intense events similar to the Skeleton Fire, Evans West Fire and the 18 Fire of recent years that have occurred in ponderosa pine stands that were largely untreated. Stands of large mature ponderosa pine currently existing within the project area are at risk to wildfire. If these trees were to be lost in any disturbance, with the current brush and fuel conditions, replacement stands would unlikely survive wildfire effects through time. Very few stands would survive wildfires for the required 200 to 300 years needed by the ponderosa pine in order to reach old/large structure.

Continuation of an infrequent and stand replacement severity fire regime will take place in fire dependent ecosystems that historically had frequent non-lethal severity fire regimes.

Approximately 19% is in lodgepole pine stands. Structure and density play a key role in how fire carries through this fuel. The lodgepole pine areas are continuous in density with few changes in structural pattern enabling fire to carry well. With no fuels treatments in these stands, fuel characteristics will continue to support high to extreme fire behavior and fire movement across the landscape.

Suppression actions will continue to be hazardous for fire fighters and suppression strategies will be limited due to lack of escape routes and safety zones. The effectiveness of aerial delivered retardants will be limited because of high fire intensity and long range spotting. Dozer line construction will be required instead of hand constructed fireline because of high fire intensity, long range spotting and limited safe access.

Roads allow access to most areas for fire suppression within the project area. Existing fuel conditions adjacent to the roads do not provide a defensible area for suppression forces to effectively attack a moderate to high intensity wildfire. Most roads currently do not provide safe access and egress routes for suppression forces or the public. The public's safety will be compromised due to limited safe egress routes.

During a high intensity wildfire, smoke emission particulate matter of 10 microns and less in size (PM 10) could range from 240 pounds to 2,000 pounds or more per acre. Where down fuels have accumulated and/or stands are dense the PM 10 production may exceed these estimates. PM 10 describes particulate matter 10 microns and less in size; these particles are small enough to enter the human respiratory system. Smoke from a large wildfire could impact the communities of Fort Rock, Christmas Valley, Brothers, and La Pine.

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

Treatment effects to the canopy have been modeled utilizing the Forest Vegetation Simulator (FVS). Canopy Base Heights, Canopy Bulk Densities, and Canopy Closures have been averaged for each prescription group. This data is used to analyze fire effects in treated stands for each prescription group. Prescription group 6 and 9 are plantations with about 350 trees per acre. There is not sufficient stand data for further fire behavior analysis. However, these are proposed for small diameter thinning to a stocking level of about 100 trees per acre. There could be biomass utilization opportunities in these units. Thinning will be followed with mowing, and prescribed fire in some of these stands. These treatments are intended to move the stands toward a condition where canopy fuels will not contribute towards fire behavior.

Direct and Indirect Effects: Precommercial thinning of ladder fuels would increase Canopy Base Heights (CBH) and decrease Canopy Bulk Densities (CBD) and would have a direct affect to reducing fire behavior potential by elevating the torching indices and crown fire thresholds.

Handpiling would occur primarily in units not identified as harvest units unless the harvest units are inaccessible to ground based machinery because of steep slopes. Treating existing surface fuels and activity created fuels reduces surface fuel loadings and changes surface fuel models, thus reducing flame length potential and undesired fire effects to residual stands.

Machine piling would occur primarily in Harvest Units unless areas are inaccessible to ground based machinery because of steep slopes. Treating existing surface fuels and activity created fuels reduces surface fuel loadings and changes surface fuel models, thus reducing flame length potential and undesired fire effects to residual stands.

Lop and Scatter treatments would occur in areas with relatively low levels of thinning slash. Fuel loadings are low enough allowing surface fuels to be treated with prescribed fire during underburning operations. Treating these surface fuels changes surface fuel models, thus reducing flame length potential and undesired fire effects to residual stands.

Mechanical Shrub Treatment (MST) would would reduce the surface fuel bed depth and increase CBH. MST treatments will reduce the flame length potential and increase fire tolerance in residual stands.

Pile Burning would occur in areas that have received handpiling or machine piling treatments. Burning the piles is the most economic method of removing slash piles and facilitates the removal of canopy fuels that have been treated with thinning. This treatment is part of the progression for increasing CBH and decreasing which in turn increases the residual stands tolerance to fire.

Underburning would reduce surface fuels, increase CBH, and decrease CBD. The effects from underburning in regards to fire behavior, is that potential flame lengths would decrease and the stands resistance to fire would increase. Because of the changes to CBH and CBD there is a lower probability for crown fire initiation.

In Deer Winter Range it is anticipated that on average 50 to 60 percent of the area within treatment units would be mowed and burned by prescribed fire, retaining the remaining 40 to 50 percent as untreated open grown bitterbrush. Additional treatments include precommercial thinning, handpiling, and pile burning.

The proposed treatments in Deer Winter Range would reduce natural fuel accumulations at the base of individual trees and under groups of trees. Where ponderosa pine is widely scattered this treatment would not reduce the risk of large acreage wildfires occurring due to contiguousness of untreated bitterbrush, but it would provide some protection for the mature trees. Under extreme fire behavior conditions, fires within these treated areas with untreated areas containing high brush densities would burn intensely and long range spotting would likely create control problems.

Fuels treatments in lodgepole pine would alter fuel conditions so that fires burn primarily in the surface fuels with slower rates of spread and lower intensities when compared to the fire behavior potential with existing conditions. Fuel treatments will not eliminate the possibility of fire occurring within these stands. With fire in these stands, lodgepole pine being a thin barked species, will likely suffer high mortality (stand replacement) during future fire events.

Fuels treatments in ponderosa pine would alter fuels conditions to levels where subsequent fires burn primarily in the surface fuels with the exception being wildlife leave islands (10 or 20 percent of treatment unit area) where once fire enters these areas, dense thickets of small diameter trees reserved for wildlife cover would provide a ladder of fuel for surface fire to transition into tree crowns with crown fire and the development of fire brands increasing spot fire potential.

On prescribed burn units, in efforts to reduce fire behavior potential mowing treatments may occur on unit perimeters and generally be 12 feet and less in width from existing roads edges or unit boundaries. Mowing would be accomplished utilizing ground based machinery.

Proposed treatments would reduce the risk of large acreage losses from wildfire by disconnecting and fragmenting continuous high risk ground fuels. These treatments would reduce untreated block size and provide areas where suppression resources have opportunities to safely anchor fireline, increasing the chances for control of subsequent wildfires.

Canopy Fuels

Table 23 displays canopy attributes which contribute to fire behavior and the changes in the attributes for each prescription group and by alternative.

Table 23: Canopy Fuels Characteristics by Alternative

Harvest Prescription Group	Canopy Base Height (feet)			Canopy Bulk Density (kg/m³)		
	Alternative					
	1	2	3	1	2	3
1	10	33.8	33.5	.073	.019	.019
2	10.7	28.3	28.3	.083	.022	.022
3	7	26	26	.053	.024	.024
4	7.2	36.3	32.1	.067	.017	.017
5	7.2	36.3	32.1	.067	.017	.017
7	9.5	11.5	22	.046	.029	.027
8	9.5	11.5	22	.046	.029	.027
10	7.2	36.3	32.1	.067	.017	.017
20	10.2	13	13	.075	.053	.053

In both action alternatives, the increase in "Canopy Base Heights" will reduce tree torching because the treated stands now require longer flame lengths to initiate torching. The reduction in "Canopy Bulk Densities" reduces crown fire potential by making tree to tree crown fires less probable.

Fire Behavior

Flame Length: Table 24 displays the comparison of the three alternatives after modification of surface fuels, canopy base height, and canopy bulk density. Flame length is expressed in feet . Percent of area is the area within the project area boundary that displays the various flame lengths.

Table 24: Flame Length by Alternative and Percent of Area

Flame Length (ft)	Alternative – Percent of Area [1]		
	1	2	3
0 - 4	12	73	67
4 - 8	87	26	32
8 - 12	Less than 1	Less than 1	Less than 1
12 or more	Less than 1	Less than 1	Less than 1

1. Percent of area is within plus or minus 1%.

Treatments in Alternative 2 increase the total amount of the landscape which will support 0 to 4 foot flame lengths to 73 percent; an increase of 61 percent when compared to existing conditions. This change comes primarily by reducing the amount of flame lengths in the 4 to 8 foot range to 26 percent (down 61 percent) of the area.

In Alternative 3, the total amount of area that supports 0-4 foot flame lengths is 67 percent; an increase of 55 percent compared to existing conditions. Again, this is primarily because of reducing the amount of flame lengths in the 4-8 foot range to 32 percent (down 55 percent) of the area. As referenced in Table 18, page 62 a fire with flame lengths less than 4 feet can easily be attacked at the head or flanks by firefighters.

Fire Type: Table 25 displays fire type and compares the three alternatives after modification of surface fuels, canopy base height, and canopy bulk density. Percent of area is the area within the project area boundary that displays the various fire types.

Table 25: Fire Type by Alternative

Fire Type	Alternative – Percent of Area [1]		
	1	2	3
Surface	22	77	73
Passive	77	22	26

1. Percent of area is within plus or minus 1%.

Treatments in Alternative 2 increase the total amount of the landscape which will support surface fire to 77 percent; a substantial increase of 55 percent when compared to existing conditions. This is directly related to reducing the amount of passive crown fire to 22 percent (down 55 percent) of the area.

In Alternative 3, the total amount of area that supports surface fire is 73 percent; an increase of 51 percent compared to existing conditions. Again, this is because of reducing the amount of passive crown fire to 26 percent (down 51 percent) of the area.

Rate of Spread: Table 26 displays rate of spread and compares the three alternatives after modification of surface fuels, canopy base height, and canopy bulk density. Percent of area is the area within the project area boundary that displays the various rates of spread

Table 26: Rate of Spread by Alternative

Rate of Spread (chains/hour)	Alternative – Percent of Area [1]		
	1	2	3
<5	8	64	60
5-15	42	14	13
15+	50	22	27

1. Percent of area is within plus or minus 1%.

Treatments in Alternative 2 increase the total amount of the landscape which will support a fire rate of spread of 5 chains (one chain equals 66 feet) per hour and less to 64 percent; an increase of 56 percent when compared to existing conditions. This is directly related to reducing the rates of spread in the 5 to 15 chains per hour and 15 or more chains per hour categories to 14 percent and 22 percent of the area respectively; a reduction of 28 percent each. Of the project area, 36 percent has a rate of spread greater than 15 chains per hour.

In Alternative 3, the total amount of area that supports rates of spread 5 chains per hour and less is 60 percent; an increase of 52 percent compared to existing conditions. Again, this is because of reducing the rates of spread in the 5-15 chains per hour category to 13 chains per hour (down 29 percent), and reducing the 15 or more chains per hour category to 27 percent (down 23 percent). 40 percent of the area has a rate of spread greater than 15 chains per hour.

By reducing the rate of spread, fires would burn with less intensity and implementation of the Brothers Wildfire Use Plan for resource benefit would be more likely to successfully occur.

Fire Effects to Ponderosa Pine

Fire damage to the crown and bole influences a tree's probability of surviving fire. Previous studies have consistently ranked crown damage, usually crown scorch or consumption, or a combination, as important to predicting postfire mortality of ponderosa pine trees (Dieterich 1979, Wyant et al. 1986, Saveland and Neuenschwander 1990, Stephens and Finney 2002, Wallin et al. 2003, McHugh and Kolb 2003, McHugh et al. 2003).

Most mortality models developed for mixed conifer and ponderosa pine forests have used variables that characterize above-ground damage from fire (scorch height, bark char height, percent crown volume scorched). These variables are related to flaming combustion and fireline intensity (Stephens and Finney 2002).

BehavePlus 3.0.2 is a fire modeling system that is a collection of models that describe fire behavior, fire effects, and the fire environment, and has been used to determine crown scorch based on flame lengths for the planning area. 97th percentile weather attributes (temperature and winds) were used with a .4 mid-flame wind reduction factor to account for treated stands providing less sheltering to the wind. Table 27 displays flame lengths and associated scorch heights.

Table 27: Flame Lengths with Associated Scorch Heights in 97% Weather Conditions

Flame Length (feet)	2	3	4	5	6	7	8	9	10	11	12
Scorch Height (feet)	6	14	25	38	52	67	83	100	117	136	155

Ponderosa Pine Mortality

The principal cause of mortality following fire is crown scorch rather than damage to the cambium or roots. The size of tree determines its ability to withstand scorch. A model has been developed to predict mortality using tree dbh and scorch heights as independent variables. Fire effects are also dependent upon other factors such as season, site condition, tree age and vigor, available moisture, and occurrences of insect and disease attack (Saveland, Neuenschwander 1989).

Table 28 focuses on the 7 to 14 inch dbh tree size class to illustrate the relationship between tree diameter at breast height (dbh), flame length, and mortality.

Table 28: Probability of Mortality in Ponderosa Pine by DBH and Flame Length (%)

Tree DBH (inches)	Flame Length (feet)							
	1	2	3	4	5	6	7	8
7	1.7	2.6	6.2	20.8	86.9	100	100	100
8	.6	1	2.4	8.1	33.6	100	100	100
9	.3	.4	.9	3.1	13	60.7	100	100
10	.1	.2	.4	1.2	5	23.5	100	100
11	.04	.06	.1	.5	2	9.1	47.2	100
12	.01	.02	.05	.2	.8	3.5	18.3	100
13	.01	.01	.02	.07	.3	1.4	7.1	41.7
14	0	0	.01	.03	.1	.5	2.7	15.9

All diameters within this size class survive reasonably well when flame lengths are less than 4 feet. As flame lengths increase so does the mortality rate, especially in the smaller diameter trees. Trees in the size classes less than 7 inches dbh are not included in this mortality analysis because of their inherent vulnerability to scorch and it's assumed that flame lengths in the 0–4 foot range will generally cause high mortality in these size classes of ponderosa pine. At the other end of the diameter spectrum is ponderosa pine greater than 14 inches dbh. Larger diameter pine is not further analyzed and is assumed to have a high survival rate with flame lengths up to 8 feet'.

The following table compares treatment effects to flame lengths for each size class in ponderosa pine units for Alternative 2 and Alternative 3. This analysis was modeled in FlamMap with GIS information. Output acres are a compilation of 30m² pixels representing the dominant flame length and size class within each pixel. Pixels were then stratified by size class and flame length, and summed by acres. The acreage amounts represent how much of a condition is distributed throughout the treatment units.

Table 29: Alternative 2 (Proposed Action) and Alternative 3 Flame Length by Size Class in Ponderosa Pine Units

Deadlog Flame Length by Size Class in Ponderosa Pine Units					
Size Class	Flame Length (ft)	Alternative 2		Alternative 3	
		Pre-treatment Acres	Post-treatment Acres	Pre-treatment Acres	Post-treatment Acres
0-4"	0-4	58	94	52	84
	4-8	37	2	35	3
	8-12	0	0	0	0
	12+	0	0	0	0
4"-7"	0-4	32	741	30	561
	4-8	778	76	599	71
	8-12	4	0	3	0
	12+	2	0	1	0
7"-14"	0-4	290	1743	295	1335
	4-8	1445	22	1042	20
	8-12	9	0	7	0
	12+	21	0	11	0
14"-21"	0-4	678	5360	684	5521
	4-8	4644	21	4803	21
	8-12	56	0	53	0
	12+	2	0	2	0
21"+	0-4	206	2201	209	2279
	4-8	1986	7	2062	7
	8-12	14	0	14	0
	12+	2	0	2	0

Following treatments, the amount of area that supports flame lengths less than 4 feet, in all tree size classes, has been increased significantly in Alternative 2 and Alternative 3. The amount of area that supports flame lengths in the 4-8 foot range has been significantly reduced in both action alternatives. The amount of area that supports flame lengths longer than 8 feet is eliminated from treated units in both of the action alternatives.

For Alternative 2, after treatment, 10,139 acres within treatment units would support flame lengths less than 4 feet; an increase of 8,875 acres compared to existing conditions. 129 acres of the area within treatment units would support flame lengths between 4-8 feet; a decrease of 6,775 acres. Of the 129 acres with 4-8 foot flame lengths, 78 acres is comprised of fire vulnerable trees less than 7 inches dbh ponderosa pine distributed throughout the treatment units. The potential for flame lengths longer than 8 feet is not great enough to round up to a whole number and is represented as 0.

For Alternative 3, after treatment there would be 9,870 acres within treatment units would support flame lengths less than 4 feet; an increase of 8,809 acres compared to existing conditions. 122 acres of treatment units would support flame lengths between 4 and 8 feet; a decrease of 6,350 acres. Of the 122 acres with 4 to 8 feet flame lengths, 74 acres is comprised of fire vulnerable less than 7 inch dbh ponderosa pine distributed throughout the treatment units. The potential for flame lengths longer than 8 feet is not great enough to round up to a whole number so it's represented as 0.

Under both action alternatives there is a substantial increase in the amount of area that supports less than 4 foot flame lengths. As reference in Table 24, page 68, a fire with flame lengths of less than 4 feet can easily be attacked at the head or flanks by firefighters.

Prescribed Fire Maintenance Treatments

Prescribed fire treatments will need to be maintained over time to manage natural fuels to levels which are conducive to low intensity surface fire. The Fire Behavior Prediction System Fuel Models most commonly associated with low flame lengths are (Anderson 1982):

- 2 (timber or brush with grass understory),
- 5 (low brush)
- 8 (short needle conifer litter, light loading), and
- 9 (long needle conifer or hardwood litter).

The need for maintenance treatments would be based on fuels accumulations. It is anticipated that prescribed fire units would need additional treatments 3 years to 10 years following the initial prescribed fire treatment. Maintenance treatments would focus primarily on reducing natural fuels in the 0.0 to 3.0 inch size classes and reducing the amount of understory seedlings and saplings.

Air Quality

Fuel loadings for surface fuels have been estimated for each stand using the "Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest", PNW-105 (Maxwell, Ward, 1980). Canopy fuel loads have been estimated utilizing stand data and "Forest Vegetation Simulator" (FVS). Total emissions have been estimated by combining surface fuel loading data with canopy fuels and utilizing the "Prescribed Burning Emissions Calculation Matrix – Simple Method" (Peterson, year unkown).

Underburning in ponderosa pine stands is currently the most economical method of reducing surface fuel loadings in the Deadlog Area.

Alternative 1 (No Action)

Direct and Indirect Effects: Under wildfire conditions, factoring in both canopy fuels and surface fuels, emissions could be 560 pounds and greater of PM 10 per acre due to the extent of consumption and the torching and crowning of tree canopies.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Prescribed fire smoke emissions created from underburning and pile burning are of concern and would produce approximately 214 pounds of particulate matter 10 microns (PM 10) and less in size per acre.

Table 30 displays the estimated total tons of emissions in both PM 2.5 and PM 10 for each action alternative. PM 10 estimates account for all particulate matter 10 microns and smaller; PM 2.5 emissions are included with PM 10, thus the PM 10 estimates should be interpreted as the total tonnage of emissions smaller than 10 microns for the project area.

Table 30: Emissions by Alternative

Alternative	Emissions (tons)	
	PM 2.5	PM 10
2	956	1,087
3	1,063	1,208

Burning would be conducted in compliance with National Ambient Air Quality Standards and Oregon Department of Forestry Smoke Management regulations and restrictions. Burning would occur during favorable weather conditions, with the transport winds necessary to disperse smoke away from populated areas.

Cumulative Effects: Cumulative Effects of foreseeable activities in the area are primarily beneficial to reducing fire behavior potential and improving firefighter safety. Table 31 identifies the foreseeable activities in the Deadlog vicinity and the expected effects for fire and fuels.

The effects of fuels treatments in the Deadlog area are geographic in scope and limited to the stands that are treated; therefore cumulative effects are addressed at the stand level. The timeframe is approximately 15 years because effects from fuels treatments are no longer detectable after that amount of time. Cumulative effects would then be the potential within that time and space to accumulate or interact with effects from other ongoing or reasonably foreseeable projects.

Table 31: Cumulative Effects

Activity/ Project	Action Description	General Effects
KO Timber Sale Reforestation maintenance	Fence Maintenance or removal and Big Game Repellant application. Dwarf Mistletoe control Pruning and Girdling.	Pruning will raise canopy base heights, thus increasing the stands tolerance to fire. Snags created by girdling may produce fire brands and spot fires when exposed to fire.
Wildlife Improvement Maintenance	Guzzler maintenance on two guzzlers.	No fire and fuels effects.
Cluster II Grazing allotment EA 2006.-Grazing allotment Maintenance and Improvement	Fence Repair, Fence building, Water sets, Cattle Grazing, waterline installation and maintenance.	Grazing reduces the accumulation of fine fuels thus reducing fire behavior potential.
Aspen Project Fuels Treatments	Adjacent to planning area Machine Shrub treatment and thinning.	Fuels treatments will reduce fire behavior adjacent to the deadlog area and will affect fire movement across the landscape.
Buick Project Fuels Treatments	Adjacent to SW tip of planning area. Small tree thinning, handpiling, burning, underburning and Machine Shrub treatment.	Fuels treatments will reduce fire behavior adjacent to the deadlog area and will affect fire movement across the landscape.
Brothers Wildfire Use Area	Use of wildfire to meet resource objectives through area.	The reduction of surface fuels and ladder fuels will enable wildfire to play a more natural role across the landscape while meeting resource objectives.
Road Maintenance	Ongoing road maintenance. Danger tree removal, roadside brushing, drainage repair, spot surfacing.	Maintaining roads will enable fire resources to access the area. No fuels effects.
Travel Management	Travel Management EIS possible signature within 2 years. Shared use roads.	Closing roads will limit access for fire fighting resources. Fires will move across the landscape as roads grow over.
Green Dot road Closure	Administrative closure of roads Hunting season.	No fire and fuels effects.
Opal mine	Opal mine operations on mine claim including camping site.	Evacuation issues during wildfires. No fuels effects.
BPA power line Maintenance	Power line maintenance within right of way includes mowing of brush and seedlings and scattered tree and snag removal. Outside of the right of way individual hazard trees would also be removed. Cycle varies 3 - 5 years.	Power line maintenance will provide a fuel break which may be of use when suppressing wildfires.

FOREST VEGETATION – TREES

EXISTING CONDITION

The Deadlog area is dominated by ponderosa pine stands with some stands dominated by lodgepole pine. The area is characterized as being dry with average precipitation levels below 15 inches per year. This dry zone historically was dominated by ponderosa pine and conditions which allowed frequent fires causing little stand level mortality. The stands were characterized by widely spaced large diameter trees, grass and forb dominated understories, low susceptibility to bark beetle outbreaks and low levels of mistletoe infection. There are some historical records which document some of the Deadlog area at the turn of the Century. A survey by township in 1913 of the T23S, R15E gave a description. “Pure yellow pine, with exception of about a section of lodgepole in northeastern part. Yellow pine 31,100 MBM. saw timber. Very little reproduction of any kind.... Fire damage, none” (Cogder 1913). A more eloquent description of T22S, R15E and 16E which is the northern half of the area from 1902 reads:

“The soil, which was of a pumice stone formation, with a solid foundation, and covered with a heavy growth of wild grass about four inches high, was very prolific. The timber embraced one of the finest bodies of yellow pine anywhere, the trees being very uniform in size, averaging about three feet in diameter, and running from 50 to 75 feet to the first limb, indicating the quantity of clear lumber each tree would produce. All appeared perfectly sound, and I do not believe there was a windfall on the entire tract.” (Puter 1908)

The distribution of the large ponderosa pine on the landscape and other general stand conditions are generalized through a few studies of stands and the arrangement of large trees and stumps. Locally Youngblood (Youngblood et al 2004) has analyzed stands in central Oregon while Agee (Agee 2003) and Arno (Arno 1995) have analyzed stands in Washington and Montana. The same theme carries through each study with trees spread throughout the area with few smaller young trees, fire scars indicating frequent fire, gaps and clumps of trees at varying frequency. One characteristic which does follow between the reports is the lessening of clumps and increase in random placement of trees with lower precipitation areas. This would be expected with increased competition for moisture and increased stress on closer spaced trees (Agee 1993).

Past Management

The area has had different management activities over the decades. Portions of the area were owned by Brooks Scanlon Timber Company and were logged heavily before 1930. These properties were obtained by the Forest Service between 1934 and 1941 and constitute more than 5,200 acres (33 percent) of the Deadlog Planning area. The whole area has been managed by the Forest Service since the 1930s. Management has included partial cutting of at risk trees, regeneration harvest of mistletoe infected stands, commercial and non-commercial thinning of younger stands of ponderosa pine and fire reintroduction and suppression. The area where partial cutting of at risk trees covers the most area and was conducted mostly in the 1960s, Regeneration harvests has occurred on a smaller area and was conducted from the late 1960s into 1980s. Thinning of stands especially those established following the harvest activities in the 1920s and 1930s covered the most area. Grazing and fire suppression, has resulted in the stocking of large areas, due to natural regeneration, with 50 to 90 year old trees of varying densities.

Current Stand Conditions

Ponderosa pine dominates the area with most trees being less than 16 inches diameter. Understories are dominated by higher fuel loads than historically occurred including in many stands, bitterbrush, manzanita and ceanothus while many stands which have large overstory trees have heavy stocking of small diameter ponderosa pine and lodgepole pine. Mistletoe infection is high and widespread through many stands. These stands have a preponderance of trees which are smaller diameter than historically were present. These stands are also stocked with more trees than were present historically. The density of stands ranges from 200 to 500 trees per acre where historically large trees had densities less than 60 trees per acre (Arno 1995 and Youngblood 2004). The species composition in the majority of the Deadlog area (except for cold air drainages) was ponderosa pine. The majority of stands in the Deadlog area have some lodgepole pine throughout.

Methodology for Selecting Treatments Areas

Selection of areas for silviculture treatment was based on a focus factor of ponderosa pine and lodgepole pine stands which were susceptible to insect attacks. Tree density is a main factor for susceptibility to bark beetle outbreak and mortality which can be managed (Cochran 1994). These stands included stands which were established following the heavy harvests of the 1930s (blackbark stands as defined in USFS 1990) and stands with large overstory trees where the understory grew in since the reduction of wildfire. Stands with large tree overstory and small tree understory where stocking is high were selected in order to sustain and increase vigor of the large trees and maintain old tree or old growth on the landscape (Kolb et al 2007, Ritchie et al. 2007, McDowell et al 2003).

Stands which are the most susceptible to insect outbreak and mortality were selected. Some stands were dropped following field review if they had too much mistletoe to be manageable. Further stands for treatments were selected for fuels needs. This was identified as stands which if treated would bring the landscape back into a more frequent fire interval and stands which in their current fuels condition would not survive a wildfire. These stands were selected using the methodology of location and stand characteristics which would lend a stand to high mortality with a wildfire. The fuels characteristics assessed were surface fuels, ladder fuels and crown fuels. The fuels in that order affect the fire resistance for dry forests (Agee 2005). Many of these stands, in order to facilitate the implementation of fuels treatments, were identified as having a need to reduce the stocking level in order to reduce crown and ladder fuels. Open ponderosa stands were selected for treatments though in portions the ladder and crown fuels were not a problem. Returning these stands to light surface fire conditions to conserve them was the objective (Spies et al. 2006).

METHODS FOR COMPARING STAND CONDITION

The existing conditions discuss the characteristics which are used to compare alternatives and whether the alternatives move toward the desired condition. For forest vegetation three main themes for existing condition are discussed:

- Stand resistance to insects and disease
- Comparison to historic condition
- Stand resistance to fire mortality.

STAND RESISTANCE TO INSECTS

Introduction

As occurs today, continuous acreage of young trees (less than 200 years) were historically uncommon on the Deadlog landscape. Historically, in ponderosa pine types, small areas of stand replacement fires occurred in pockets of mortality resulting from insects and disease. When stand replacement events did occur the stand would be replaced in small areas and scattered remnant trees would remain through the stand as seed sources (Arno 1995). The stands were typically characterized by widely spaced large diameter trees with grass and forb dominated understories. These stands had low susceptibility to bark beetle outbreaks and were considered as light to moderate an epidemic when mortality was 50 to 200 trees per section (640 acres) (Grant 1939). This level of mortality is the same as one tree per 3 to 12 acres. Presently, in stands with large diameter trees and heavy stocking, the mortality of the large tree component is higher than 2 trees per acre. Refer to Figure 13 showing large tree structure.

Stand resistance to insects, primarily bark beetles, is mostly related to tree vigor and density. The amount of moisture allowed for a stand must be apportioned to all the plants and trees growing on a site. The lower the moisture levels in a stand for the same tree density the less resilience to insects attack and mortality. Plant associations indicate the level of moisture and soil depth. This helps identify the tree stocking levels which are not susceptible to beetle mortality (Cochran 1994). Mistletoe infection in stands has also been observed to increase stand susceptibility to bark beetle mortality.

Competition between trees is identified through stand density. Mountain pine beetle and western pine beetle historically impacted different stand types.

Throughout the Deadlog planning area mountain pine beetle mortality is commonly found in all stand types including lodgepole pine, ponderosa pine, mixed species stands and both managed and unmanaged stands. Mountain pine beetle is strongly associated with mortality in lodgepole pine stands which have at least 100 trees per acre greater than 9 inches dbh. This occurrence can be at the clump, stand or landscape level for trees to be affected. More currently, mountain pine beetle is associated with tree mortality in heavily stocked ponderosa pine stands, both older and younger (blackbark), and large diameter and smaller diameter trees, which have a component of lodgepole pine. Scattered clumps are now, occasionally, extending to the stand level of mortality.

Western pine beetle will typically attack larger diameter ponderosa pine where densities are high for clumps. The large diameter mortality may occur to the least healthy tree or a larger tree. The number of trees in clumps which die can be singular or can include the whole clump (Personal Communication Eglitis).

Scope and Scale of Analysis

The scope of the analysis for resistance to insects, primarily bark beetles, focuses on the condition within each stand. The overall landscape of the Deadlog area susceptible to mountain pine beetle is analyzed for each alternative.

Measures

Stand Density Index (SDI) and Basal Area (BA) are two methods for comparing the level of vegetation on a site. Competition, especially between trees, is identified through stand density. Higher tree density in a stand means more competition and less resistance to insect and disease. Stand densities in lower moisture areas have relatively higher competition than the same densities on higher moisture areas. SDI values in different plant associations will have different competition and stress inferences (Cochran 1994). SDI values and BA ranges for each plant association that are above levels where beetle mortality or outbreak may occur are shown in Table 32.

Table 32: Deadlog Plant Associations and Associated Basal Areas

Plant Association Group	Plant Association	Acres	Upper Management Zone [1] /BA [2]
Lodgepole Pine	Fescue	62	
	Sage/ Fescue	1,275	
	Bitterbrush/ Fescue	1,608	137/ **71-83**
Mixed Conifer	Snowbrush-manzanita	83	143/ **74-87**
Ponderosa Pine	Bitterbrush- Sage/ Fescue	1,369	73/ **38-44**
	Bitterbrush/ Fescue	6,226	115/ **60-70**
	Bitterbrush/ Needlegrass	14	111/ **57-67**
	Bitterbrush – Manzanita/ Needlegrass	103	92/ **48-57**
	Bitterbrush – Manzanita/ Fescue	5,306	124/ **64-75**
	Bitterbrush – Snowbrush/ Needlegrass	6	145/ **75-88**

1. Upper Management Zone – The density level at which a suppressed class of trees begins to develop.
2. Booser & White undated: basal areas ranges 8-16 inches dbh

Methods

Dense ponderosa pine stands were identified using Photo Interpretation (PI) data. Stands identified from the PI data with more than 20% total crown closure were selected as stands which were above the Upper Management Zone (UMZ) for ponderosa pine and susceptible to beetle mortality. Comparison of alternatives uses satellite data from 2004 which has been calibrated to show stand characteristics of similar reflectance where actual stand data is available. The comparison of the pixels which are above the Upper Management Zone and the treatment of stands which will reduce the stand densities to less than the Upper Management Zone. The data description is found on the web at http://www.fsl.orst.edu/lemma/common/dataDictionary.php .

Stand density index (SDI) values were derived and compared with the Upper Management Zone for the plant associations. This information identified 56% of the area as over the threshold of resistance to bark beetle attack. This does not include areas which are near the upper management zone and may be at risk within a decade.

For more detailed description of methods, refer to the Project Record, Silviculture Report, page 19.

Existing Condition

Stands of blackbark pine that were established in the 1920s and 30s, which have not been managed, tend to be dense stands of poles with heavy fuels from beetle mortality. The fuels are mostly lodgepole pine from previous infestations; however ponderosa pine mortality is becoming more common due to tree stress. Managed stands of ponderosa pine have been precommercially or commercially thinned and are now 60 – 130 square feet of basal area. These stands have responded to lower stocking levels with increased growth, crown volume and understory tree and brush establishment.

Stands which have a component of large old trees typically have been partially harvested since 1940. With limiting fire, good overstory seed production and an even more open condition, the understory of most stands in the area currently have heavy understory tree densities. The understory trees are a mix of ponderosa pine and lodgepole pine and all size classes from seedlings and saplings to larger 20" diameter trees. The stocking levels and species mix in both types of ponderosa stand leave the stands susceptible to beetle attack.

Figure 13: Large Tree Structure Representing Reference Conditions

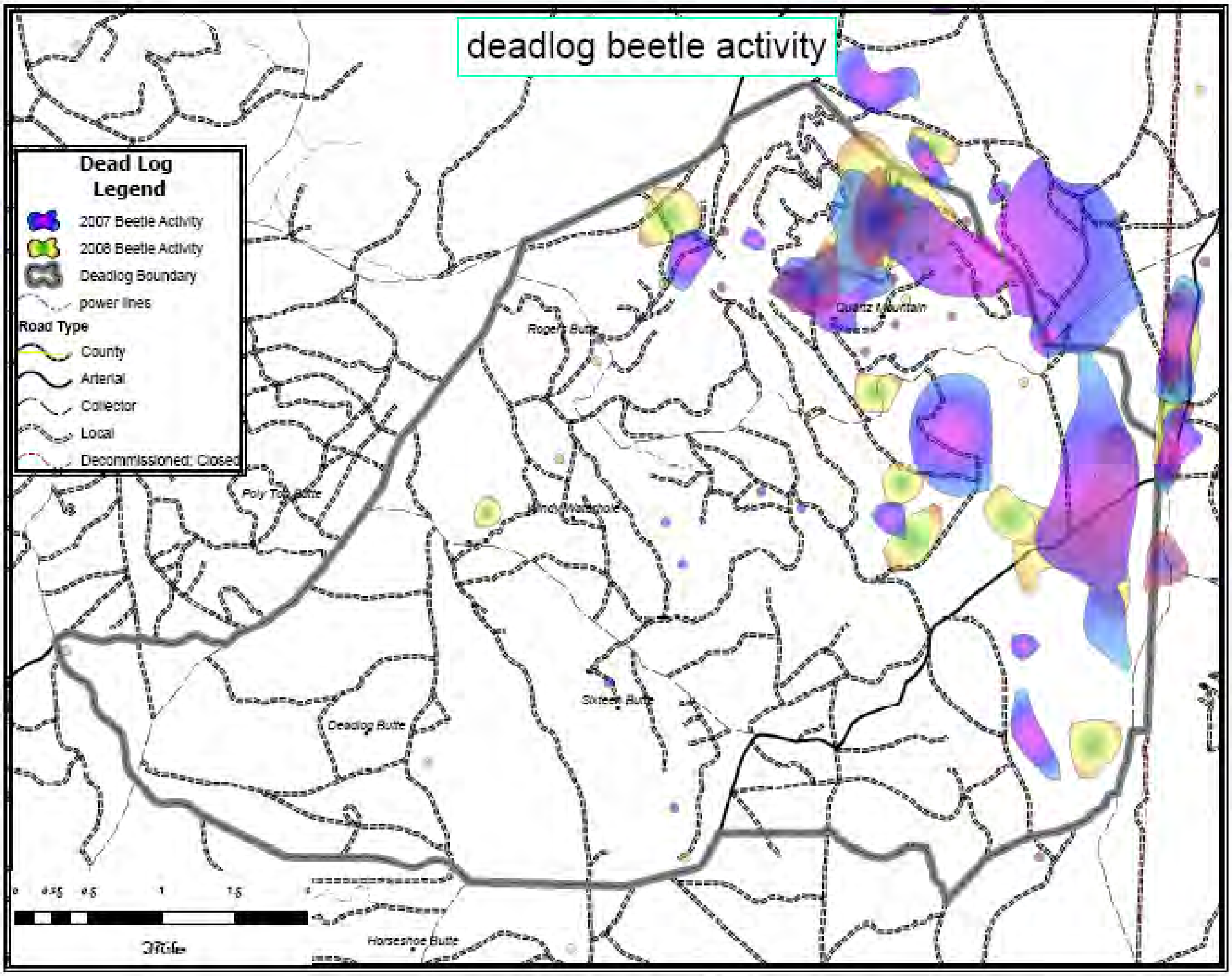
Figure 14: Typical Blackbark Existing Conditions - Deadlog

The current condition in Deadlog planning area is an area dominated by overstocked stands with reduced vigor and high susceptibility to bark beetle mortality or outbreak. Currently mountain pine beetle and western pine beetle are infecting stands and causing mortality throughout the planning area. Aerial surveys mapping beetle infestations identified 227 acres of beetle infestation in 2006, 1,594 acres in 2007, and 1,127 acres in 2008. This impact is occurring in lodgepole pine, ponderosa pine and mixed lodgepole and ponderosa pine stands. This infestation is dominated by mountain pine beetle though areas of western pine beetle mortality were identified mostly causing mortality to large trees. Field visits have identified 30% of the stands with some level of beetle mortality; 51 percent of the stands visited had some stocking of lodgepole pine. Combined, 57 percent of the stands had beetle mortality and/or lodgepole pine present in the stand. These two factors alone identify a large part of the planning area with risk to mortality from bark beetles.

Typically, the mountain pine beetle attacks trees less than 16 inches in diameter. Mountain pine beetle causes substantially less mortality of trees greater than 16 inches dbh. If lodgepole pine is present all tree sizes can be affected. Dense stands of ponderosa pine blackbark trees are susceptible with or without lodgepole pine present. The mortality in these conditions will include the largest trees in the stand, extending the time where stands are dominated by large trees.

Western pine beetle tends to attack the larger older ponderosa pine. Within dense old tree clumps the impacts of western pine beetle can be highly variable and it is hard to predict which trees would be attacked. Mortality should tend to be in the less vigorous trees, although there are many examples of healthy tree mortality. Typically, one or two trees in a clump are killed even though a whole clump can be killed.

Figure 15: Deadlog Beetle Detection Survey



ENVIRONMENTAL CONSEQUENCES

Summary of Comparison of Alternatives

Alternative 1 (No Action) leaves the area as it is with beetle activity and mortality rising. Alternative 2 (Proposed Action) and Alternative 3 would reduce the area susceptible to mortality for about two or more decades. Alternative 2 treatments would have longer effectiveness in the stands with large old trees. Shorter effectiveness in Alternative 3 is due to leaving all trees with old tree characteristics with few exceptions, heavy stocking in clumps not being one of those exceptions. Though not treating all the same acres, both action alternatives would have a similar landscape effect on stand vigor and sustainability.

Alternative 1 (No Action)

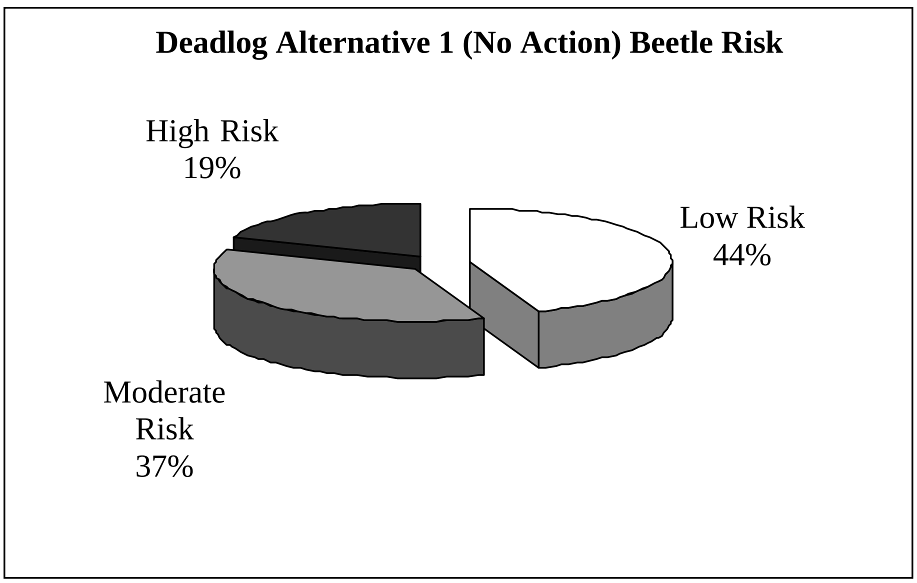
Direct and Indirect Effects: The No Action alternative would keep the Deadlog Planning area in the same condition as it is in now. The current level of beetle risk would remain the same and the current level of beetle mortality in all size groups of ponderosa pine and lodgepole pine would accelerate. This wide impact of bark beetle can be expected to continue because of high stand densities and the intermixing of lodgepole pine in ponderosa pine stands. Bark beetle mortality would reduce the number of large overstory old trees on the landscape and increase the time it takes for other stands to develop large tree structure.

The area at risk to beetle mortality based on SDI is shown in Figure 16. This is based on analysis using satellite imagery and comparing the upper management zone SDI of the plant associations. This risk is increasing as stand densities increase with tree growth. High Risk was identified was greater than 175 percent of the upper management zone SDI. This level of stocking is where current beetle mortality was consistently observed in the Deadlog planning area.

Lodgepole pine seems to attract attack even when scattered through a unit. These attacks have been observed on the Deschutes National Forest to instigate mortality of adjacent ponderosa pine of all diameters and commonly trees larger than 16 inches dbh.

Bark beetle mortality can expect to continue to cause lodgepole and ponderosa pine mortality in all size trees. This has good potential to deplete the old large diameter trees throughout the planning as well as reducing the average diameter of the remaining stand. This would delay the growth of ponderosa pine into larger diameter classes through reduce growth of trees from competition and mortality of larger trees. Modeling of stand exam data shows that all stands where exams were available were above the upper management zone and would remain at beetle risk until some form of mortality changes the stand density.

Figure 16: Alternative 1 (No Action) Display of Area at Risk to Beetle Mortality



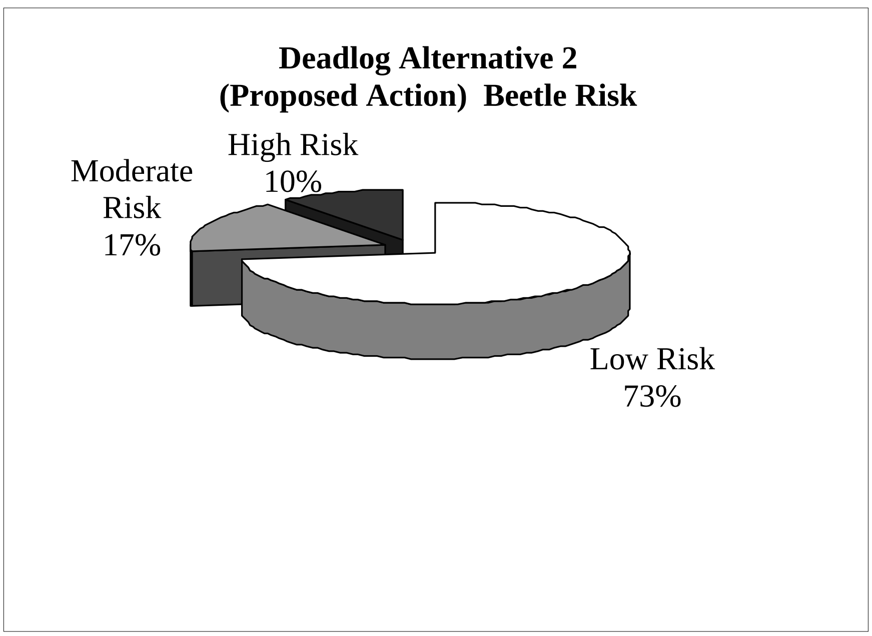
Alternative 2 (Proposed Action)

Direct and Indirect Effects: This alternative would treat 6,919 acres of ponderosa pine and lodgepole pine to levels which would reduce stocking levels and bark beetle mortality risk. By reducing stand density and removing lodgepole pine where possible within ponderosa pine stands, risk to bark beetles would be reduced for at least two decades. Reduced risk and mortality would promote large tree survival and recruitment in small diameter stands into the larger diameter groups more quickly.

The area at risk to beetle mortality following treatments is shown in Figure 17, showing a change of nearly 30 percent of the area into a low risk category. This does not show the reduction of risk within the low risk category. Stands where treatments occur tend to have a concentration of moderate and high risk but also have areas where within a decade or less they would be at risk. Whole units would have the density reduced, except for areas set aside for wildlife habitat or resource protection.

Beetle activity would be expected to be noticeably reduced. High density stands would be reduced by at least 30 percent, but would continue on 10 percent of the area (refer to Figure 17) due to the need for wildlife corridors, protection areas, and habitats which are uncommon on the landscape. Both moderate and high risk identified areas are scattered through the planning area and are not in concentrations which would justify treating all these areas, leaving approximately 73 percent of the area at low risk to beetle mortality.

Figure 17: Display of Alternative 2 (Proposed Action) Area at Risk to Beetle Mortality – Post Treatment



Enhancement of the lowered beetle risk in ponderosa pine stands would occur through the removal of lodgepole pine in mixed stands of ponderosa and lodgepole pine. Ponderosa pine treatments would occur on 6,042 acres with 3,715 acres (61 percent) having lodgepole pine removed. This would reduce the risk of ponderosa pine mortality due to beetles attracted to stands with lodgepole pine present.

Further reduction of acres susceptible to bark beetle mortality would occur with overstory and shelterwood harvest in lodgepole pine stands on 490 acres. These regeneration treatments would return the stands to a condition where smaller lodgepole are predominant, reducing beetle risk.

Bark beetle mortality can be expected to be greatly reduced though the moderate and high risk that would continue on 27 percent of the area. This reduction of beetle risk and mortality would occur over a broad area of the planning area. Especially important with the desired condition described in the Eastside Screens is the sustainability of the large trees present on the landscape especially those in stands identified as LOS. Growth of trees into large diameter sizes would be increased due to increased growth response and lowered mortality through stocking level reduction.

Bark beetle susceptibility can be expected to remain in stands where fuels reduction, with no thinning, is prescribed and the current SDI is above the upper management zone SDI. These treatments do not reduce stand SDI where it is above the upper management zone to a level below the upper management zone (Refer to Project Record, Silviculture Report, Table 5, page 27.

Plantation thinning would improve the long term bark beetle resistance. Plantation thinning would typically occur in stands which are not above the upper management zone SDI. Stocking levels would allow at least two decades of growth before the stands enter the upper management zone SDI.

Alternative 3

Direct and Indirect Effects: Alternative 3 would treat 6,488 acres of ponderosa pine and lodgepole pine to reduce stocking levels and bark beetle mortality risk. This reduction similar to Alternative 2 would have a defined effect on the area which is at risk to beetle mortality and would allow future growth of that area without becoming at risk for over two decades. This reduced risk is brought about by reducing stand density and removing where possible the lodgepole pine component of ponderosa pine stands. The reduced bark beetle mortality would promote large trees to survive and recruit the larger trees in small diameter stands into the larger diameter groups faster than leaving them alone. Overall, the benefit to reducing bark beetle susceptibility would be less than Alternative 2 though substantially better than the no action alternative.

The area at risk to beetle mortality following treatments is shown in Figure 18. For the Deadlog planning area this is the same as Alternative 2, a change of 30 percent of the area into a low risk category. What this does not show is the reduction of risk within the low risk category. Stands where treatments occur tend to have a concentration of moderate and high risk but also have areas where within a decade or less they would be at risk. The whole unit except for areas set aside would have the density reduced.

Current beetle activity with Alternative 3 can be expected to be noticeably reduced. High density stands were selected for treatments and would be reduced by at least 30 percent. High risk areas would continue on 10 percent of the area that was avoided due to the need for corridors, protection areas and habitats which are uncommon on the Deadlog landscape. Both moderate and high risk identified areas are scattered through the planning area and are not in concentrations which would justify treatments. Following treatments more than 70 percent of the area would be at low enough densities to be at low risk to beetle mortality. LOS stands in would continue to have pockets of high density old trees, leaving all trees with old tree characteristics. In these stands of LOS ponderosa pine, it is common for the pockets to be well above the upper management zone SDI, remaining at risk to bark beetle mortality. Though some stocking reduction would occur, many of the clumps would remain at risk to bark beetles.

Enhancement of the lowered beetle risk in ponderosa pine stands would occur through the removal of lodgepole pine in mixed stands of ponderosa and lodgepole pine. A total of 5,650 acres in ponderosa pine were examined for treatment with 3,354 acres (59 percent) identified for lodgepole pine removal.

This would likely reduce ponderosa pine mortality due to beetles attracted to stands where lodgepole pine is present. This is slightly less than Alternative 2.

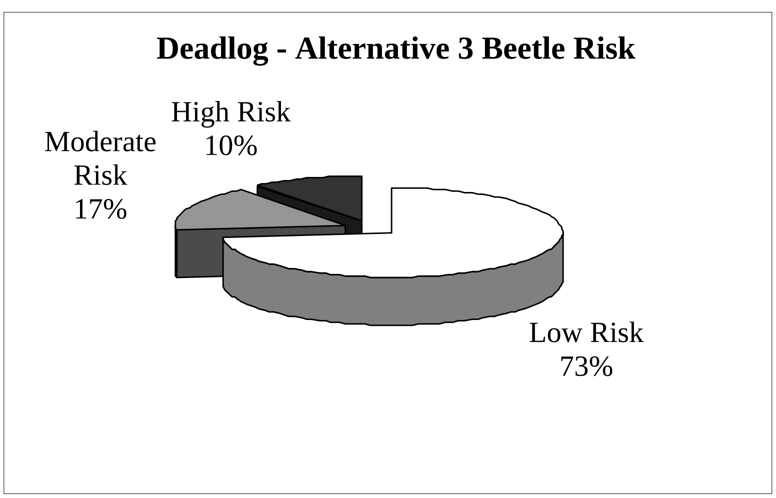
Lodgepole pine overstory removal in lodgepole pine stands would reduce susceptibility to bark beetle mortality on 157 acres. These regeneration treatments would greatly reduce host material size, reducing beetle risk. Commercial thinning of 332 acres of lodgepole stands that are approximately 90 years old would leave the largest diameter lodgepole pine and would not guarantee resistance to bark beetles. These stands would exhibit increased vigor although bark beetles would still target host trees of that size and age. It is uncertain whether beetles would cause mortality in these stands. Observations on the Bend Fort Rock district have shown where thinned lodgepole pine stands sometimes seem resistant to beetles while in other stands heavy mortality occurs despite thinning efforts.

Bark beetle mortality can be expected to be greatly reduced though the risk would still be present on 30 percent of the planning area. This reduction of beetle risk and mortality would occur over a broad area of the planning area. Especially important with the desired condition described in the Eastside Screens is the sustainability of the large trees present on the landscape especially those in stands identified as late old structure. Growth of trees into the large diameter sizes would be increased due to increased growth response and lowered mortality through stocking level reduction.

Commercial thinning would be deferred on 400 acres of steeper slopes; fuels treatments would take place. Bark beetle susceptibility would be expected to remain in stands where fuels reduction is the only action and the current SDI is above the upper management zone SDI. Modeling shows that fuels treatments, focusing on ladder fuels and surface fuels to reduce stocking of trees less than 7 inches dbh, does not reduce stand SDI to a level below the upper management zone SDI. Refer to Project Record, Silviculture Report, Table 5, page 27.

Plantation thinning would improve long term bark beetle resistance. The plantations that would be thinned in Alternative 3 are the same as Alternative 2. Plantation thinning typically would occur in stands that are not above the upper management zone SDI. The stocking levels this treatment would leave would allow at least two decades of growth before the stands would enter the upper management zone SDI. In Alternative 3 biomass would be removed. This would reduce scorch to trees from burning slash. Biomass removal would not cause any difference in the affects of beetle resistance.

Figure 18: Display of Alternative 3 Area at Risk to Beetle Mortality – Post Treatment



COMPARISON TO HISTORIC CONDITION (HISTORIC RANGE OF VARIABILITY – HRV)

Introduction

The Historic condition is based on a landscape level. While any individual stand may be within the historic range of conditions on the landscape, the amount the area which currently matches the conditions which were historically present is the basis of comparison. Within different plant associations, the historic condition was different. This analysis tries to identify the ranges of condition which may have occurred and not just a snap shot at one time. The ranges of condition are considered the Historic Range of Variability (HRV). Historic condition of the vegetation can be classified with four main identifiers. The four identifiers are:

- Average tree age or size
- Stand density
- Species composition
- Fuel loading.

The tree size or age and density have been aggregated into definitions of structure. Structure has been defined in the Eastside Screens into seven levels. The seven levels are stand initiation, stem exclusion open canopy, stem exclusion closed canopy, understory reinitiation, multi-stratum without large trees, multi-stratum with large trees and single stratum with large trees (Refer to Table 33).

Table 33: Structural Stages

Label	Structural Stage	Definition	Description
1	Stand Initiation	Growing space is reoccupied following a stand replacing disturbance. Typically by seral species.	One canopy stratum, one dominant cohort of seedlings or saplings. Grass, forbs, or shrubs may also be present with early seral trees
2	Stem Exclusion Open Canopy	Occurrence of new tree stems is excluded (moisture limited). Crowns are open grown. Canopy is discontinuous. This structure can be maintained by frequent underburning or management	One discontinuous canopy stratum. One cohort of trees. New tree stems excluded by competition. Trees may be poles or of small or medium diameter. Understory shrubs, grasses, or forbs may be present.
3	Stem Exclusion Closed Canopy	Occurrence of new tree stems is excluded (light or moisture limited). Crowns are closed and abrading.	Canopy layer is closed and continuous. One or more canopy strata may be present. Lower canopy strata, if present, is the same age class as the upper stratum. Trees may be poles or of small or medium diameter. Understory shrubs, grasses, or forbs may be present.
4	Understory Reinitiation	A second cohort of trees is established under an older typically seral, overstory. Mortality in the overstory creates growing space for new trees in the understory. Large trees are uncommon.	The overstory canopy is discontinuous. Two or more canopy layers are present. Two or more cohorts of trees are present. Overstory trees may be poles or of small or medium diameter. Understory trees are seedlings, saplings or poles.
5	Multi-stratum, without large trees	Several cohorts of trees are established. Large overstory trees are uncommon. Pole, small, and medium sized trees dominate.	The overstory canopy is discontinuous. Two or more canopy layers are present. Large trees are uncommon in the overstory. Horizontal and vertical stand

Label	Structural Stage	Definition	Description
			structure and tree sizes are diverse. The stand may be a mix of seedlings, saplings, poles, or small or medium diameter trees.
6	Multi-stratum, with large trees	Several to many cohorts and strata of trees are present. Large trees are common.	The overstory canopy is broken or discontinuous. Two or more canopy layers are present. Two or more cohorts of trees are present. Medium and large sized trees dominate the overstory. Trees of all sizes may be present. Horizontal and vertical stand structure and tree sizes are diverse.
7	Single stratum, with large trees	A single stratum of large trees is present. Large trees are common. Young trees arte absent or few in the understory. Park-like conditions may exist.	The single dominant canopy stratum consists of medium sized or large trees. One or more cohorts of trees may be present. An understory may be absent or consist of sparse or clumpy seedlings or saplings. Grasses, forbs, or shrubs may be present in the understory.

Scope and Scale of Analysis

The Eastside screens direct using a large landscape where forest types, environmental settings and disturbance regimes are relatively uniform (USFS 1995). This area is and was fairly similar in responses, plant association, and weather patterns. To the south and east the stands tend to be drier and more prone to contain sagebrush. To the west and north the landscape pattern, soil and weather patterns provide for more lodgepole pine types. Quartz Mountain influences the landscape pattern through the Deadlog area with ridges and draws dominating. Throughout the surrounding landscape simple cinder buttes and flatter topology dominate. The analysis considers the following issue – The classification of structure compared to historic range.

Classification of Historic Structural Stage

The Deadlog planning area was used for comparing the current condition to historical or reference condition. Historical records were used to identify what the distribution of structure types may have been. Three sources of information were used for this analysis. One source is the land survey notes from the original surveys of the area in 1880. A second source was 1930 forest survey data. The methodology for interpreting these two surveys is covered in Appendix B of the Silviculture Report, Project Record. A third source of information is the modeling of the biophysical setting (Bps). The HRV for the Bps was done for ponderosa pine woodland and savanna in the Brothers Wildfire Use Plan (USDI 2007).

Classification of Existing Structural Stage

Stand delineations and stand attributes from the Deschutes National Forest Photo Interpretation (PI) vegetation mapping project were used to classify structural stages in the Deadlog planning area. The vegetation mapping project used 1995 color aerial photos (scale 1:12,000). For details on the mapping project refer to the mapping project report (Forest Data Incorporated, 2001). This information was used to identify stands by their structure where a minimum of 10 large trees (greater than 21” dbh) per acre in contiguous stands greater than 10 acres (USFS 1993) is considered old growth or LOS. The LOS was divided into two groups; multi-canopy or single canopy dominance. The younger and smaller diameter stands were classified depending on the size and density of the trees present in closed canopy, multi-size, understory reinitiation or stand initiation phases. Typically, blackbark stands, if dense, were multi-story stands and thinned stands were understory reinitiation. The choice to place thinned blackbark stands into Understory Reinitiation instead of Stem Exclusion Open Canopy is due to the ensured need of future understory burns to maintain the understory without regeneration. In dry ponderosa pine both structure stages can move towards Single Story with Large Tree Structure Stage. This is detailed in Appendix B of the Silviculture Report, Project Record.

Measures

The structure of the landscape was measured with the current stand condition and the changes of structure by treatments. Fuels only treatments would not change the structural classification. Commercial thinning in blackbark stands would maintain or move these stands into understory reinitiation. Thinning treatments in multi-story stands with large trees would not change the structure identified since all stories would remain only the density would change. Overstory removal treatments would move stands to stand initiation stage.

Reference Condition

The Deadlog area around the time of European settling was dominated by open ponderosa pine stands with large diameter trees. Stands with smaller diameters and dense stocking were few on the landscape. Disease and mortality due to fires or insects were confined to pockets throughout the landscape, few larger than a few acres (Agee 1993). The pockets of mortality would eventually become stocked and would eventually fill in with a new cohort (trees). The open pine condition with fire would keep fuels and disease levels, including mistletoe, and bark beetle outbreaks at a low level. During the 1930s, the start of an outbreak of bark beetles was considered to be when more than 50-100 trees were killed per square mile (Grant 1939). This level is equivalent to less than one tree per six acres. Higher levels of infestation occurred when they were in pockets and was the reason why sampling and reporting occurred over the section. Open stand conditions allows for high vigor with limiting factors being mostly by nutrients and moisture. Stand vigor is tied to beetle mortality resistance and stand sustainability.

Existing Condition

Within the Deadlog Planning area, Table 34 displays the current stratification of Structure. This is done by Plant association though there is less than a determinant amount on the landscape in the Lodgepole pine plant association group being about 10% of the planning area (1,580 acres).

Table 34: Deadlog Stand Structure

Structure	Structure Description	Acres	Current Percent	Ranges of HRV [1]
1	Stand Initiation	1,459	9%	7-18%
2	Stem Exclusion Open Canopy			0-1%
3	Stem Exclusion Closed Canopy	232	1%	0-8%
4	Understory Reinitiation	6,460	40%	0-20%
5	Multi-story without Large trees	5,912	37%	0%
6	Multi-story with Large trees	1,782	11%	10-52%
7	Single Story with Large trees	206	1%	41-69%

1. Refer to Table 8, page 33, Silviculture Report, Project Record for ranges of HRV determinations.

It is estimated that there are 9,205 acres of blackbark in the planning area. This is about 60 percent of the area. Blackbark stands which have been thinned are commonly considered Understory Reinitiation while thick unthinned stands can be considered Multi-story without Large Trees. These two structures dominate the Deadlog landscape.

Comparison of Alternatives

The action alternatives increase the amount of ponderosa pine stands which would become open large structure. The sustainability of large trees on the landscape is increased with reduction of competition in stands through increased vigor and reduced competition (Kolb et al 2007, Ritchie et al 2008, McDowell et al 2003). Because of the selection for all size trees in bark beetle outbreaks due to competition, more open stands similar to understory reinitiation have the highest opportunity to grow large trees and become Late Old Structure (BLM 2007).

All the alternatives have Stand Initiation, Stem Exclusion Closed Canopy and Multi-story with Large trees stand structures within the Historic Range of Variability. The largest differences between the No Action alternative and action alternatives is between the Understory Reinitiation and Multi-story without Large tree stand structures. There is a major shift from Multi-story without Large tree structure to Understory Reinitiation structure with the action alternatives. The difference in this change between action alternatives is very little and does not change the percentages noticeably. The reduction in stand density is not designed to initiate understory regeneration, but to bring the stand into a level of stocking which is sustainable.

Understory regeneration has not been observed under canopies in ponderosa pine which are younger than 120 years. This lack of successful regeneration and the application of prescribed fire would move these stands into the open pine type with large trees desired in eastside screen direction. Between Alternatives 2 and 3 there is little difference in acreage moving towards late old structure. The largest difference is the potential for less diameter increment. Alternative 3 would leave more trees especially in old clumps. This higher level of stocking would reduce the potential for tree growth. These higher clump stockings would be similar to the historical condition and would leave more old trees at stocking levels which could attract western pine beetle. This may allow more individual trees or entire clumps at higher risk to attack than in Alternative 2. Alternative 3, because of leaving more trees in clumps, can be expected to have less longevity in reducing beetle susceptibility.

Table 35 Alternative Comparison of Structure Deadlog Project Area

Structure	Structure Description	Ranges of HRV - %	Alternatives - % Structure		
			1	2	3
1	Stand Initiation	7-18	9	10	10
2	Stem Exclusion Open Canopy	0-1	0	0	0
3	Stem Exclusion Closed Canopy	0-8	1	0.5	0.5
4	Understory Reinitiation	0-20	40	60	59
5	Multi-story without Large trees	0	37	17	18
6	Multi-story with Large trees	10-52	11	11	11
7	Single Story with Large trees	41-69	1	1.5	1.5

Alternative 1 (No Action)

Direct and Indirect Effects: The same structure mix as is present would remain. Compared to the HRV, there is an abundance of understory reinitiation and multi-story without large trees and also a scarcity of large open tree structure (Table 35). This scarcity, with the direction from the Eastside Screens, indicates a lack of meeting the objective of managing for large open structure in the long term. Within the Multi-story with large tree structure group there is a chance in the future of losing the current level of this structure due to overstory mortality of the large trees present.

The opportunity for stands to develop into late old structures of 6 and 7 is dependent on the structures with smaller diameter trees growing from stages 3, 4, and 5. Typically, understory reinitiation has a high chance of growing into large structure especially with fire (BLM. 2008). Multi-story without large trees and closed canopy stem exclusion take longer and have the chance of not developing into large trees because of mortality. The structural stages which are overstocked in ponderosa pine type have a high probability of beetle mortality and reduced diameter growth. For average diameters and the future expected diameters refer to page 36, Silviculture Report, Project Record. The expected 20 year dbh growth is 1.5 inches.

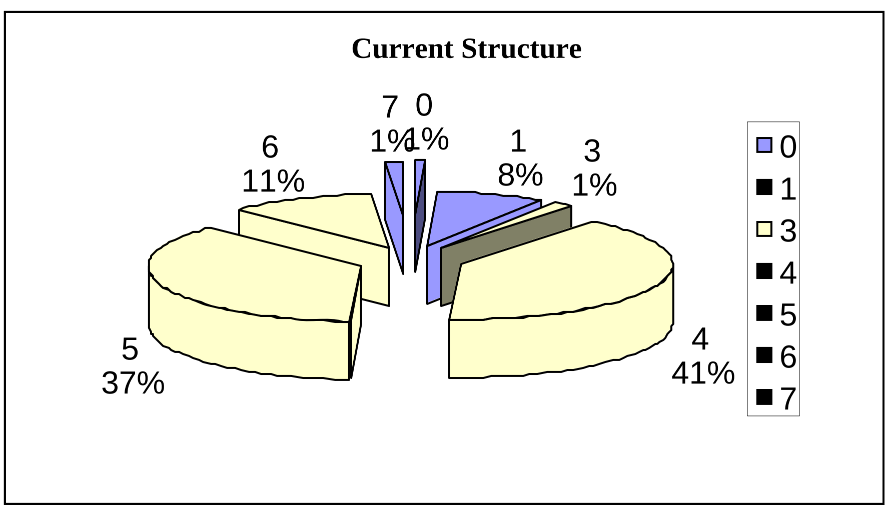
Currently the area which is susceptible to bark beetles would not grow into LOS. Stands in these structure classes would typically not grow into LOS due to the chronic and sometimes outbreak levels of mortality from bark beetles. Using GBA Handbook and calculations estimating growth was developed and shows that in 20 years it is not expected that on average the stands would grow into an average diameter large enough to be old growth.

Within the plant associations which were historically dominated by ponderosa pine there are many acres which currently have lodgepole pine as codominant or dominant species. This is increasing with mortality to overstory ponderosa pine and larger lodgepole pine to current bark beetle mortality and the continued ingrowth of lodgepole pine in the understory.

Table 36: Current Structure Acreage

Structure	Total Acres
0	147
1	1,312
3	232
4	6,460
5	5,912
6	1,782
7	205
Total	**16,050**

Figure 19: Current Structure Chart



Alternative 2 (Proposed Action)

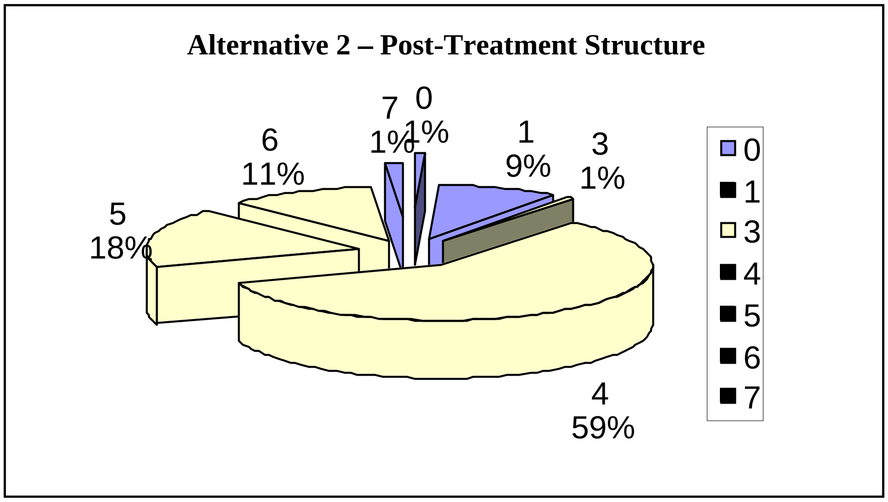
Direct and Indirect Effects: Alternative 2 would move stands towards HRV by managing stands into a condition with more potential to become open ponderosa pine. The largest structure type to move towards the open condition is the dense multi-layer stands (structure 5). Through thinning this would become understory reinitiation (structure 4). The increase in understory reinitiation of over 3,000 acres has more potential to become open large pine structure in the future (BLM 2008). The reduction of stocking levels for all structures increases growth and vigor and reduces mortality potential. This growth increase has the potential of increasing the number of stands with large diameter trees more quickly. Thinning from below increases the average stand diameter by removing many of the smaller trees. The increase in growth with thinning prescriptions would keep the 10 year growth average above 1.5 inches per decade. Growth for would average 2.7-4.6 inches dbh over 20 years and commonly be above four inches dbh growth within the first two decades following treatments. This increase in average diameter growth is much larger than that for Alternative 1 (1.5 inches dbh) because of the average diameter in that alternative and the level of competition between trees. For more detailed information refer to Table 13, page 38 Silviculture Report, Project Record.

The long term sustainability of the large trees present and LOS condition would be increased with thinning. Thinning and releasing large old trees has been shown to increase vigor and stand sustainability (Ritchie et al 2008, McDowell 2003). According to Kolb et al (2007), the main drawback to maintaining the large trees on the landscape is with the use of prescribed fire. Forest Service observations in the Flattop project (south of the Deadlog area) has shown very little large tree mortality following prescribed burning in the spring. Stand stocking following treatments would make the stands more resistant to mortality during common drought cycles which follow a decadal pattern (Hessl et al 2003). The drought cycles can increase moisture stress and the landscape level of risk of wildfire. Thinning and fuels treatments would reduce the chance of high mortality of all sizes of ponderosa pine. The stands treated under Alternative 2 would remain below the upper management zone SDI for more than two decades.

Table 37: Alternative 2 – Change in Forest Structure

Current Structure	After treatment Structure	Treatment Acres	Structure Acres Post Treatment	Percent of Area by Structure - Percent
0	0	12	147	1
1	1	337	1,466	9
3	3	15	89	0.5
	4	143		
4	1	46	9,551	59
	4	4,052		
5	1	107	2,814	17
	4	3,090		
	5	1,258		
6	6	1,487	1,783	11
7	7	205	205	1
Total		**10,752**	**16,055**	**100%**

Figure 20: Alternative 2 – Post Treatment Structure Chart



Alternative 3

Direct and Indirect Effects: Alternative 3 effects to structure are similar to Alternative 2. There are approximately 100 fewer acres of structure class 5 structure that would move into structure class 4, understory reinitiation. This change is due to the reduction of acres that would receive a commercial thin, although this does not change the percentage of area in either structure class. In Alternative 3, units with slopes greater than 30 percent were removed from the commercial thinning treatments. These would still receive some fuels treatments of surface and ladder fuels however this would not reduce stocking enough to reduce the risk to mortality from beetles or increase long term growth. Alternative 3 does have two units added for commercial thinning and these have the same potential of growing into large structure as other commercially thinned stands.

The average diameters expected to be left in Alternative 3 are higher than the current condition, since as in Alternative 2, thinning from below reduces the stocking of smaller diameter trees. In alternative 3 the growth and diameters in the blackbark thinning is expected to be the same. Where there is a difference is in the stands which contain late old structure. In LOS stands, smaller trees with old tree characteristics would be left. Many of these trees have smaller diameters and are found in clumps. This would leave higher stocking in some places with smaller diameter trees that may have been removed in a thin from below with no exceptions as in Alternative 2. In LOS, overall diameter and growth would be expected to be less in Alternative 3 than Alternative 2.

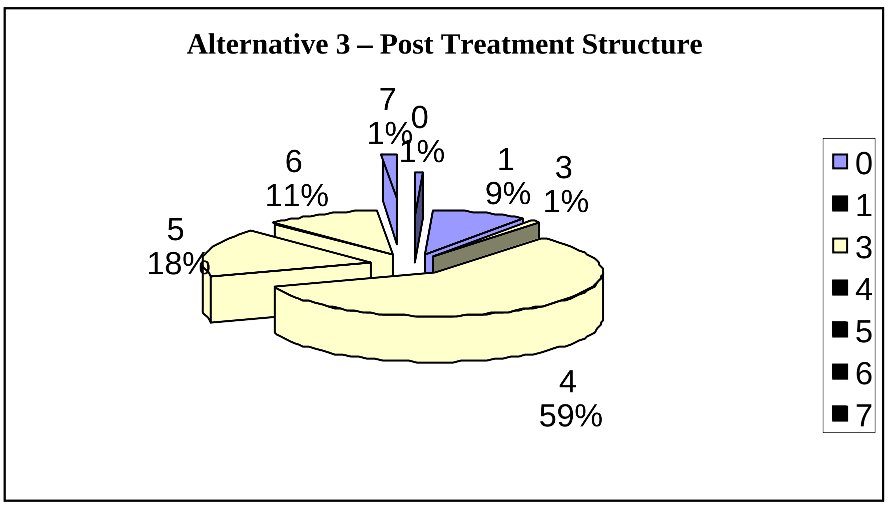
Leaving all old trees in some clumps may leave the stocking levels of the clumps susceptible to bark beetle mortality through higher densities. The mortality in these overstocked clumps may be expressed as individual trees or all the trees in the clumps due to the mortality patterns caused by western pine beetles. In the Quartz Mountain Old Growth Area, over 60 percent of the large tree clumps had stand densities above the upper management zone SDI. Many of the clumps had younger trees which would be removed in this alternative, although many of the clumps had old trees which would not be cut to a level near or below the upper management zone SDI.

Similar to Alternative 2, the long term sustainability of the large trees present and Late Old Structure condition would be increased with thinning. The main drawback to maintaining the large trees on the landscape is with the use of prescribed fire (Kolb et al 2007). Stand stocking following treatments would make the stands more resistant to mortality during common drought cycles which follow a decadal pattern (Hessl et al 2003). The drought cycles can increase moisture stress and the landscape level of risk of wildfire. For stands treated under Alternative 3, stand density would remain below the upper management zone SDI for more than two decades for most prescriptions. In large structure stands leaving old character trees in the upper management zone SDI is reached in a majority of the stands within 20 years. The longevity of the treatments in Alternative 3 has the potential to be less than for Alternative 2.

Table 38: Alternative 3 – Structure Change

Current Structure	After Treatment Structure	Treatment Acres	Post Treatment Structure Acres	Percent Area by Structure - Percent
0	0	12	147	1
1	1	385	1,466	9
3	3	87	132	1
	4	100		0
4	1	46	9,506	59
	4	4,325		0
5	1	107	2,812	18
	4	2,992		
	5	1,534		
6	6	1,487	1,782	11
7	7	206	206	1
Total		**11,281**	**16,055**	**100%**

Figure 21: Alternative 3 – Post-Treatment Structure Chart



STAND RESISTANCE TO FIRE

Introduction

For this report, tree resistance to fire and increase in diameter were analyzed. Other factors were analyzed in the fuels section and discussion of this DEIS. Tree resistance to fire, especially surface fire, is influenced by tree diameter and bark thickness. The bark on many western conifers provides insulation for growing tissue from the heat of fire. Typically larger and older trees have thicker bark making them more resistant to fire mortality. Lodgepole pine is an exception with thin bark in all sizes and age classes.

Scope and Scale of Analysis

The analysis of treatment effects is on the stand level. Estimates of the effect to fuels would be made over the planning area in order to assess the fire resilience of the landscape.

Measures

Alternatives are compared for resistance to fire, which is measured by average diameter of trees.

Methods

Vegetative analysis and estimates of stand conditions were done using stand exam data from 2007 and 2008. These were entered into the Forest Vegetation Simulator (FVS) provided by the Forest Service. The documentation, description, instructions, and software for this program are available on the internet at www.fs.fed.us/fmsc/fvs. FVS at its most basic level is a family of forest growth simulation models. Since its initial development in 1973, it has become a system of tightly linked analytical tools. These tools are based upon a growing body of scientific knowledge gleaned from decades of natural resources research and are based on the Prognosis growth and yield model. Fire and Fuels Extension (FFE) to FVS simulates fuel dynamics and potential fire behavior over time and can be used to simulate and predict snag fall down rates, fuel loadings, and parameters affecting fire behavior and fuels accumulation and decay.

This model was used to compare alternative actions including timber harvest and treating fuels. The SORNEC variant version 2008.12.3.0 was used. This variant of the model is based on studies measuring stand characteristics throughout the northwest and has specific adaptations for the central Oregon area.

Reference Condition

Historically, in ponderosa pine types, few stand replacing fires occurred though pockets of mortality would occur. When stand replacement events did occur the stand would be replaced in small areas and scattered remnant trees would remain through the stand as seed sources (Arno 1995). The snag and down fuels present in historic large ponderosa pine stands were low, typically less than 2.2 tons per acre of fuels with fewer than 2 snags per acre (Agee 2002). Historically the down fuels were light with small areas of concentrations, which had short residence burn time due to frequent low intensity fires (Agee 2002). Historical conditions had lower fuels levels than generally occur today. Historical records such as the description by Puter and the forest survey of 1913 give the idea of an understory dominated by grasses. The land surveys documents areas, especially associated with the buttes, as having understories of manzanita and "greasewood" (probably ceanothus) and windfall trees in some locations.

The surface fuel loads are represented by fuel models to identify the fuels arrangement and the fire characteristics under varying weather conditions. Expected fuels levels would be low as documented in the ponderosa pine type described in studies. Open stands had low Crown Bulk densities and high crown canopies.

Existing Condition

Currently the ponderosa pine stands are dominated by 60-80 year old ponderosa pine with lodgepole pine. Unmanaged stands, which have not been managed, tend to be dense stands of poles with heavy fuels from beetle mortality. The fuels are mostly lodgepole pine from previous mortality. Ponderosa pine mortality is becoming more common due to tree stress. Managed stands of ponderosa pine have been precommercially or commercially thinned and are now 60–130 square feet of basal area. These stands have responded to lower stocking levels with increased growth, crown volume, and understory tree and brush establishment. The release favors brush and typically lodgepole pine seedlings. The brush is bitterbrush in lower elevations transitioning to ceanothus and manzanita in upper elevations. Where large trees dominate, understory tree and brush density has increased with the lack of fire. The understory trees tend to be ponderosa and lodgepole pine and are younger than 100 years. Historically the understory was comprised of low stocking of brush and seedlings due to frequent fires reducing seed sources for brush and fire intolerant tree species. These frequent fire stands had forbs and grasses dominating the understory vegetation.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: Using the Growth Basal Area (GBA) Handbook, growth estimates show that in 20 years it is not expected that, on average, stands would grow much more than a 1.5 inches. This rate of growth would not add much to the resistance of the trees over that 20 years.

Alternative 2 (Proposed Action)

Direct and Indirect Effects: The growth increase from treatments has the potential of increasing the number of stands which have large diameter trees sooner. Thinning from below increases the average stand diameter by removing many of the smaller trees. The increase in growth with thinning prescriptions would keep the 10 year growth average above 1.5 inches per decade. Typical growth for the different prescriptions is commonly above four inches in diameter within the first two decades following treatments. This increase in average diameter growth is much larger than that for the no action alternative because of the average diameter in that alternative and the level of competition between trees. The increase in diameters would improve the fire resilience of the stands much more than found with Alternative 1 (No Action).

Alternative 3

Direct and Indirect Effects: The average diameters expected to be left in Alternative 3 are higher than the current condition, since as in Alternative 2, thinning from below reduces the stocking of smaller diameter trees. In alternative 3 the growth and diameters in the blackbark thinning is expected to be the same. Where there is a difference is in the stands which contain late old structure. In LOS stands, smaller trees with old tree characteristics would be left. Many of these trees have smaller diameters and are found in clumps. This would leave higher stocking in some places with smaller diameter trees that may have been removed in a thin from below with no exceptions as in Alternative 2. In LOS, overall diameter and growth would be expected to be less in Alternative 3 than Alternative 2.

Cumulative Effects

Cumulative Effects are past, ongoing and foreseeable activities that may incrementally cause effects when considered with the proposed action. Past activities have been included with the existing condition. Cumulative Effects of foreseeable and ongoing activities are limited to the stand level in the Deadlog area for most silviculture metrics. Structure effects are measured on the landscape level which for this was defined as the Deadlog planning area. Table 39 identifies the foreseeable and ongoing activities in the Deadlog vicinity and the expected effects for silviculture.

Table 39 Deadlog Cumulative Effects Actions

Activity/ Project	Action Description	General Effects
KO Timber Sale Reforestation maintenance	Fence Maintenance or removal and Big Game Repellant application. Dwarf Mistletoe control Pruning and Girdling.	Will reduce individual stand mistletoe and stocking on other than Deadlog Units. Over the planning area may decrease the intensification of mistletoe infection
Wildlife Improvement Maintenance	Guzzler maintenance on two guzzlers.	Maintaining cove around guzzlers may increase stand beetle risk though not in Deadlog units
Cluster II Grazing allotment EA 2006.-Grazing allotment Maintenance and Improvement	Fence Repair, Fence building, Water sets, Cattle Grazing, waterline installation and maintenance	No silvicultural effects
Aspen Project Fuels Treatments	Adjacent to planning area Machine Shrub treatment and thinning	No silvicultural effects in Deadlog planning area
Road Maintenance	Ongoing road maintenance. Danger tree removal, roadside brushing, drainage repair, spot surfacing.	May remove individual trees but will not affect stand level conditions.
Green Dot road Closure	Administrative closure of roads Hunting season	No silvicultural effects
Opal mine	Opal mine operations on mine claim including camping site.	No silvicultural effects away from excavation site.
Travel Management	Travel Management EIS possible signature within 2 years. Shared use roads.	No silvicultural effects.
BPA power line Maintenance	Power line maintenance within right of way includes mowing of brush and seedlings and scattered tree and snag removal. Outside of the right of way individual hazard trees would also be removed. Cycle varies 3 - 5 years.	May remove individual trees but will not affect stand level conditions.

PATHOLOGY

SUMMARY

Western dwarf mistletoe (WDM, *Arceuthobium campylopodum*) infected blackbark stands and WDM-infected stands with at least some component of Late Old Structure (LOS) represent approximately 74 percent of the project area (Powers 2009, Deadlog silviculture report).

A spatial analysis was conducted that evaluated the severity and distribution of WDM throughout the analyzed stands. The spatial analysis indicated that WDM occurs in a patchy distribution in most blackbark and LOS stands (Figure 2, Pathology report, Project Record) and at mixed levels of severity. On average, 54 percent of stand exam plots had no infection in stands where WDM occurred, 14 percent were lightly infected, 21 percent moderately, and 11 percent were heavily infected in evaluated stands. These are likely more severe levels of WDM infection than occurred historically in central Oregon in ponderosa pine (Roth 1953).

Modeling indicated that the effects of WDM alone would not prevent the development of old growth conditions (Hopkins et al. 1992) within 50 to 60 years (data not shown) on an average stand basis where it occurs under any of the 3 alternatives. This result indicates that the negative impacts of WDM alone are likely not sufficient to prevent the development of old growth stands. WDM infection in conjunction with high stand susceptibility to bark beetle attack (Miller and Keen 1960, Cochran 1994, Booser and White 1996) and higher probability of stand replacing fire due to increased fuel loadings as a result of fire exclusion, increases the probability that many stands (or portions of stands) will not develop into old growth conditions.

Modeling indicated that under both Alternative 2 and 3 for blackbark and LOS stands one year after treatment, dwarf mistletoe rating (DMR) and dwarf mistletoe infection (DMI) values will be lower than Alternative 1 values. The difference between Alternative 2 and 3 after treatment are essentially the same in both blackbark and LOS stands. Under Alternative 3, however, the DMR and DMI values will remain lower than both Alternative 1 and 2 for 40 years in blackbark stands. Alternatives 1, 2, and 3 have essentially the same projected values 20 and 40 years from now in LOS stands. These results suggest that Alternative 3 would be the best option to reduce the deleterious effects of WDM in blackbark stands. The retention of ponderosa pine with old tree characteristics (Van Pelt 2008) and the increased distance between residual trees prescribed in Alternative 3 would likely allow for quicker development of old growth stands.

INTRODUCTION

The most significant disease in the Deadlog project area is Western dwarf mistletoe (WDM, *Arceuthobium campylopodum*) in ponderosa pine (*Pinus ponderosa*). Lodgepole pine dwarf mistletoe (*Arceuthobium americanum*) also occurs in the lodgepole pine, but is not significant in this analysis because of its scheduled removal from stands. Field surveys within the project area revealed that approximately 50 percent of stands had some level of WDM infection which occurs in stands dominated by ponderosa pine with blackbark characteristics as well as in stands that have at least some component of Late Old Structure (LOS) (Powers, personal communication). WDM occurs in all size classes and throughout the tree crowns where it occurs.

Ponderosa pine infected with WDM exhibits reduced volume and height growth (Hawksworth 1996, Maffei and Jacobi 1986), reduced viable seed set and cone production (Hawksworth 1996), increased susceptibility to fire caused mortality (Conklin and Geils 2008), and increased susceptibility to successful western and mountain pine beetle attack (Miller and Keen 1960, Eglitis 2009, personal communication) proportional to increasing levels of infection. These direct and indirect negative effects of WDM decrease the likelihood that a heavily infected stand of ponderosa pine will develop into old growth characteristics (Hopkins 1992). Severity of infection of dwarf mistletoes is measured with a Dwarf Mistletoe Rating (DMR) on a scale from 1 (light) to 6 (severe) (Hawksworth 1977).

Individual trees with a DMR of 3 or less and stands with an average DMR of less than or equal to 2 have a higher likelihood of being effectively managed through thinning treatments and attaining old growth characteristics. Left untreated, dwarf mistletoe severity will increase within the stand and it will spread laterally to uninfected areas of the stand at a rate of one to two feet per year (Hawksworth 1996). Even-aged ("blackbark") stands are much more likely to respond positively to management where WDM infected trees have been selectively removed and the residual basal area reduced within the stand to increase tree vigor. This relationship also holds true for stands with a significant uneven age structure and a large tree component (LOS) except that it is more complicated with the localized effects of infected overstory trees infecting understory regeneration. Understory trees that are infected from above will not develop into mature trees due to high levels of WDM infection, would serve as ladder fuel, reduce the vigor of the older trees through competition, and make them more susceptible to attack from western and mountain pine beetle. These factors taken together would reduce the productivity in the portion of the stand where the infected overstory occurs and throughout the stand exceeding 10 percent loss in productivity (stand DMR less than or equal to 2 and DMI less than or equal to 3), which is above the guidelines in the Deschutes Forest Plan (USFS 1990). Management actions to reduce the effects of dwarf mistletoe would typically call for the removal or girdling of all infected overstory trees at the time of or within 10 years of treatment (Schmitt 1996). This is likely not possible because of restrictions from the "eastside screens" policy (USFS 1995), which requires that all trees greater than or equal to 21 inches dbh be retained on site, including trees that are infected with WDM. In order to simultaneously meet eastside screens and the Deschutes forest plan requirement of "…dwarf mistletoe stabilized indefinitely at a low infection level…" with "…no more than a 10% loss in productivity…" for unevenaged management, it is necessary to treat these stands.

SCOPE AND SCALE OF ANALYSIS

The scope of the analysis for resilience to disease within the Deadlog planning area focuses on the condition of WDM within a selection of affected blackbark and LOS stands. The stands were evaluated using Forest Vegetation Simulator (FVS) for factors relating to stand productivity (see methods), whether or not the stands reached old growth characteristics, and distribution and severity of WDM infection within the stand. Under the three alternatives, stands were evaluated from the current condition, 20, 40, and 100 years into the future. Under Alternatives 2 and 3, stands were also evaluated one year following treatment.

METHODS

Stand exam data was collected during 2007 and 2008 in the Deadlog project area. Only stands that had dwarf mistletoe infection were recorded and analyzed. Two types of stands were selected to represent the current conditions in the project area and used in the analysis (Table 43, page103): 1) Blackbark Stands that are primarily composed of ponderosa pine with blackbark characteristics, but have scattered trees larger than 21 inches dbh; and 2) LOS stands. The LOS stands all have some significant component of trees larger than 21 inches" dbh. Ten of each type was selected to be analyzed. All stands were analyzed using Forest Vegetation Simulator (FVS) version 6.21 with the Southern Oregon Northern California (SORNEC) variant 4/29/08 (Dixon 2002). The effects (mortality, snag creation, volume loss) seen in the results presented here are due to dwarf mistletoe. Measures of the effects of WDM on ponderosa pine fall under four categories:

- The effects of western dwarf mistletoe infection on stand "productivity"
- The effects of western dwarf mistletoe on the development of the affected stand into old growth or late seral conditions (Hopkins et al. 1992).
- The effects of western dwarf mistletoe under the three alternatives.
- Spatial Analysis: Western dwarf mistletoe severity at the plot level within stands

REFERENCE CONDITION

Under the historic large open ponderosa pine stand conditions that occurred throughout the species range, frequent low intensity ground fire likely reduced historical dwarf mistletoe infestations directly by selectively removing heavily infested trees and branches via torching and indirectly by simplifying forest structure and increasing average inter-tree spacing (Hessburg et al. 1994). These low density and simply layered stands also slowed local and lateral spread of dwarf mistletoe (Hessburg et al. 2008). There are no known historic surveys for WDM conditions conducted in the project area to compare against these criteria. The earliest and closest known survey was conducted in 1953 in an old growth ponderosa pine stand at the current Pringle Falls Experimental Forest (35 miles west of the project area). The stand was extensively sampled for WDM distribution and severity in ponderosa pine. The researchers found WDM in a patchy distribution on a total of 41 percent of the area surveyed (107 of 260 acres) with 58 percent of the affected area being very lightly infected, 29 percent lightly, 12 percent moderately, and only 1 percent heavily infected (Roth 1953).

EXISTING CONDITION

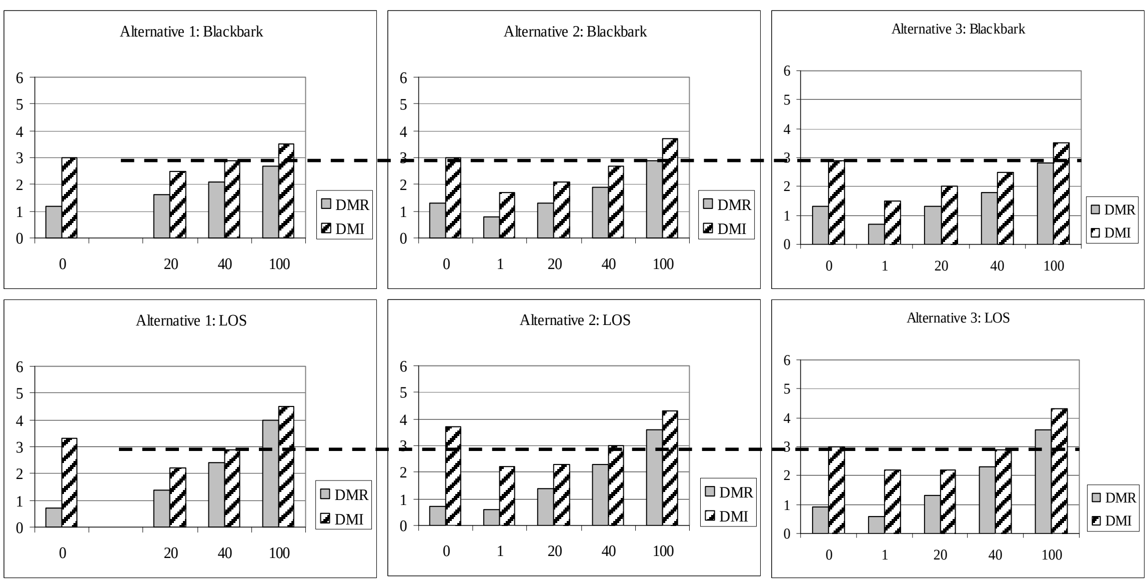
Currently at least 50 percent of visited Deadlog stands are infected with WDM which comprise about 30 percent (4,815 acres) of the project area (Powers, personal communication). WDM occurs in a patchy distribution across the landscape, in varying severities (Table 43, page 103), and in all size classes of ponderosa pine (data not shown). Stand exam data indicate that sampled blackbark stands are slightly more severely infected than stands with some component of LOS, but that the affected area is very similar within both types (Table 43, page 103). In comparison to Roth's 1953 Pringle Falls survey, stand exam data indicate that affected stands within the Deadlog project area have very similar affected areas on the landscape, 46 percent Deadlog and 41 percent Pringle Falls. The severity of the WDM in the project area, however, is currently significantly higher with two percent, 20 percent, 59 percent, and 19 percent in the very lightly infected, lightly, moderately, and heavily infected categories. These same categories had 58 percent, 29 percent, 12 percent, and one percent respectively in the Pringle Falls survey 55 years ago. This imperfect comparison may suggest that although the proportional occurrence of dwarf mistletoe has not changed much across the landscape, the severity of infection, where it occurs, has increased dramatically in the last 55 years. This observation is what would be expected with the known lack of fire and selective cutting practices that are known to have taken place in the project area in that period of time (see Reference Condition).

ENVIRONMENTAL CONSEQUENCES

Field observations within the project area and literature indicate that WDM has the ability to explosively disseminate its seeds and effectively infect understory trees to an average lateral distance of 50 feet from an average height of 45 feet (Hawksworth 1996). The majority of seeds fall and infect understory or adjacent trees within 33 feet or less (Hawksworth 1996). This lateral distance of potential spread decreases the lower the source of infection occurs in the infected tree. Left untreated, it can be expected that current infected areas will spread laterally through the stand at a rate of 1 to 2 feet per year and that infected areas will increase in severity due to inter- and intra-tree spread (Hawksworth 1996). Evidence for this can be seen in the increasing stand DMR and DMI values and the increasing percent of board foot volume that has been affected by WDM calculated by the model at 20, 40, and 100 years under all three alternatives (Figure 22; Table 40, page 101; Table 41, page 102; Table 42, page 103).

The modeling used in this analysis is only intended to be representative of the possible effects of WDM at the stand level. It does not model the localized effects of WDM at the plot level. Further investigations at the plot level would be required to better understand this relationship. FVS modeling with the SORNAC variant is also known locally to underestimate the increased growth that is attributable to thinning compared to what has consistently been observed in the field by local experts (Powers 2009, personal communication). This suggests that actual growth will be better following thinning treatments than that projected by the model. It is likely that this will be favorable to even further reducing the deleterious effects of the residual WDM projected by the model in the field overtime. The projections from the model are most accurate at 20 years and less accurate at 40 years. Projections at 100 years are not reliable, but are instructive for illustrating the time frames required for the development of old growth conditions (Hopkins et al. 1992) and what may happen over longer time periods without other unpredictable disturbances to the stand and are presented here strictly for illustrative purposes.

Figure 22: Summary of Comparison of Calculated DMR and DMI Values by Alternative



Note: Dotted lines are inserted at 40 year projected DMI values for alternative 1 for ease of comparison with values calculated in alternatives 2 and 3.

Alternative 1

Direct and Indirect Results: Results indicate that the current percent distribution of WDM in ponderosa pine across the landscape is very similar to known historical surveys (Maffei and Beatty 1988), but that the severity of the disease has increased where it occurs (Roth 1953). This result is consistent with what would be expected to occur with fire suppression and selection cutting practices that have both occurred in the project area. This result would suggest that where WDM occurs it will have a more deleterious effect on the stand than it would have historically. These effects will take the form of reduced volume and height growth (Hawksworth 1996), reduced viable seed set and cone production (Hawksworth 1996), increased susceptibility to fire-caused mortality (Conklin and Geils 2008), and increased susceptibility to successful western and mountain pine beetle attack (Miller and Keen 1960, Eglitis 2009, personal communication).

Table 40: Alternative 1 (No Action) Modeled Indicators of Stand Productivity and Conditions through Time

Years Since Treatment	DMR	DMI	% BFV Loss From DM	Residual Live Trees ≥ 21”	Residual Live Trees ≥ 31”	DM Created Snags ≥ 14”	Meets R6 Definition Of Old Growth (OG) or Late Seral (LS)
All Dwarf Mistletoe Affected Stands							
0	1.1	* 3.1	0.0	4	1	0	**NO**
20	1.6	2.3	0.3	5	1	2	**NO**
40	* 2.3	2.9	9.3	7	1	3	**NO**
100	* 3.5	* 4.1	* 19.2	**16**	**2**	**5**	**LS**
All Dwarf Mistletoe Affected Blackbark Stands							
0	1.2	* 3.0	0.3	2	0	0	**NO**
20	1.6	2.5	9.4	4	0	2	**NO**
40	* 2.1	2.9	* 20.1	7	0	4	**NO**
100	* 2.7	* 3.5	* 48.8	**20**	1	**5**	**OG**
All Dwarf Mistletoe Affected Late Old Structure (LOS) Component Stands							
0	0.7	* 3.3	0.3	6	1	0	**NO**
20	1.4	2.2	7.8	7	2	1	**NO**
40	* 2.4	2.9	* 16.5	8	2	2	**NO**
100	* 4.0	* 4.5	* 51.1	**15**	**3**	**5**	**LS**

≥ = greater than or equal to
* Forest Vegetation Simulator calculated value is above guidelines of greater than 10 percent volume loss due to dwarf mistletoe infection recommended in the forest plan (USFS 1990) (DMR greater than or equal to 2, DMI greater than or equal to 3, percent BFV loss from dwarf mistletoe greater than 10 percent).

DMI values under alternative 1 were predicted to decrease without treatment in both blackbark and LOS stands (Table 40). This is due to the higher mortality that occurs in the model in the smaller diameter dwarf mistletoe infected trees from model years 0 to 20 (2 to 5 times more in LOS and blackbark stands respectively) compared to model years 20 to 40. While this dwarf mistletoe caused mortality initially reduced the DMI values in the model, average stand DMR values increased as expected in the model.

Modeling indicated that the affected stands will achieve old growth characteristics (Hopkins et al. 1992) in 50 to 60 years (data not shown) on an average stand basis even with the stand left untreated. This is likely due to the generally patchy distribution of mistletoe within the stand, affecting perhaps 46 percent of the stand area in mixed severities (assuming plot data are representative of the true distribution of WDM within the stand), and the 54 percent that is left unaffected. On average, such stands would be expected to achieve old growth conditions barring disturbance from bark beetles and/or fire.

The increasing severity of infection over time, the increasing stand densities, and the increased fuel loading together make it much less likely that old growth conditions will be achieved or maintained in many of the stands over time without treating the stand. Areas within the stand that are affected by WDM will serve as “stressed” pockets that will be more likely to draw attacks from beetles which will then subsequently attack healthy portions of the stand due to the close proximity and increased populations of beetles. This will be even more likely in drought years due to the already low precipitation that the project area receives.

The WDM affected portions of the stand will be more prone to crown fire due to high numbers of infected and suppressed understory trees and the low hanging witches'-brooms that create fuel ladders.

The results of this analysis indicate that the DMR and DMI values as well as the percent of board foot volume loss will continue to increase even with treatment; however, they will remain at a lower level through the stand because of treatment.

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

Direct and Indirect Results: Treatments proposed under Alternatives 2 and 3 will increase the distance between residual trees (residual trees in Alternative 3 will be even more widely spaced than Alternative 2), remove heavily infected trees, reduce the overall stand density, and reintroduce fire into the stands. This will reduce the direct and indirect negative effects the mistletoe will have on the resiliency of the stand where it occurs and on average throughout the stand by reducing the overall amount of mistletoe within the stand.

Modeling indicates that DMR and DMI values will be lower than alternative 1 values one year after treatment under both Alternatives 2 and 3 for blackbark and LOS stands (Figure 22, page 100; Table 40, page 101; Table 41, page 102; Table 42, page 103). By opening up the stand the lateral spread between the remaining infected trees will be slowed. By simultaneously removing the heavily infected trees (DMR greater than or equal to 4) the overall amount and severity of mistletoe left in the stand will decrease. Where it remains in lightly and moderately infected trees, the open stand conditions will increase the trees' ability to grow faster in height. This will make it more likely that lightly to moderately infected trees will eventually outgrow infection, which has been shown to be possible in infected released ponderosa pine (40 to 70 years of age) when 10 to 12 inches of height growth per year over the last 5 years is achieved upon release (Barrett and Roth 1985, Maffei, personal communication). This relationship is less certain for more mature trees (Roth and Barrett 1985). Field observations within the project area indicate that, on average, infected ponderosa trees with a DMR of 1 or 2, an 11 inch dbh, 43 feet tall, will have 9 inches (range 5-14 inches) height growth in the last five years. This observation is taken only under current overstocked conditions and does not take into consideration the effects of release, which will likely vary depending on site conditions. It suggests that 10 to 12 inches of height growth is possible in the project area with infected blackbark trees under some conditions.

Table 41: Alternative 2 Modeled Indicators of Stand Productivity and Conditions through Time

Years Since Treatment	DMR	DMI	% BFV Loss From DM	Residual Live Trees ≥ 21"	Residual Live Trees ≥ 31"	DM Created Snags ≥ 14"	Meets R6 Definition Of Old Growth (OG) or Late Seral (LS)
All Dwarf Mistletoe Affected Stands							
0	1.1	3.1	0.3	4	1	0	**NO**
1	0.6	1.9	8.6	4	1	0	**NO**
20	1.4	2.2	* 15.2	5	1	1	**NO**
40	* 2.2	2.9	* 23.2	7	1	2	**NO**
100	* 3.2	* 4.0	* 53.2	**18**	**1**	**5**	**OG**
All Dwarf Mistletoe Affected Blackbark Stands							
0	1.3	3.0	0.4	2	0	0	**NO**
1	0.8	1.7	* 12.5	2	0	0	**NO**
20	1.3	2.1	* 18.0	3	0	1	**NO**
40	* 1.9	2.7	* 25.5	6	0	2	**NO**
100	* 2.9	* 3.7	* 50.2	**19**	**1**	**5**	**OG**
All Dwarf Mistletoe Affected Late Old Structure (LOS) Component Stands							

Years Since Treatment	DMR	DMI	% BFV Loss From DM	Residual Live Trees ≥ 21”	Residual Live Trees ≥ 31”	DM Created Snags ≥ 14”	Meets R6 Definition Of Old Growth (OG) or Late Seral (LS)
0	0.7	3.7	1.4	6	1	0	**NO**
1	0.6	2.2	4.5	6	1	0	**NO**
20	1.4	2.3	* 11.7	7	1	1	**NO**
40	* 2.3	* 3.0	* 20.7	8	2	2	**NO**
100	* 3.6	* 4.3	* 55.1	**17**	**2**	**6**	**LS**

Table 42: Alternative 3 Modeled Indicators of Stand Productivity and Conditions through Time

Years Since Treatment	DMR	DMI	% BFV Loss From DM	Residual Live Trees ≥ 21”	Residual Live Trees ≥ 31”	DM Created Snags ≥ 14”	Meets R6 Definition Of Old Growth (OG) or Late Seral (LS)
All Dwarf Mistletoe Affected Blackbark Stands							
0	1.3	2.9	0.4	2	0	0	**NO**
1	0.7	1.5	* 12.6	2	0	0	**NO**
20	1.3	2.0	* 18.6	3	0	1	**NO**
40	1.8	2.5	* 25.5	7	0	3	**NO**
100	* 2.8	* 3.5	* 49.6	**21**	**1**	**5**	**OG**
All Dwarf Mistletoe Affected Late Old Structure (LOS) Component Stands							
0	0.9	3.0	0.3	6	1	0	**NO**
1	0.6	2.2	4.5	6	1	0	**NO**
20	1.3	2.2	* 12.0	7	1	1	**NO**
40	* 2.3	2.9	* 21.0	8	2	2	**NO**
100	* 3.6	* 4.3	* 55.1	**17**	**2**	**6**	**LS**

The Forest Vegetation Simulator calculated value (Table 41, page 102, Table 42) is above guidelines of greater than 10 percent volume loss due to dwarf mistletoe infection recommended in the forest plan (USFS 1990) (DMR greater than or equal to 2, DMI greater than or equal to 3 percent BFV loss from dwarf mistletoe greater than 10 percent).

Spatial Analysis

Table 43: Current Severity and Distribution of Western Dwarf Mistletoe by Stand and Plot

Stand Number	Acres	Number Of Sampled Plots	Acres Represented by Each Plot	* Percent With No Infection	* * Percent With Light Infection	*** Percent With Moderate Infection	**** Percent With Heavy Infection
Average of all Stands							
All Stands	2,005	477	4	54	14	21	11
Blackbark Stands	692	207	3	53	11	22	14
LOS Stands	1,313	270	5	55	16	20	9
Black Bark Stands							
3	100	25	4	20	20	40	20
4	71	20	4	60	30	10	0
5	33	15	2	80	13	0	7
6	20	15	1	67	0	20	13
9	104	25	4	4	8	36	52
15	40	15	3	100	0	0	0
19	53	21	3	43	10	33	14
47	90	35	3	85	6	9	0
62	47	15	3	86	7	0	7
139	134	21	6	14	10	57	19

Stand Number	Acres	Number Of Sampled Plots	Acres Represented by Each Plot	* Percent With No Infection	* * Percent With Light Infection	*** Percent With Moderate Infection	**** Percent With Heavy Infection
LOS Stands							
18	37	25	1	64	12	16	8
38	129	30	4	23	27	30	20
41	254	45	6	56	16	16	13
56	45	15	3	27	27	40	6
60	70	20	4	80	15	5	0
63	96	25	4	72	20	4	4
64	52	20	3	70	20	5	5
81	28	15	2	27	40	26	7
145	198	35	6	58	0	31	11
155	404	40	10	90	0	10	0

* Percent With No Infection = Percentage of sampled plots with no dwarf mistletoe.
** Percent With Light Infection = Percentage of sampled plots with a calculated DMI of 1-1.9
*** Percent With Moderate Infection = Percentage of sampled plots with a calculated DMI of 2-3.9
**** Percent With Heavy Infection = Percentage of sampled plots with a calculated DMI of 4-6.

The difference between Alternatives 2 and 3 after treatment are essentially the same in both blackbark and LOS stands. Under Alternative 3, the DMR and DMI values would remain lower than either Alternatives 1 and 2 for 40 years in blackbark stands (Figure 22, page 100, Table 40, page 101; Table 41, page 102; Table 42, page 103). Alternatives 1, 2, and 3 have essentially the same projected values 20 and 40 years from now in LOS stands.

Modeling indicates that the percent board foot volume loss due to infection of WDM is variable under the three alternatives. Alternative 1 indicates that percent board foot volume loss will not be above standards and guidelines (no more than 10 percent loss in productivity) (USFS 1990) for approximately 30 years in blackbark and LOS stands (Table 40, page 101). Alternatives 2 and 3 are projected to always be above LRMP standards and guidelines in blackbark stands, but not for approximately another 20 years in LOS stands (Table 41, page 102, Table 42, page 103). This is likely due to the affect of mistletoe infection in the larger residual trees following treatment which show a relatively greater affect of percent board foot volume loss (PBFVL) in comparison with the higher proportion of smaller diameter trees infected under Alternative 1.

The results of this analysis, a review of literature, and professional opinion suggest that Alternative 3 will be the best option to reduce the deleterious effects of WDM in blackbark and LOS stands for the following reasons:

- Modeling indicates that the effects of western dwarf mistletoe alone will not hinder blackbark and LOS stands from achieving old growth characteristics (Hopkins et al. 1992) on average within the Deadlog project area. Without treatment, however, it is far more likely that the stands will be more susceptible to bark beetle and fire related mortality and that dwarf mistletoe will spread and increase in severity over time. Treatment will reduce these risks and deleterious effects.
- In both Alternatives 2 and 3, DMR and DMI values will be reduced following treatment compared to Alternative 1 in blackbark and LOS stands. This will reduce the deleterious effects of dwarf mistletoe where it occurs within the stand.
- Alternative 3 will create more spacing between residual trees and therefore reduce between tree spread of mistletoe and likely increase the possibility of lightly infected trees of outgrowing mistletoe infection.
- The retention of mistletoe free ponderosa pine with old tree characteristics (Van Pelt 2008) and the greater distance between residual trees prescribed in Alternative 3 will likely allow for quicker development of old growth stands (Hopkins et al. 1992).

WILDLIFE – BIOLOGICAL EVALUATION

SUMMARY OF EFFECTS INCLUDING THE BIOLOGICAL EVALUATION (BE)

The Wildlife biological evaluation (BE) summarized the determinations for each alternative in Table 44. It was determined that implementation of all of the proposed activities will have no effect and would have no impact on any sensitive wildlife species or associated habitat.

Table 44: Summary of Conclusions for Species Considered Under the Biological Evaluation for the Deadlog Project Area

Species	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3 -
Northern Bald Eagle	No Impact	No Impact	No Impact
Northern Spotted Owl	No Effect	No Effect	No Effect
American Peregrin Falcon	No Effect	No Effect	No Effect
Johnson’s Hairstreak Butterfly	No impact	No impact	No impact
Lewis’ Woodpecker	No impact	No impact	No impact
White Headed Woodpecker	No impact	No impact	No impact
Townsend’s Big-eared Bat	No impact	No impact	No impact

* All Project Design Criteria (PDCs) in the 2006-2009 Programmatic BA are met. Consultation is not necessary.

INTRODUCTION

This report meets the direction provided by the Forest Service Manual (FSM 2600), the Deschutes National Forest Land and Resource Plan (LRMP, 1990) as amended. It specifically addresses the project’s effects upon federally proposed or listed candidate, threatened, or endangered species and forest-wide sensitive species (TES species). Management Indicator Species (MIS, USDA 1990), Birds of Conservation Concern (BCC, Fish and Wildlife Service designation), High Priority Shorebirds (Fish and Wildlife Service designation), Focal Landbird Species, and the components of these species’ habitats are addressed by the Wildlife Report for the project.

Projects proposed in occupied or potential habitat of any federal candidate, threatened, or endangered species on the Forest must be consistent with the Project Design Criteria (PDC) for the Joint Aquatic and Terrestrial Programmatic Biological Assessment (BA) for Fiscal Years 2006-09 (USDA et al. 2006), hereafter referred to as the Programmatic BA, in order to require no further consultation. Projects that affect the species addressed by the document, and do not meet the applicable PDCs, must initiate the appropriate level of consultation with the U. S. Fish and Wildlife Service. PDCs for proposed species may be included in the BA but are optional for the management agencies. This project is designed to meet the applicable Programmatic BA’s PDCs.

This report has considered and applied the best science available, including papers, reports, literature reviews, review citations, peer reviews, science consistency reviews, results of ground-based observations or surveys, and the use of GIS (PAGs, forest structure, tree density, road density, etc.). The best available science was used to determine species or habitat presence and effects. A complete list of the science used can be found within the species discussions and in the Literature Referenced or Reviewed section of this document.

It may include required mitigation measures or optional recommendations designed to eliminate or reduce negative effects. A professional-level wildlife biologist has completed this Biological

Evaluation (BE), and it has been reviewed and approved by a journey-level biologist. It will be filed with the originating request for Pre-Field Review and included in the project's files with the supporting NEPA documentation.

LOCATION DESCRIPTION

The project is within the East Cascades Ecoregion (ODFW 2006). It is specifically designated as EC-08 Sixteen Butte. The identified special features are: 1) winter range for deer and elk; and 2) the area has some of the largest tracts of older-aged ponderosa pine forest in the ecoregion. Key Habitats include ponderosa pine woodlands and Key Species include Lewis' woodpecker and white-headed woodpecker.

Only a small portion of the project area is classified as Deer Habitat (MA7, winter range, 586 acres, 3.6 percent) with the majority of it summer range.

SPECIES AND HABITATS EVALUATED

The following species (Table 45) and their habitats were considered in the preparation of this document. Those with **bolded** type are known, suspected or have some potential to occur within the project's boundaries. There are no known current sites occupied, no known historic sites, and no current or potential habitats for those species that are not in bold.

Table 45: Threatened, Endangered, and Sensitive Species List

Species (Scientific)	Species (Common)	Classification
Strix occidentalis caurina	Northern spotted owl	T, MIS
Rana pretiosa	Oregon spotted frog	C, OR/S
Martes pennanti pacifica	Pacific fisher	C, S, SOC, OR/S
Haliaeetus leucocephalus	Northern bald eagle	S, OR/T, MIS
Pristiloma arcticum var. *crateris*	Crater Lake tightcoil	S
Pristinicola hemphilli	Pristine springsnail	S
Boloria selene atrocostalis	Silver-bordered fritillary	S
Mitoura johnsoni	Johnson's hairstreak butterfly	S
Podiceps auritus	Horned grebe	S
Podiceps grisegena	Red-necked grebe	S, OR/S
Bucephala albeola	Bufflehead	S
Cotumicops noveboracensis	Yellow rail	S
Agelaius tricolor	Tricolored blackbird	S
Seiurus noveboracenis	Northern waterthrush	S
Melanerpes lewis	**Lewis' woodpecker**	S, OR/S, MIS
Picoides albolarvatus	**White-headed woodpecker**	S, OR/S, MIS
Centrocercus urophasianus	Greater sage-grouse	S, SOC, OR/S
Falco peregrinus anatum	American peregrine falcon	S, OR/E, MIS
Gulo gulo luteus	California wolverine	S, SOC, OR/T, MIS
Sylvilagus idahoensis	Pygmy rabbit	S, SOC, OR/S
Corynorhinus townsendii	**Townsend's big-eared bat**	S, OR/S, MIS

***Federally listed and Regional Forester Sensitive** species come from the Region 6 Threatened, Endangered, and Sensitive species list for the Deschutes National Forest; E=Endangered, T=Threatened, S= Sensitive; C=Candidate for Federal listing, P=Proposed for Federal listing, SOC=USFWS Species of Concern, S=USFS Region 6 Sensitive, OR/T,E,S = State of Oregon status. *Petitioned for listing but found to not be warranted by the USFWS (USDI 2003,), currently under review by the FWS; MIS = Management Indicator Species.

Johnson's Hairstreak Butterfly

Existing Condition

This butterfly species can be found in coniferous forests, especially old growth. Their occurrence and distribution is limited to trees in stands with mistletoe infections. The primary caterpillar host is the pine dwarf mistletoe (*Arceuthoblum campylopodum*) that grows on conifers. It is likely that several species of dwarf mistletoes are utilized (USDA 2008). The butterfly lays its eggs on and the caterpillarand feeds on all exposed parts of the plant. The chrysalids hibernate in the mistletoe mass (Opler et al. 2006). This species is uncommon with a limited distribution in the Pacific Northwest. In eastern Oregon it has only been confirmed in the northeast near Baker City, approximately 200 miles to the northeast of the project area, although surveys have been limited and identification is difficult. It has an overlapping range with other species that are very similar in appearance.

Alternative 1 (No Action)

Direct and Indirect Effects: If present in the area, there would be no adverse effects to the hairstreak unless catastrophic wildfire would eliminate a large area of forest on the landscape.

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

Direct and Indirect Effects: Due to the dependence of hairstreak butterflies on mistletoe for critical life functions, the project's reduction of trees with mistletoe may have some minor, short-term affects to them. The entire project area is not being treated and not all mistletoe infected trees would be removed. Retention patches for deer and other species would also have infected trees within them. Very little is known about this species and its distribution which leaves the effects question unclear.

Consistency with LRMP Standards and Guidelines as Amended

No specific LRMP guidance for this species. Reference the Management Requirements/Project Design Criteria in the Wildlife Report for additional information.

Lewis' Woodpecker

Existing Condition

This species utilizes dead wood (large snags) in open forests (ponderosa pine, and in some cases riparian) that may have been logged or burned (Winkler et al. 1995; Natureserve, 2006; Saab et al. 2002). Marshall et al. (2006) reports that this species is associated with open woodland habitat near water. It primarily breeds in Oregon white oak, ponderosa pine, and riparian cottonwood communities. Important components of breeding habitat include open woodland canopy and large-diameter dead or dying trees. It can excavate its own nest chamber but prefers to use an existing abandoned woodpecker hole. The population has declined due to the loss of nesting and food storage trees, and increased competition for nest cavities from introduced European starlings (Csuti et al. 2001).

Alternative 1 (No Action)

Direct and Indirect Effects: Stand density would continue to increase, which would continue to reduce open habitat conditions desired by Lewis' woodpeckers. There would be a slow degradation in the numbers of large green trees and snags as insect and competition related mortality increased with time. The loss of understory trees from mistletoe mortality would also contribute to this decline across the landscape. Potential catastrophic wildfires would create a large pulse of snags for foraging and nesting, although within 10 years or less a large number of them would fall. Recovery of green trees and future snags would require decades to provide suitable habitat conditions.

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

Direct and Indirect Effects: The proposed actions would have some direct effects to Lewis' woodpecker habitat due to the loss of snags to prescribed fire, temporary road construction, and safety issues. Some snag recruitment would occur from mortality of green trees from prescribed burns.

Salvage cutting of snags would not occur. Reducing stand density to create more open conditions with larger trees would be beneficial and increase available habitat in the long-term. Future potential nest trees would be provided through time from recruitment of and retention of green trees. Adverse effects listed above may impact individuals in the short-term but would not likely be significant at the population scale.

Consistency with LRMP Standards and Guidelines as Amended

All applicable standards and guidelines will be met. However, current snag levels are estimated to be below recommended levels from DecAID. Monitoring after harvest and burning operations will determine if snag creation is necessary. Some snags will be created through girdling as well (see Connected Actions). Refer to the Management Requirements/Project Design Criteria and K-V Projects sections in the Wildlife Report.

White-headed Woodpecker

Existing Condition

This woodpecker is the only one that relies heavily on the seeds of ponderosa pine. They prefer open ponderosa pine or mixed-conifer forests dominated by ponderosa pine. Their numbers increase with large diameter old growth ponderosa pine and will use both contiguous and fragmented habitats. However, many seemingly good habitats are unoccupied, and they are considered uncommon across their range. Managed forests, including shelterwood or seed tree cuts, will be used if large pine trees are retained. Snags, stumps, leaning trees and dead tops are all used for nesting, which is usually in a very open, low canopy situation (Marshall et al. 2006). Nest trees average 18 inches dbh and foraging occurs on larger dbh trees. This species has suffered a severe population decline due to the loss of mature ponderosa pine forests (Csuti et al. 2001).

Alternative 1 (No Action)

Direct and Indirect Effects: Stand densification will continue which will further reduce the open habitat conditions desired by white-headed woodpeckers. There would be a slow degradation in the numbers of large green trees and snags as insect and competition related mortality increased with time. The loss of understory trees from mistletoe mortality will also contribute to this decline across the landscape. Potential catastrophic wildfires would create a large pulse of snags, although this species is more dependent upon foraging in green trees. Recovery of green trees and future snags would require decades to provide suitable habitat conditions.

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

Direct and Indirect Effects: The proposed actions would have some direct effects to white-headed woodpecker habitat due to the loss of snags to prescribed fire and safety issues. Some snag recruitment would occur from mortality of green trees resulting from prescribed burns, but the number cannot be estimated. Salvage cutting of snags would not occur. Reducing stand densities to create more open conditions with larger trees would be beneficial and increase available habitat in the long-term. Future potential nest trees would be provided through time from recruitment of retention green trees. Additionally, the thinning of large areas of black bark ponderosa pine would result in larger trees with higher seed production. This would benefit white-headed woodpeckers during the winter months. Adverse effects may impact individuals in the short-term but would not likely be significant at the population scale.

Consistency with LRMP Standards and Guidelines as Amended

All applicable standards and guidelines will be met. However, current snag levels are estimated to be below minimum requirements. Snag creation is a possible mitigation tactic. Refer to the Management Requirements/Project Design Criteria and K-V Projects sections in the Wildlife Report.

Townsend's Big-Eared Bat

Existing Condition

Two subspecies of Townsend's are found in Oregon, including one east of the Cascade Mountains. The presence of suitable roost sites is more important than the vegetation type in determining the distribution of this bat. It roosts in buildings, caves, mines and bridges. They have been documented to utilize tree cavities and lava outcrop overhangs in Central Oregon (Dogkin et al. 1995). They primarily feed on moths but will take other insects. Capture is usually on the wing, but they take insects from foliage (Csuti et al. 2001). Human disturbance may cause bats to permanently abandon caves (Graham 1966 *in* Maser et al. 1981). Populations have steadily declined (Csuti et al. 2001), which has been observed in trend monitoring in local caves.

Alternative 1 (No Action)

Direct and Indirect Effects: No effect unless large-scale catastrophic wildfire eliminated potential forage resources (i.e. insects associated with shrubs).

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

Direct and Indirect Effects: Presently there are no known cave habitats for roosts for the big-eared bat within the project area. If discovered, these habitats would be protected. Big-eared bats are known to utilize cliffs, rock outcrops and snags/trees for day roosting. Potential forage resources would be protected by measures developed for other species. Reference the Mitigation Measures/Project Design Criteria in the Wildlife Report.

Consistency with LRMP Standards and Guidelines as Amended

All applicable standards and guidelines will be met.

Cumulative Effects

Table 46 broadly summarizes potential landscape-scale effects of past and foreseeable actions in the vicinity of the project on wildlife, including the species assessed in this report.

Table 46: Cumulative Effect Summary

Management Activities/Natural Events/Foreseeable Actions*	Description	Effects Upon Wildlife Species
1. KO Timber Sale/Reforestation	Plantation fence maintenance and big game repellent applications. Dwarf mistletoe control activities (pruning and girdling of infected trees). Past harvest/thinning effects.	Reductions of hiding cover for deer and snags/logs for dependent species including white-headed and Lewis' woodpeckers. Mistletoe control may have adverse effects on hairstreak butterflies if present. Local impacts on individual species but no long-term adverse effects on populations.
2. Road maintenance within and adjacent to the project area.	System roads that remain in place with associated human use and periodic maintenance activities. Management actions past, present and future via travel management (Green Dot) and physical closures to mitigate negative effects.	Direct and indirect (i.e. disturbance, habitat effectiveness reduction) losses of habitat for deer and other species. Permanent adverse effects to individuals at the local scale but unlikely to have measurable effects at the population level. No effects on white-headed, Lewis' woodpeckers or Townsend's big-eared bat.
3. Grazing by livestock and associated improvements and maintenance activities (Quartz Mountain and Sand Springs Allotments).	Active cow allotment. Several water sets are within or adjacent to the planning area. Buried water lines cross the area in several locations. Extensive fencing is present.	Affects upon herbaceous and shrub vegetation that may affect dependent species. Potential effects on Townsend's big-eared bat insect forage, however, essentially a very minor effect. Generally, proper utilization management and pasture rotations reduce the adverse effects to infrequent local impacts to individuals. Water sets are the most impacting to vegetation but occupy a very small area. Managed grazing is not likely to affect populations.
4. Aspen Project vegetation treatments.	Within a few miles of the project boundary. Includes prescribed burns, mowing and thinning of pine plantations that have been	Effects upon wildlife species were addressed and the appropriate mitigation measures were adopted to reduce potential adverse effects.

Management Activities/Natural Events/Foreseeable Actions*	Description	Effects Upon Wildlife Species
	done and will continue into the future until completed.	
5. Wildfires	At least 6 fires greater than 100 acres have happened since 1913 within or near the project area. The fires having occurred within the boundary include: South Ice Cave (S, SW portions of area in 1915) and Quartz Mt. (NE and central portions in 1913 and 1918). The most recent large fire was the Aspen Flat fire of 1959 to the east of the project area.	Habitat related alterations by past fires have been included in assessments done for the project area including hiding cover, structural stage classification, etc. Fires are a natural disturbance and many species have evolved with them and depend upon fire created habitat conditions. Atypically hot fires may be damaging to soils and result in erosion and loss of site productivity which may have long-term adverse effects on many species. No known effects on species assessed by the BE.
6. Opal mine	Located in the SW portion of Quartz Mountain. Active annually.	Permanent habitat losses but a very small site.
7. Past fuels treatments	Wigtop area.	Conversion of shrub habitats to grass domination in the short to mid-term depending upon site and intensity of treatments. Variable effects on wildlife with some adversely affected and some benefited. Potential but minor effects on Townsend's big-eared bat forage insects.
8. Forest Access and Travel Management EIS	Reviews all system roads on the Forest. Final decision will specify closed unless posted open. Prohibits cross country travel.	Benefits many species sensitive to human disturbance.
9. Miscellaneous	Cinder pits, power line corridor, illegal motorcycle trails, dispersed camp sites, wildlife guzzlers, cone collection, firewood (snag/log) thefts, noxious/exotic weeds, etc.	Permanent loss of habitat, disturbance, and fragmentation. Effects variable by species resulting in losses of some individuals but unlikely to adversely affect populations. Effects are very limited on species addressed by the BE.
10. Weed Control EIS	Will allow chemical control of noxious and exotic weeds when approved.	Benefits

*** Notes**: Additional detail for individual management activity/natural events by respective reference numbers:

1. Past changes in habitats (e.g. structural stage, crown cover, etc.) are reflected in hiding cover indices, LOS assessments, etc. thereby incorporating cumulative effects where the measurements were done, e.g. Implementation Units and the project area. Currently the ODFW population indices for mule deer indicate a stable population for the South Paulina deer herd subunit, which is near their Management Objective (MO).
2. Road/motorized trail density assessments (e.g. Implementation Units) and effects determinations for those species where applicable meet the quantification aspect of cumulative effects for this activity. Reference the Wildlife, MIS for details.
3. Bounding was generally limited to the Implementation Units.

Specifically, for the foregoing TES species addressed by this report, there are no cumulative effects from preceding, ongoing or known future activities that would adversely affect any of the species potentially in the project area. Effects may impact individuals in the short-term but not population viability.

WILDLIFE – MANAGEMENT INDICATOR SPECIES AND HABITAT

SUMMARY OF EFFECTS ANALYSIS CONCLUSIONS

Alternative 1 (No Action)

- Species dependent upon more complex forest structure and higher canopy cover would benefit in the short to mid-term, e.g. forest accipiter hawks, American marten.
- Species dependent upon open habitats associated with frequent, low intensity wildfires would decline (white-headed woodpecker, flammulated owl, chipping sparrow, etc.).
- Shrub habitats would likely decline due to shading by the increasing densities of trees which would adversely affect dependent species (green-tailed towhee, fox sparrow). The lack of natural disturbance such as low intensity fire would result in more decadent shrub communities with less age class diversification.
- Deer hiding and thermal cover would slowly increase with stand densification. However, browse forage (e.g. bitterbrush) would likely decline slowly in both abundance and quality due to shading and competition.
- Snag and log densities would likely increase as competitive stresses upon trees result in more mortality. Snag/log diameters would however slowly decrease due to the limited resources available to each tree to grow as stand densification increases. Species that utilize small diameter snags would benefit, e.g. black-backed woodpecker, while those requiring larger snags or more open habitats would decline, e.g. northern flicker.
- Fragmentation from past timber harvest activities is presently low and would continue to decline. The fragmentation and disturbance affects due to roads is presently high, which would continue as none would be closed.
- Unauthorized motorcycle trail impacts (cutting of trees and damages to other vegetation and soils), including disturbance, would likely increase with time.
- In the mid to long-term the risks of epidemic insect impacts and/or catastrophic wildfires would increase and if they occur there would be long-term negative impacts to a large number of species that are dependent upon forest and shrub habitats. A few species that utilize burnt forests would benefit until the trees fall, e.g. black-backed woodpecker, Lewis' woodpecker, olive-sided flycatcher. The magnitude and duration of these effects depend upon the size and intensity of the stochastic events of insect epidemics and/or wildfires.

Alternative 2 (Proposed Action) and Alternative 3

- Both action alternatives have very similar effects on wildlife species, as there is only a minor difference in acreage treated and each utilizes the same types of vegetative treatment prescriptions.
- Species dependent upon more complex forest structure and higher canopy cover would likely decline affecting individuals but not populations, e.g. forest accipiter hawks, American marten.
- Species dependent upon open habitats and large ponderosa pine trees associated with frequent, low intensity wildfires would increase, e.g. northern flicker, flammulated owl, Lewis' woodpecker, white-headed woodpecker, etc.
- Shrub habitats would be reduced in the short-term due to disturbance including prescribed fire, mowing, and logging, which would likely negatively affect shrub dependent species (green-tailed towhee, fox sparrow, dark eyed junco, etc.). The more decadent shrub communities would be regenerated in the mid to long-term. Thus, the effects would be temporary affecting individuals but not populations. Species favoring grassy habitats, e.g. chipping sparrow, should increase.

- Deer hiding and thermal cover would decrease. However, road closures would improve solitude and habitat effectiveness.
- Snag and log densities would likely decrease due to prescribed fire and logging. Future snag diameters would slowly increase due to the reduction of competitive stresses between trees with thinning. Species that utilize large diameter snags would benefit, e.g. northern flicker, in the long-term. Mortality from bark beetles would be reduced in treated areas, which may affect species that specialize in the smaller diameter snags. Retention patches, however, would still have some mortality in the smaller trees from competition.
- Fragmentation from past timber harvest activities is presently low and would likely remain stable or improve with road closures.
- Motorcycle trail impacts to vegetation would likely increase with time.
- In the mid to long-term, the risks of epidemic insect impacts and/or catastrophic wildfires would be significantly decreased on 70% of the project area. A few species that utilize burnt forests, e.g. black-backed woodpecker, Lewis' woodpecker, olive-sided flycatcher, mountain blue bird, may be affected without large pulses of fire killed trees, however prescribed burns and small wildfires would likely mitigate this effect.
- The reduction of stand densities by harvest and thinning activities would reduce competitive stresses between trees and reduce the adverse effects of mistletoe infestations. In the long-term, single story LOS (i.e. Stage 7) would evolve towards the HRV levels common to xeric ponderosa pine communities. This would greatly benefit wildlife species that are highly dependent upon this habitat type including: white-headed woodpecker, Lewis' woodpecker, pygmy nuthatch, flammulated owl, etc. All of these species have declining population trends.
- There would be some impacts associated with soil compaction and direct mortality of shrubs by logging activities. Temporary roads, skid trails and landings would also have adverse but localized effects upon habitats. Sub-soiling the landings and temporary roads would mitigate these effects.
- Fuel reduction activities following commercial and non-commercial tree thinning would reduce the risks of future large, intensity wildfires and promote the establishment of herbaceous plants in the understory. In addition, the exposure of mineral soil from prescribed burning would enhance the potential for conifer regeneration, particularly where there are older overstory pine trees.
- Shrub community effects from fuel treatments may be adverse in the short to mid-term depending upon the type, intensity and timing of treatments. Low quality sites (i.e. xeric, shallow soils) for bitterbrush would require 15-25 years for full recovery, which may be impacting to deer and shrub dependent species of birds and mammals. Mitigation retention patches would alleviate these effects.
- Cable logging on steep slopes (Alternative 2) would not have a substantial difference in effects on habitats when compared to the fuel treatments in Alternative 3. Both alternatives would reduce tree density and canopy cover.
- Fuel reduction treatments using mechanical mowing, ladder fuel reduction, and prescribed burns in units without preceding commercial harvest would have effects similar to those described for post-logging treatments on soils, shrubs, and understory trees. There would likely be losses of some trees, snags and logs to prescribed fire with the resulting adverse impacts to deer hiding cover and snag/log dependent species. Both prescribed fire and mowing of shrubs may cause direct mortality to nesting birds if conducted in the spring. The extent, intensity, and timing of treatments would vary and so would the effects upon habitats and wildlife species. Multiple treatments (logging, pile and burn, mowing, broadcast burning) in units will have the most pronounced and long lasting effects on understory vegetation.
- Overall, fuel treatments would benefit those species dependent upon open forested habitats, maintained by frequent low intensity fire. Those species oriented to complex forest structure and high canopy cover would be negatively affected but the magnitude depends upon the variables of

treatments and the mitigation measures implemented. Individuals would be affected but not populations.
- The potential for large-scale intense wildfires in the project area is very high currently. The effects upon wildlife from wildfires would be much more adverse in terms of duration and the number of species affected than the local, short to mid-term effects of treatments, particularly if mitigated.
- The proposed treatments would result in the return to a more natural vegetation disturbance cycle that would benefit those species dependent upon relatively frequent, low intensity fire and open forest conditions. Many of the species assessed by this report are presently in a negative population trend situation due to the lack of providing these habitat conditions at the landscape-scale. Therefore, overall the project would have many more benefits to wildlife from the action alternatives than the no action option.

INTRODUCTION

This Wildlife Report meets the direction provided by the Forest Service Manual (FSM 2600), the Deschutes National Forest Land and Resource Plan (LRMP; USDA, 1990), and the Environmental Assessment for the Continuation of Interim Direction Establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales (referenced as the "Eastside Screens"; USDA, 1995).

This report specifically addresses the project's effects upon the following species groups and their habitat:

- Management Indicator Species (MIS, LRMP designation),
- Birds of Conservation Concern (BCC),
- Focal Bird Species,
- High Priority Shorebirds (HPSBs)

This report has considered and applied the best science available, including papers, reports, literature reviews, review citations, peer reviews, science consistency reports, and results of ground-based observations or surveys. The available information was used to determine species or habitat presence or effects. A complete list of the science used can be found within the species discussions and in the Literature Cited or Reviewed section of this document.

Neotropical migratory birds have become species of interest, due to the downward trend of landbirds in the western United States. The declines of these populations are a result of many complex issues, but factors believed to be responsible include the loss, fragmentation, and alteration of historic vegetation communities. Other probable causes to the decline include predation from feral species, nest parasitism, and use of pesticides associated with agriculture areas. There is currently an Executive Order (13186) that provides enhanced cooperation between the Forest Service and U.S. Fish and Wildlife Service (USFWS) in regards to addressing impacts to neotropical migratory birds in conjunction with the Migratory Bird Treaty Act. Specific activities are identified where cooperation between the parties will substantially contribute to conservation and management of migratory birds, their habitat, and associated values, and thereby advance many of the purposes of the Executive Order.

In response to this Executive Order and subsequent compliance with the Migratory Bird Treaty Act, the Deschutes National Forest is currently following guidelines from the "Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington" (Altman 2000). This conservation strategy addresses key habitat types as well as biological objectives and conservation strategies for these habitat types found in the East Slope of the Cascades, and the focal species associated with these habitats. The conservation strategy lists priority habitats including: 1)

Ponderosa Pine, 2) Mixed Conifer (late successional), 3) Oak-Pine Woodland, 4) Unique Habitats (Lodgepole Pine, White Bark Pine, Meadows, Aspen, and Subalpine Fir).

Another publication recently became available from the USFWS titled “Birds of Conservation Concern 2008” (BCC), which identifies species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973. Bird species considered for inclusion on lists in this report (and the companion Biological Evaluation) include non-game birds, game birds without hunting seasons, subsistence-hunted non-game species in Alaska, and ESA candidates, proposed endangered or threatened, and recently delisted species. While all of the bird species included in BCC 2008 are priorities for conservation action, the list makes no finding in regard to whether they warrant consideration for ESA listing. The goal is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions (USFW 2008).

From the BCC publication, Bird Conservation Regions (BCRs) were developed based on similar geographic parameters. One BCR encompasses the Bend-Fort Rock Ranger District—BCR 9, Great Basin. Species on these lists are discussed within this document if they are known to or potentially could occur within the proposed treatment areas.

In 2004, a publication titled “High Priority Shorebirds—2004” became available, also by the USFWS. This publication identifies U.S. and Canadian shorebird populations that are considered highly imperiled or of high conservation concern by the U.S. Shorebird Conservation Plan as of August 2004.

Habitat manipulation affects species differently. An action that may increase habitat for one species may decrease habitat for another species. Federal threatened, endangered, and regionally sensitive species lists are always consulted first. Species that do not appear on these lists but show up as a management indicator species or focal species may have persistence issues at a regional or national level but may not have persistence issues at the state or local level. In order to get an idea of the level of concern for these species, rankings were obtained from Natureserve Explorer: an online encyclopedia of life, available at http://www.natureserve.org/explorer. Rankings are given for global, national, and state levels. Only the state rankings are used in this analysis. This source has been incorporated in the Wildlife Species Review List (Table 47).

The project is within the East Cascades Ecoregion (ODFW 2006), EC-08 Sixteen Butte. The identified special features are: 1) winter range for deer and elk; and 2) some of the largest tracts of older-aged ponderosa pine forest in the ecoregion. Key habitat includes ponderosa pine woodlands and key species include Lewis’ Woodpecker and White-headed woodpecker.

EXISTING CONDITION

Plant Association Groups (PAGs)

Dry ponderosa pine is the dominate plant association group (PAG) within the project area. Dry lodgepole pine is next in dominance but much more limited in its spatial scope and stand sizes (approximately 18% of area). Lodgepole pine is often associated with stands dominated by ponderosa pine. A very small mixed conifer stand is located on the upper north slope of Quartz Mountain. Xeric shrub communities are relatively small and normally located on the tops of buttes or south slopes of ridges (e.g. Sixteen Butte). Mountain mahogany is present in small patches in these areas and often associated with rock outcrops.

Structural stages have been classified by the project silviculturist and described in detail in that report. In general, structural stages 4 and 5 are dominate on the landscape (approximately 80 of the area) and are referred to as “black bark” or mid-aged stands that have not evolved long enough to be considered old-growth (i.e. stages 6 and 7). As noted, stage 6 accounts for 12.4 percent of the area and stage 7 only 1.5 percent. A few open, single-storied ponderosa pine stands are very near the stage 7 classification.

Analysis Methodology

Deer Cover

To assess deer cover, each proposed treatment unit was field reviewed to determine if they met criteria to be classified as deer hiding and/or thermal cover. Thermal cover is applicable on winter range (Deer Habitat MA-7).

Hiding cover is defined using the Thomas (1979) definition. Three classes were utilized including non-cover, marginal, and acceptable. At least 50 percent of a stand/unit must provide hiding cover to meet the definition of marginal and at least 75 percent to meet acceptable. The stands/units are quantified as follows: non-cover equals 0 acres; marginal equals 50 percent of the stand/unit acreage; and acceptable equals 100 percent of the stand/unit acreage. This approach has been adopted to better reflect the patchy environment common to the xeric site conditions common to Central Oregon. It has been developed over a period of about 10 years by professional biologists on a number of projects affecting low elevation xeric (dry) habitat types.

Thermal cover classification has also been modified to reflect the low site productivity of the xeric conifer stands in the project area and must meet at least 30 percent crown cover. Crown cover exceeding 30 percent in dry ponderosa pine sites are at extremely high risk of bark beetle infestations. These areas are most likely only a temporary benefit to deer and other species.

Species Surveys

It was assumed that if habitat conditions were present in the project area, that habitat could support a species if they were present in the area, even if lacking direct observation of their presence. Species that would only briefly visit the area during migration, or extremely rare in the area, were not assessed for effects upon habitats by the project. Other assumptions made in the determinations of effects are documented in the following discussions.

Surveys established for northern goshawk (Woodbridge et al. 1993) were utilized in two consecutive years assessing the project area. One northern goshawk nest site and two Cooper's hawk sites were located. No other formal surveys for species were conducted. General reconnaissance in the field noted many species that would be expected for the habitat types present in the project area.

ENVIRONMENTAL CONSEQUENCES

Old Growth Management Areas (OGMA)/Corridors

There is one OGMA located within the project boundary of approximately 937 acres that is on Quartz Mountain. The OGMA primarily features ponderosa pine habitat with some small inclusions of lodgepole pine and mixed conifer. Presently, the OGMA is experiencing some mortality of larger overstory ponderosa pine due to competition from small trees in the understory. Additionally, there are significant areas with atypical amounts of dwarf mistletoe infestations. Fuel accumulations have placed the OGMA at high risk to catastrophic insect infestations and/or wildfire. The indicator species for the OGMA is the northern goshawk as specified by the LRMP (MA8, General Theme and Objectives, 4-149) for old-growth ponderosa pine. One active nest was located adjacent to the project area. Other species that should be considered as indicators of this habitat type include the white-headed woodpecker and flammulated owl.

Prior to this project, there have been no previously designated/mapped OGMA corridors within the project area but several terminated adjacent to the project boundary. Corridors to link LOS stands and OGMAs are required by the Eastside Screens. Corridors connecting the OGMA within the project area to others outside of it have been designated for this project. LOS outside of the OGMA is essentially non-existent and no corridors were designated for this category.

Late and Old Structure (LOS)

Ponderosa pine structural stages 4 and 5 are dominate on the landscape (approximately 80% of the planning area) and are referred to as “black bark” or mid-aged stands that have not evolved long enough to be considered old-growth (stages 6 and 7). A few open, single-storied ponderosa pine stands are very near the stage 7 classification. Ponderosa pine LOS in stage 6 multi-storied structure is 1,702 acres (approximately 12.4 percent of the planning area) and stage 7 single storied structure is 206 acres (approximately 1.5 percent of the planning area). The historic range of variability (HRV) for stage 6 in ponderosa pine is estimated to be 10 percent and stage 7 is 55 percent. The Eastside Screens require an analysis of HRV, and in this situation Scenario A is applicable because a LOS stage (either or both) is below the minimum. Stage 5 ponderosa pine is presently estimated to be 5,444 acres (approximately 34 percent of the planning area).

Lodgepole pine stage 5 is 403 acres (approximately 2.5 percent of the planning area) and stage 6 is 28 acres (less than 1.8 percent of the planning area). This stage has an HRV of only 5 percent so there is good future potential for LOS ponderosa pine as these stands mature.

Alternative 1 (No Action)

Direct and Indirect Effects: Habitat connectivity would remain favorable, unless a catastrophic wildfire was to occur within the project area or within the portions of the corridors outside the project boundary. Without wildfire there would likely be a slow degradation in the numbers of large green trees and canopy cover as insect and competition related mortality increased with time. Also losses of understory trees from mistletoe will also contribute to this decline across the landscape.

Alternative 2 (Proposed Action) and Alternative 3:

Direct and Indirect Effects: Where possible unit boundaries avoided designated corridors. The Eastside Screens require a minimum amount of tree canopy equivalent to the upper on-third. of the site’s productivity. In addition, the corridors must be at least 400 feet in width. The density of retention trees to meet the standard were determined by the team’s silviculturist, and the respective prescriptions where units overlay corridors will meet this objective. Therefore, effects by thinning activities within corridors will be minimal and their function will remain intact.

Species and Habitats Evaluated

Species that are listed or proposed for listing as threatened or endangered, or are on the Regional Forester’s sensitive species list are analyzed in the Biological Evaluation for the project (Refer to the previous section; Wildlife – Biological Evaluation).

A variety of mammals and birds utilize the habitat available within and adjacent to the project area. Refer to the following tables for a listing of species with special status that have been reviewed. **Management Indicator Species** (Table 47; Table 54, page 137; Table 55, page 140) come from the Deschutes National Forest Land and Resource Plan (LRMP)[1990]; **Landbird Focal Species** (Table

56, page 142) come from the Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington (Altman 2000); **Birds of Conservation Concern** (BCC, Table 57, page 145) come from the US Fish and Wildlife Service Birds of Conservation Concern – BCR 9 (Great Basin) [2002]; and **Shorebirds** (Table 58, page 146) come from the 2004 US Fish and Wildlife Service U. S. Shorebird Conservation Plan.

Conclusions are made as to the lack of presence of individual species based on habitat availability and suitability. Species ***bolded have*** known or potential habitat within the project area and will be further evaluated to determine potential impacts from the project.

MANAGEMENT INDICATOR SPECIES

Table 47: Management Indicator Species (MIS)

Management Indicator Species			
Species	**Status**	**Habitat**	**Presence**
Northern goshawk	MIS	Mature and old-growth forests; especially high canopy closure and large trees	Habitat in proposed treatment areas
Cooper's hawk	MIS	Similar to goshawk, can also use mature forests with high canopy closure/tree density	Habitat in proposed treatment areas
Sharp-shinned hawk	MIS	Similar to goshawk in addition to young, dense, even-aged stands	Potential habitat in proposed treatment areas
Golden eagle	MIS, BCC	Large open areas with cliffs and rock outcrops	Potential habitat in proposed treatment areas.
Red-tailed hawk	MIS	Large snags, open country interspersed with forests	Habitat in proposed treatment areas.
Townsend's big-eared bat	MIS	Caves and old dwellings	Potential habitat in proposed treatment areas. Refer to the BE for details.
Elk	MIS	Mixed habitats	Habitat in proposed treatment areas
Mule deer	MIS	Mixed habitats	Habitat in proposed treatment areas
American marten	MIS	Mixed conifer or high elevation late-successional forests with abundant down woody material	Potential habitat in proposed treatment areas.
Great gray owl	MIS	Mature and old growth forests associated with openings and meadows	No habitat within or adjacent to proposed treatment areas
Great blue heron	MIS	Riparian edge habitats including lakes, streams, marshes and estuaries	No habitat within or adjacent to proposed treatment areas.
Osprey	MIS	Large snags associated with fish bearing water bodies	No habitat within or adjacent to proposed treatment areas.
Snags and downed wood associated species and habitat	**MIS**	Snags and downed woody material	Habitat in proposed treatment areas

***Federally listed and Regional Forester Sensitive** species come from the Region 6 Threatened, Endangered, and Sensitive species list for the Deschutes National Forest (refer to the BE for details);

Rationale for Species not Considered in Detail

Townsend's big eared bat was discussed under the Regional Forester's Sensitive Species List in the previous section – Wildlife, Biological Evaluation - of this EIS.

For the following species, there is no habitat within or adjacent to proposed treatment areas. A lack of habitat assumes a lack of presence and therefore any actions or no action within the proposed treatment areas would have no affect to the following species: Great gray owl, great blue heron, Osprey. For more specific information refer to the Project Record, Wildlife Report, beginning on page 20.

Species Receiving Further Considered

Northern Goshawk: *MIS, S3 Vulnerable*

In Oregon goshawks tend to select mature or old-growth stands of conifers for nesting, typically those having a multi-layered canopy with vegetation extending from a few meters above ground to more than 40 meters high. Generally nesting sites are chosen that are near a source of water and are on moderate slope, usually having northerly aspects. This habitat type is quite similar to that used by the Cooper's hawk, but the trees tend to be older and taller and have a better developed understory of coniferous vegetation (Reynolds, Meslow, and Wight 1982 *in* Csuti et al. 2001). Foraging generally occurs within these mature stands where small openings occur. Goshawks generally forage on songbirds, but often utilize small mammals such as rodents as well as the occasional snowshoe hare. Other bird species are also preyed upon such as blue and ruffed grouse.

Within "Scenario A of the Eastside Screens Standard and Guides" (i.e. LOS stages 6 and/or 7 are below HRV) as it amends the Deschutes LRMP, the direction for management is as follows:

- Protect every known active and historically used goshawk nest-site from disturbance. "Historically" refers to known nesting activity occurring at the site in the last 5 years. Seasonal disturbance restrictions may be implemented at sites.
- 30 acres of the most suitable nesting habitat surrounding all active and historical nest tree(s) would be deferred from harvest.
- A 400 acres "Post Fledging Area" (PFA) would be established around every known active nest site. While harvest activities can occur within this area, retain the LOS stands and enhance younger stands toward LOS condition, as possible.
-

Surveys of potential northern goshawk habitat in the proposed treatment areas used the method outlined by Woodbridge et al. (1993). There was one goshawk site located adjacent to the project area.

Alternative 1 (No Action)

Direct and Indirect Effects: The current condition of the area provides relatively high canopy cover and complex stand structure, which may be utilized by goshawks. In the event of future insect epidemics and/or catastrophic wildfire, large areas could be adversely impacted and require many decades to recover to the quality of habitat preferred by goshawks.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed treatments would substantially reduce canopy cover and simplify stand structure, which would likely reduce the potential for goshawk nesting. Alternative 2 treats approximately 48 percent (7,685 acres) and alternative 3 approximately 51 percent (8,220 acres) of the heavily forested stands in the planning area to reduce tree density and correspondingly the canopy coverage and structure. About 27 poercent (4,335 acres) of the project area would remain untreated that presently has higher tree density, however the majority of this acreage is fragmented slivers or otherwise unmanageable. The larger untreated stands (i.e. matrix polygons) may provide nesting habitat for goshawks and other accipiters (i.e. Cooper's and sharp-shinned hawks). The LRMP requirements for deer hiding cover (WL-54 and 59) and structural diversity (WL-74, TM-56) would provide some potential nesting sites and edges for foraging by goshawks. The non-black bark pine units within the OGMA will have 20% of their area retained in a non-thinned condition to mitigate effects on goshawks and other species oriented to more complex structure habitat.

The one nest site is within a designated Old Growth Management Area but adjacent to it outside of the project boundary. A portion of the designated nest core (30 acres) would be within the project boundary but all of the post-fledgling area (400 acres) would be outside of it. The proposed treatments will not affect the nest core area.

Cooper's Hawk: *MIS, S4 Apparently Secure*

The Cooper's hawk prefers coniferous, mixed and deciduous forests, as well as riparian, juniper, and oak woodlands. The vegetative profile around nests are trees 30-60 and 50-70 years old in northwest and eastern Oregon, respectively with tree density of 265 per acre and 469 per acre. Cooper's hawks commonly nest in deformed trees infected with mistletoe (Marshall et al. 2006). Surveys for goshawks, often can disclose Cooper's hawk territories. There are two known Cooper's hawk nests within the planning area.

Alternative 1 (No Action)

Direct and Indirect Effects: The current condition of the area provides relatively high canopy cover and complex stand structure, which may be utilized by Cooper's hawks. In the event of future insect epidemics and/or catastrophic wildfire, large areas could be adversely impacted and require many decades to recover to the quality of habitat preferred by Cooper's hawks.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed actions are not expected to impact any known nest sites or dispersing Cooper's hawks as they move through the area. As noted for goshawks, there will be a substantial reduction of canopy cover across the planning area that will limit future nesting habitat for Cooper's hawks. The LRMP requirements for deer hiding cover (WL-54 and 59) and structural diversity (WL-74, TM-56) would provide some potential nesting sites and edges for foraging. An untreated nest core area of 15 acres would be retained around each of the two known nest sites. Reference the file map.

Sharp-shinned Hawk: *MIS, S4 Apparently Secure*

Sharp-shinned hawks**,** in Oregon, breed in a variety of forest types that have a wide range of tree species, though most are dominated by conifers. Nests have been located at elevations that range from roughly 300 to 6,000 feet. Vegetative characteristics found at nest sites, include high tree density and high canopy cover, which produce cool, shady conditions. Nest stands preferred by sharp-shinned hawks are younger than those preferred by Cooper's and goshawk, usually 25-50 year old, even-aged stands. The Deschutes LRMP defines sharp-shinned hawk habitat as stands with a mean canopy cover of 65 percent or greater, tree density of at least 475 trees per acre, stand age 40-60 years (LRMP WL-25). In eastern Oregon all nest sites found by Reynolds et al. (1982) were in even-aged stands of white fir, Douglas-fir, ponderosa pine, or aspen, with ground vegetation limited to grasses and creeping barberry (Marshall et al. 2006). Natureserve reports that the sharp-shinned hawk has a ranking of "apparently secure" in Oregon.

Alternative 1 (No Action)

Direct and Indirect Effects: The current condition of the area provides relatively high canopy cover and complex stand structure, which may be utilized by sharp-shinned hawks. In the event of future insect epidemics and/or catastrophic wildfire, large areas could be adversely impacted and require many decades to recover to the quality of habitat preferred by sharp-shinned hawks.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed actions would not be expected to impact any nest sites or dispersing sharp-shinned hawks as they move through the area. As noted for goshawks there will be a substantial reduction of canopy cover across the planning area that will limit future nesting habitat for sharp-shinned hawks. The LRMP requirements for deer hiding cover (WL-54 and 59) and structural diversity (WL-74, TM-56) would provide some potential nesting sites and edges for foraging.

Golden Eagle: *MIS, BCC, S4 Apparently Secure*

Generally, golden eagles occur in grass-shrub, shrub-sapling, and young woodland growth stages of forested areas, or in forest with open lands nearby for hunting. Essentially they need only a favorable nest site, usually a large tree or cliff, a dependable food supply, mainly of medium to large mammals and birds, and broad expanses of open country for foraging. They especially favor hilly or mountain country, where take off and soaring are facilitated by updrafts; deeply cut canyons rising to open sparsely treed mountain slopes and crags represent ideal habitat (Johnsgard 1990).

Alternative 1 (No Action)

Direct and Indirect Effects: Tree densification is likely reducing the amount of potential foraging habitat and the availability of large overstory trees for nest sites due to competition and insect related mortality.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Habitat conditions would likely be improved by reducing tree densities and the potential for large-scale wildfires that could eliminate potential nest trees. Refer to the Mitigation Measures/Project Design Criteria section for additional information (e.g. protection of cliffs).

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines would be met.

Red-tailed Hawk: *MIS, S5 Secure*

Red-tailed hawks have an extremely wide tolerance for habitat variation, frequenting woodland, agricultural land, clearcuts, grasslands, sagebrush plains, alpine environments, and urban areas. Red-tails are largely perch hunters, supported by habitat types that provide suitable perches (trees, utility poles, outcrops, etc.) and are open enough to permit the detection of ground-dwelling prey. They construct nests in a variety of situations including trees and cliffs, placing their nests higher than other broad-winged hawks (Marshal et al. 2006). The planning area provides abundant foraging habitat. Red-tails are commonly observed soaring above the planning area and across the district. There are no known nest sites that occur within the planning area. Natureserve (2006) ranks this species as "secure" in most of continental United States, including Oregon.

Alternative 1 (No Action)

Direct and Indirect Effects: Tree densification is likely reducing the amount of potential foraging habitat and the availability of large overstory trees for nest sites due to tree density and insect related mortality.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Habitat conditions would likely be improved by reducing tree densities and the potential for large-scale wildfires that could eliminate potential nest trees.

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines would be met.

Elk: *MIS, S5 Secure.*

Elk are uncommon within the project area. They are most likely to be present during spring and fall migration.

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no known or expected short-term adverse effects. Without forest health treatments the risk of catastrophic wildfire would increase in the future. Catastrophic wildfire could place elk cover at risk over potentially large areas of the landscape. Recovery time from wildfire could take years, if not decades.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Effects of the action alternatives on elk would likely have little overall impact due to the low use in the area. Effects upon mule deer habitat have some applicability to elk.

Consistency with LRMP standards and guidelines as amended: This is not applicable as there are no designated Key Elk Area.

American (Pine) Marten: *MIS, S3 Vulnerable*

There are no known historic sightings of American marten within the planning area. Martens occupy a narrow range of habitat types, living in or near coniferous forest (Allen 1987). More specifically, they associate closely with late-successional stands of mesic (moist or wet) conifers, especially those with complex physical structure near the ground (Buskirk and Powell 1994). In these areas, structure near the ground is important in providing access to spaces below the snow (Corn and Raphael 1992 *in* Ruggiero et al. 1994). The information synopsis in Natureserve (2006) states that fallen logs and debris are special habitat features.

An average territory size is approximately four square miles (2,560 acres), with densities as high as 1-2 per 250-500 acres in the fall. Complex physical structure addresses important life needs: 1) providing protection from predators; 2) access to below snow space where most prey are captured in winter; and 3) providing protective thermal microenvironments (Buskirk and Powell 1994). The more desirable forest types of the marten are large, somewhat dense, stands of lodgepole pine, mixed conifer, and mountain hemlock. Abundant coarse woody material in these stands is important to support a rodent prey base (LRMP WL-61). Natureserve (2006) ranks this species as being "vulnerable" in Oregon.

Ponderosa pine habitats are not likely to have extensive utilization by marten, although they may be used as martens move through an area. Down logs and concentrations of dead wood may be important to marten during these times for both security and foraging. The latter activity is focused upon small rodents which depend upon down logs, shrubs and other forest floor cover for concealment.

Alternative 1 (No Action)

Direct and Indirect Effects: Habitat conditions would remain unaffected and continue to improve where canopy cover and down woody debris accumulations increase, provided that catastrophic wildfires do not impact large areas of habitat.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Treatments within preferred lodgepole pine habitat would likely reduce the potential quality of the sites for marten due to reductions in canopy cover and impacts to existing or future large woody debris on the forest floor. Many of the lodgepole stands will have 20 percent of their area in retention patches to meet deer cover objectives, which should also potentially benefit marten. The stands are isolated and have poor connections to upper elevation habitats. Lodgepole habitats are approximately 18 percent of the project area. The likelihood of occupancy by marten is therefore low. Adverse effects may affect individuals but will not likely be significant at the population scale.

Mule Deer: *MIS, S5 Secure.*

Mule deer are known to use the proposed treatment areas for hiding and thermal cover and foraging.

- **Existing Hiding and Thermal Cover**

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, LRMP WL-54). Hiding cover provides security to big game and protection from predators. Hiding cover is especially important for reducing vulnerability to hunting and poaching pressure by providing concealment in areas that have high open road densities and easy access by hunters (e.g. the proposed treatment areas). Hiding cover is evaluated for deer summer range (the entire Forest outside the Deer Habitat management, MA7 allocation – winter range), per LRMP direction.

For winter range, cover used by big game to moderate cold weather conditions and to assist in maintaining a constant body temperature is referred to as thermal cover (Thomas 1979). Tree canopy cover conditions that provide optimal thermal cover are considered to be greater than 75 percent canopy cover in seedling and sapling stands that are greater than 5 feet in height or canopy cover greater than 60 percent in pole sized (5-9 inches dbh) trees and larger (Thomas 1979). Tree canopy cover conditions for optimal thermal cover on the Deschutes National Forest have been compromised somewhat due to low site productivity for tree growth and the risk of insect-pest epidemics killing or severely damaging tree stands (LRMP M7-5). Crown cover greater than 40 percent with trees 30 feet tall is recommended for thermal cover on the Deschutes National Forest (LRMP M7-13). As noted earlier the minimum crown cover adopted for the xeric pine sites in the project is 30 percent.

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 (LRMP, 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).

- **Implementation Unit Hiding Cover Analysis**

The LRMP requires that deer cover analysis be based upon Implementation Units (IUs), which are large areas generally bounded by roads. The Deadlog Project area intersects portions of IU #62 (18,235 acres); IU #63 (25,031 acres); and IU #69 (34,418 acres). IUs are not required for hiding cover assessments in Deer Habitat (MA-7), which totals 40,568 acres. The net acreage which was assessed for hiding cover is 20,558 acres (not including private land) and summarized in Table 48.

Table 48: Summary of Current Deer Hiding Cover in Implementation Unit (IU)

IU	IU Net Acreage	Hiding Cover Classes (acres) by Structural Stage		
		No Cover & Early	Mid	Late
62	10,602	1,146	8,613 (net 6,178 without lpp)	843
63	6,919	856	4,819 (net 4,441 without lpp)	1,244
69	3,037	23	2,498 (net 2,191 without lpp)	516
Total	**20,558**	**2,025**	**15,930 (net 12,810 without lodgepole pine)**	**2,603**

Note: *Reference file map for subdivisions. No Cover includes xeric shrublands, rocky areas, meadows, cinder pits, etc. that are incapable of growing trees for cover. lpp = lodgepole pine.

Table 49: Summary of Current Deer Hiding Cover in Implementation Units

IU	Lodgepole acres (mid structural stage)	Hiding Cover Classes (acres)		
		Non-Cover	Marginal and Acceptable Cover Acres	
62	2,435	8,171 acres (77%)	553 acres (5%)	1,878 acres (18%)
63	378	5,782 acres (84%)	442 acres (6%)	695 acres (10%)
69	307	2,427 acres (80%)	211 acres (7%)	399 acres (13%)
Totals Acreage = 20,558		**16,380 acres (80%)**	**1,206 acres (6%)**	**2,972 acres (14%)**

Based upon experience in cover classification within the Deadlog planning area the following assumptions were made in the allocation process

1) All No Cover & Early acreages = non-cover;

2) Mid is generally equivalent to black bark ponderosa pine which on average provides 10% acceptable cover and 8% marginal cover; lodgepole pine present in the IU, which has superior cover and is generally mid-structure is estimated to provide 50% hiding cover (added as acceptable cover);
3) Late is on average providing 5% acceptable cover and 7% in marginal cover (due to open pine stands; no mixed conifer is within the IUs). It is assumed that the non-black bark category used in the Deadlog analysis included early stages which would be include in the non-cover acreages for that category, i.e. no effect on proportions in cover categories. Early = stages 1, 2; Mid = stages 3, 4, 5; and Late = stages 6, 7. Crown cover is not a reliable indicator of hiding cover, as black bark commonly has higher crown cover but often with understories that exhibit slow growth. Understory conifers provide the best hiding cover for deer which are not totally measured by vertical projection methodology. Therefore, structural stage is used here as the better indicator.

Approximately 20 percent of the Implementation Units are in cover, with 6 percent marginal and 14 percent acceptable. These figures appear to be reasonable given the dry xeric pine stands with a dominance of black bark and late seral open forest conditions. Lodgepole pine is a strong contributor to hiding cover but is lacking in two of the IUs assessed. The more exhaustive analysis for the planning area resulted in 7 percent marginal and 11 percent acceptable for approximately 18% total cover. Therefore, the methodology employed for the IUs appears to be reasonable, given the similarities between the project habitat conditions (i.e. dominated by xeric, low elevation ponderosa pine) and the assessed portions of the IUs.

Using the assumption that the “mid” category is equivalent to black bark pine and deducting those stands with a lodgepole pine component there is a balance of approximately 12,810 acres in pure ponderosa pine (i.e. Table 2A, net mid without lodgepole). The balance of 3,120 acres would be black bark pine with the lodgepole component, which generally provides superior hiding cover. In total, the black bark structural stage is providing approximately 18 percent hiding cover. The LRMP requirement is 10 percent un-thinned screening clumps in black bark treatment units, which will be met. The non-black bark forested habitat is only providing 12 percent hiding cover (i.e. 5 percent acceptable and 7 percent marginal). The LRMP requirement for non-black bark in summer range is 30 percent hiding cover, so the area is deficit for this component of summer range.

- **Deer Habitat – MA-7 (Winter Range)**

The LRMP requires optimization of habitat conditions within designated Deer Habitat (winter range). It recommends a minimum of 40 percent of the winter range to provide cover with 10 percent as hiding cover and 30 percent as thermal cover. Only 3.6 percent of the project area is designated as winter range, which is part of the adjoining Wigtop Winter Range Habitat Unit. WRHUs were developed in order to better assess habitat conditions for mule deer in accord with their home range size on winter ranges (USDA 1988), but not to determine LRMP consistency.

Because the project affects such a small portion of the Wigtop WRHU (approximately 4 percent, 585 acres), the entire unit was not assessed. The LRMP suggests a minimum habitat assessment area of 3,000 acres (M7-11). Field reconnaissance of the area concluded that both hiding and thermal cover are extremely limited and unquantifiable. Cover exists only in very small, scattered patches of denser trees, which is primarily due to the low precipitation of the site. Canopy cover requirements of the LRMP to meet thermal cover (i.e. 40 percent minimum) are unrealistic in low productivity ponderosa pine sites and are generally unattainable or present only for a short term. Areas with high canopy cover are very prone to insect infestations as the trees are stressed by competition. Deer use indices of the area, including shrub browsing and pellet groups, suggest low use there, which is likely related to the site being at an upper elevation for winter range.

- **Summer Range**

The project area is dominated by deer summer range (96 percent). The LRMP requires retention of trees for hiding cover with a minimum of 30 percent in non-black bark designated summer range. Black bark pine forest must retain 10 percent Deer Habitat (MA-7, winter range) in un-thinned screening clumps within individual treatment units. Approximately 9,547 acres (59 percent) of the project area is classified as black bark leaving approximately 6,472 acres (41 percent) in non-black bark. The estimate for hiding cover across the entire planning area is approximately 17.6 percent. Stratification of the project area indicates that approximately 19% of the black bark is hiding cover and 16% of the non-black bark is hiding cover. It is assumed by the LRMP that hiding cover in summer range will meet any thermal cover requirements by mule deer. Table 50 summarizes the current condition assessment of deer hiding cover for the project.

Table 50: Project Area Current Deer Hiding Cover Summary

Forest Types Acres	Hiding Cover Classes (Acres) [1]			
	Acceptable	Marginal	Non-Cover [2]	Total Cover Acres
Black Bark (9,547)	980	789	7,778	1,769 (19%)
Non-Black Bark (6,472)	771	282 (566)	5,419	1,053 (16%)
Totals [3]: 16,019	1,751 (11%)	1,071 (7%)	13,197 (82%)	2,822 (18%)

1 - Cover acreage calculations are as follows: Acceptable = 100% of the stand/polygon acreage, Marginal = 50% of the stand/polygon acreage, and Non-Cover = 0% of the stand/polygon acreage. Cover was defined using the Thomas (1979) definition where the cover is capable of hiding 90% of a deer at 200 feet. In order to quantify hiding cover that is available to deer where vegetation is clumped or has a patchy distribution the following classification was employed: Acceptable = 75%+ of the stand/polygon provides cover; Marginal = 50-74% is cover; and Non-Cover is 0-49%. This methodology has been developed over a period of about 10 years addressing a number of vegetative/fuels projects in the eastern portion of the District. It is the professional judgment of the project biologist to be the best method of assessing hiding cover in dry forest habitat types and has been reviewed and supported by State biologists.
2 - The Non-Cover acreage includes the 50% not counted as cover for the marginal category (50% of 1,577 gross acres for Black Bark and 50% of 566 gross acres for Non-Black Bark). Planning area acreage = 16,055 acres. Without Deer Habitat = 15,469 acres. .
3 - Totals will not equal the project planning acreage due to GIS "slivers" or blanks in calculating each individual polygon. Gross acreage, excludes xeric shrublands.

The planning area is currently providing an estimated 2,822 acres of deer hiding cover. The black bark forest type is providing 63 percent of the total cover and the non-black bark type 37 percent. The very small winter range area (586 acres) was deducted from the planning area gross acreage in doing the calculations. The winter range currently has no hiding cover. The combination of low site productivity, open mature pine stands, and lack of regeneration in black bark ponderosa pine all contribute to the low amount of hiding cover currently present in the planning area. Lodgepole pine, which often provides superior cover due to its rapid understory establishment, is very limited in the planning area (approximately 10 percent of the area). The few pine plantations present in the area were machine planted in rows which compromised their ability to provide cover.

Alternative 1 (No Action)

Direct and Indirect Effects: Without forest health treatments the risk of catastrophic wildfire would increase in the future placing deer cover at risk over potentially large areas of the landscape with a resulting recovery time of years if not decades.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Assuming that all treatments would eliminate the existing hiding cover, the reduction of cover is determined by the amount of it remaining in the untreated areas (i.e. matrix polygons) and untreated units (i.e. changes with alternative). The mitigation measure for hiding cover is to leave a minimum of 10 percent hiding cover in un-thinned visual screening clups in each unit dominated by black bark. Non-black units may leave 10 to 20 percent in hiding cover which is specified by unit in the section of this report on Resource Protection Measures. Given the area's lack of hiding cover, deer movement corridors were not designated. However, the OGMA corridors will meet some of this need. Table 51 summarizes the effects of the action alternatives.

Table 51: Alternative 2 (Proposed Action) and Alternative 3 Effects to Deer Hiding Cover

Units/Matrix	Hiding Cover (acres)			
	Acceptable	Marginal Net (Gross)	Non-Cover (no effect)*	Notes
16,055 gross acres	1,751	1,071 (2,143)	12,136	Current hiding cover = 2,822 acres - 18%.
Alternative 2 (Proposed Action)				
Units treatments reductions	1,437	936	--	2,373 acres of hiding cover reduction.
Matrix retained cover	306	125 (249)	--	--
Percentages	2%	0.8%	97.2%	--
Net percentages with 10% retention**	2.8%	1.4 %	95.8%	Post-treatment residual hiding cover ~4.2%
Alternative 3				
Units treatments reductions	1,445	946	--	2,391 acres of hiding cover reduction.
Matrix retained cover	306	125 (249)	--	--
Percentages	2.0%	0.8%	97.2%	--
Net percentages with 10% retention**	2.8%	1.4%	95.8%	Post-treatment residual hiding cover ~4.2%

Note: It is assumed that ALL treatments (i.e. harvest, stand improvement, and fuels prescriptions of all types) would eliminate or substantially impact hiding cover to the point that it no longer meets the standard definition.
*Hiding cover may be present but not in sufficient quantity (i.e. minimum of 50% of the unit/polygon) to meet the definition of marginal cover.
**The 10% acreage retention for mitigation is calculated upon the actual cover acreages and not the gross treatment acreages.

There is essentially no difference between the action alternatives on effects to deer hiding cover. Alternative 2 treats 529 acres fewer acres than Alternative 3. Only 18 acres are classified as hiding cover in the 7 additional units. The above calculations are based upon the entire project area with black bark, non-black bark, winter range, and summer range combined. The distinctions between these components are essentially not important due to the low levels of hiding cover within the project, and particularly after treatments. The estimated amount of hiding cover in the non-black bark portions of the matrix polygons (untreated areas) is 145 acres or less than 1 percent of the project area. For the non-black forest within treatment units there are currently 959 acres or 6 percent of the project area in hiding cover. The forest health issue for the project area causes a focus on the over stocked stands, which provide nearly all the hiding cover in the area for deer.

It is difficult to quantify effects upon deer numbers because of the number of variables that affect deer herds and their migratory nature which extends their range outside of the project area. Cover is important for deer security particularly during hunting season. The proposed road density reductions (reference following section) and the existing Fox Butte Cooperative Travel Management Area (i.e. Green Dot road closures system) during hunting season would help compensate for cover reductions. Overall the reduction of risk to catastrophic wildfire would likely have less adverse impacts to deer numbers than if wildfire eliminated large areas of cover and forage resources.

Consistency with LRMP standards and guidelines as amended

The treatments would reduce the current hiding cover level from approximately 18 percent to approximately 4 percent in the project area. Given that some specific units to be identified in non-black bark may retain more cover (20 percent vs. 10 percent) and the un-quantified hiding cover in units designated as No Cover (i.e. less than 50 percent cover), the effect would be somewhat mitigated. The LRMP requirement to provide 30 percent hiding cover in non-black bark summer range would not be met, which would necessitate an amendment of the LRMP. Where available in black bark dominated units, the LRMP requirement to retain 10 percent hiding cover in un-thinned visual screening clumps within each treatment unit would be met.

After the project area is treated by Alternative 3, the affected Implementation Units (i.e. all three, gross 37,116 acres without MA7) would have an estimated 13 percent hiding cover (approximately 4,849 acres). Alternative 2 is nearly identical. Thus, an LRMP amendment is still applicable. The cumulative effects on hiding cover are addressed by this analysis.

The small portion of winter range is not included in the data summary presented. There is no hiding cover present and the small patches of thermal cover do not meet current definitions. An LRMP amendment is not recommended due to the very small size (586 acres or 3.6 percent of the project area) of the affected Winter Range Habitat Unit (Wigtop, 4.3 percent of 13,500 acres) and because treatments within it will not reduce any hiding or thermal cover (there is presently no cover meeting definitions.

- **Road/Motorized Trail Densities**

A fragmentation analysis was not conducted on the current condition of the project area. Nearly the entire area has been harvested by past timber sales, which included the development of an extensive network of roads and skid trails. There is also a unauthorized (user created), unmapped motorcycle trail system in the project area.

The vast majority of the area was selectively logged in the 1930s and 1940s with very little regeneration harvest prescriptions. Several plantations were established following past wildfires (e.g. Sixteen and Deadlog buttes). Plantations that are within the project area provide some edge effect where located near more mature forest. High edge contrasts are lacking except along roadways. Because of this, fragmentation due to past management activities is low. Core area habitats have been more impacted by road construction than timber management activities.

Roads and trails that provide motorized access adversely affect habitat effectiveness for big game due to motorized disturbance. Animals are most vulnerable during hunting season and to poaching. Habitat fragmentation and loss of core habitat areas is another important adverse impact from roads and trails. Current road density across the project area is approximately 4.7 miles per square mile. The overall average of the IUs is 3.6 miles per square mile, although these IUs extend beyond the project area boundary. The LRMP goal is to road densities towards 2.5 miles per square mile upper limit on deer summer range and 1.0-2.5 miles per square mile on winter range. The winter range within the project area was not assessed for road density due to its small area. Unauthorized motorcycle trails have been constructed across the project area, but their density is unknown.

Alternative 1 (No Action)

Direct and Indirect Effects: There would be no reduction in the current road density of 4.7 miles per square mile, which exceeds the LRMP goal of 2.5 miles per square mile. The effects on deer are negative but unquantifiable at the population scale due to the small area affected relative to the acreage of the South Paulina Management Unit.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed road closures for both action alternatives would reduce the current density to 3.2 miles per square mile. During hunting season the cooperative Green Dot closure also reduces open road densities: IU 62 to 0.41 mile per square mile, IU 63 to 0.5 mile per square mile, IU 69 to 0.25 mile per square mile, and the project area to 1.2 mile per square mile. The user created motorcycle trails across the project area add to the negative cumulative effects of disturbance on deer and other wildlife. Other areas with high road/motorized trail densities have increased levels of poaching and evidence of contributing to population declines. The trails have not been inventoried or mapped and a large portion of these trails go cross country adding to habitat fragmentation and loss of vegetation.

There are 14.8 miles of proposed temporary roads within the project area for Alternative 2 and 15.3 miles for Alternative 3. After management activities these roads would be obliterated and revegetated. These roads would result in only short-term, temporary impacts to deer habitat effectiveness and other wildlife.

Consistency with LRMP standards and guidelines as amended

The LRMP direction (WL-53, TS-11 thru TS-14) requires and an evaluation and recommendation from a biologist that is then presented to the responsible line officer for a decision. The evaluation was conducted by the project interdisciplinary team and resulted in recommendations lowering road density to 3.2 miles per square mile. The biologist field reviewed all roads within the planning area and supports the team recommendation. The large portion of the project area that is on nearly level terrain with low, xeric vegetation would make road closures very difficult in many situations. The roads selected for closure or decommissioning would result in large blocks of un-fragmented habitat for deer and other wildlife.

The LRMP direction is specific to Implementation Units. The current road densities for the Implementation Units are: IU #62, 4 miles per square mile; IU#63, 3.5 miles per square mile; and IU #69, 3.5 miles per square mile. The overall average is 3.6 miles per square mile. The Green Dot Closure system reduces the densities during the hunting season to approximately 0.77 mile per square mile across the entire area. The project would reduce the densities only within its boundary leaving the balance of the IUs (approximately 79 percent) unchanged.

- ***Deer Forage***

The condition of does and cows is very important for reproduction and the health of fawns and calves. Adequate amounts of high quality forage are critical to deer and elk in winter range. Forage is also important on summer range for animals to accumulate adequate amounts of fat reserves for winter months. Deer utilize a higher percentage of herbaceous species during the summer than in the winter when woody browse is critical.

Surveys of shrub habitats were not done within the project area. Lower elevations are dominated by bitterbrush, the key forage species utilized by both deer and elk in the local area. Higher elevations are dominated by green manzanita and ceanothus, less desirable browse. Due to the lack of wildfires in the project area the majority of shrub stands are mature to decadent in age/structure, but there are extensive areas of mixed age classes.

Alternative 1 (No Action)

Direct and Indirect Effects: Current forage conditions would remain unaltered in the short-term. In the longer term there is potential for catastrophic wildfire which could convert large areas to early seral conditions that would require an extensive period of time for full recovery.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The action alternatives treat 67 percent and 70 percent of the project area respectively. All treatments would impact shrub (browse) forage in particular. It is estimated that for commercial timber sale activities that at least 25 percent of the shrubs would be impacted. For prescribed burns or mechanical mowing it would range from 50-70 percent. Combination treatments would have the most impact and could affect over 80 percent of individual units.

Prescribed burning would result in a significant increase in grasses, which are preferred by elk but less important to mule deer. Shrubs at least 18 inches in height are critical on winter ranges for deer. Bitterbrush regeneration varies by the type of treatment, the intensity of the treatment and the productivity of the site. In general, recovery to current canopy coverage to height levels would require a minimum of 10 years on good sites and likely over 25 years on the xeric sites common to the project. Designing treatments to leave a mosaic of treated and untreated shrubs would reduce forage impacts and improve long-term forage conditions as shrubs regenerate and provide more nutritious browse.

The cumulative effects of the treatments are unknown as the surrounding area (IUs summer range) were not evaluated for the conditions of forage resources. The most critical portion of the project area for forage is the winter range, 3.6 percent of the project area. The adjacent winter range area (Wigtop Winter Range Habitat Unit) has had extensive natural fuels treatments in the past, converting bitterbrush stands to dominance by Idaho fescue. The WRHU was not evaluated so the acreage/percentage of impacts to shrub habitats are unknown.

Consistency with LRMP standards and guidelines as amended

This is not applicable for deer summer range. Refer to the analysis of other species dependent upon shrub habitats.

On winter range within the project area the LRMP requires optimization of habitat conditions and has specific direction on maximum treatment unit sizes, spacing and recovery periods. There is an annual limitation on the percentage of the winter range to be treated. Refer to Resource Protection Measures, DEIS, Chapter 2.

Snags and Downed Wood Associated Species and Habitat: *MIS, WLTL, Eastside Screens*

Snag and log surveys were conducted throughout the project area. Procedures recommended by the DecAID program (Mellen et al. 2006) for these resources were utilized. The specific methodology is complex and generates a significant amount of data (Bate et al. 1999). Transects were randomly stratified to ensure that all representative plant association groups (PAGs) and structural stages were sampled. The results are displayed in Table 52.

Table 52: Snag and Log Transect Summary – Existing Condition

Categories [1]	Plant Association Groups			Notes
Snags	**Ponderosa Pine**	**Lodgepole Pine**	**White Fir**	
Snags less than 8” dbh	0.30 per acre	0.10 per acre	0	Low probability of use by most species except for foraging
Snags 8”-21” dbh	1.30 per acre	0.70 per acre	0.40 per acre	Snags greater than 21” dbh dominated by PP (92.5%)
Snags greater than 21” dbh	0.60 per acre	0.02 per acre	0.03 per acre	
Logs	**Ponderosa Pine**	**Lodgepole Pine**	**White Fir**	**Notes**
Log average/acre	5.6	12	25	The majority of ponderosa pine logs in advanced decay

[1] 13 transects were surveyed with 59 segments (each equal to 1 acre with a length of 328 feet).

- Ponderosa pine - 8 transects; lodgepole pine - 2 transects; white fir - 1 transect; unclassified stands - 2 transects.
- OGMA: Structural stage 5 (mid) average 9 snags/acre; Structural stages 6 and 7 (late) averaged 2.2 snags/acre

Snags

The LRMP requirements for snag densities are established by the Wildlife Tree and Log Implementation Strategy (WLTL, USDA 1994). For ponderosa pine and mixed conifer, the range is from 0.3 to 1.9 hard snags per acre, depending upon the bird species at the 100 percent of Maximum Population Potential (MPP) which is applicable to the Old Growth Management Area. For lodgepole pine habitat the range is 1.2 to 1.9 hard snags per acre (100 percent MPP).

Mixed conifer habitat should provide a range of .3 to 1.9 hard snags per acre (100% MPP). For the General Forest Management Area the standard is a minimum of 40 percent of MPP. However, the Eastside Screens amended the LRMP and established new standards for all sale activities. The standard is to provide 100 percent MPP. Therefore, the requirement across the entire project area is the same regardless of management area designation. The Eastside Screens also specify that the 100% MPP level is to be “…determined using the best available science on species requirements as applied through the best available science on species requirements as applied through current snag models or other documented procedures.” The WLTL snag numbers cited above are based upon research done over 15 or more years ago (Thomas et al. 1979). It has now been replaced by the database of research summarized in the DecAID program, which fully meets the direction to utilize the best applicable science for the assessment of project effects on snag and log habitats.

In referencing the DecAID program (Mellen et al. 2006), it is suggested that caution be applied in selecting a population objective. It is not realistic to select habitat type/site if it is not productive enough to provide the amount of habitat needed (i.e. xeric ponderosa pine common to the project area). For this project area the 50 percent tolerance level and the ponderosa pine/Douglas-fir open category was selected as being the best representation of habitats in project area. The estimate is approximately 3.5-10 snags per acre that are greater than 10 inches in diameter (Table 53). It is concluded that presently the project area is, on average, snag deficit, particularly for the larger diameter snags (i.e. greater than 21 inches dbh). Table 53 displays some variables affecting recommendations for snags.

Table 53: DecAID Desired Conditions for Snags and Down Logs

Habitat Type/Structure	Tolerance Levels	Snag Density	Snag Size (dbh)	Percent Cover Down Wood
Ponderosa Pine/Douglas-Fir (Large)	80% (productive sites, e.g. north slopes)	13 per acre greater than 10" dbh and 11 per acre greater than 20" dbh. Increase numbers for pileated woodpecker.	12-57 inches	4.1% (10-19.7 diameter average, 14" mean, with some to 45" dbh)
Ponderosa Pine/Douglas-Fir (Large)	50% (all other areas)	1.7-30.7 per acre greater than 10" dbh and 1.8-7.7 per acre greater than 20" dbh. Averages 6.3 per acre and 3.7 per acre respectively.	10-32 inches	1.8% (4.9-19.7" dbh average, 10" mean). ~784 square feet per acre.
Ponderosa Pine/Douglas-Fir (Small-Medium)	50% (all areas)	2.7/acre >10" dbh and 1.1/acre > 19.7" dbh. High density clumps in low fire risk areas: 32/acre > 10" dbh and 8/acre > 19.7" dbh.	9.8-43 inches	3% (8-10" diameter average with some to 37" diameter)
Lodgepole Pine	50%	10/acre>10” dbh (with 2.7>19.7” dbh) for birds; 13/acre (with 4/acre>20” dbh) for Amer. marten	11-32 inches	4.4% (greater than 4.9” diameter with range 21-33” diameter for marten)

For the lodgepole pine habitat type, the Eastside Screens recommend snags greater than or equal to 12" dbh for the 100 percent potential population level, which is 180 snags per 100 acres (59 per 100 acres greater than 12 inches dbh and 121 per 100 acres greater than 10 inches dbh; also reference Thomas 1979 Appendix 22). Lodgepole habitat is limited (1,580 acres, 18 percent of the area) within the project area. As noted earlier these snag densities are based upon older research and have been updated by the DecAID reference program. They are only provided here to note the changes in requirements.

Logs

The LRMP standard for down logs is a minimum of 3-6 logs per acre that are at least 12 inches in diameter at the small end and greater than 6 feet in length in ponderosa pine. The DecAID recommendations are based upon more current science. Given the estimated 5.6 logs (large) per acre in ponderosa pine habitats presently, the percentage of cover is estimated to be less than 1 percent. Lodgepole pine is also less than 1 percent coverage. Therefore, it is concluded that the current condition is below the minimums recommended by DecAID. Lower inputs of hard snag falls to the ground are likely to lead to a log deficit in the future. Also, as noted, the majority of the logs are very old and in an advanced decay condition.

Alternative 1 (No Action)

Direct and Indirect Effects: Existing snag levels, which are below the requirements of most species. There would likely be an increase of snags due to bark beetle mortality. The current levels of logs are also below the minimum recommended levels (DecAID). Potential catastrophic wildfire could result in large pulses of snags, which would benefit some species in the short to mid-term, but the loss of green tree recruitment would ultimately be an adverse affect to all species dependent upon snags. Mistletoe infestations would also be detrimental in the long-term due to the mortality of infected understory trees, which would reduce the future supply of large snags and logs.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Losses of existing hard snags to prescribed fire may further reduce levels depending upon fire mortality recruitment of green trees. Additionally, prescribed fire would reduce existing log levels particularly to large, more degenerated structures. Any losses of snags due to safety issues would add to the cumulative negative effects to both habitat components.

Also refer to the following species discussions on woodpeckers which serve as suggorates for the effects upon snags for all the forested habitat types within the project.

There are no specific Management Indicator Species in the LRMP for downed wood. For the purpose of this evaluation refer to the previous discussion for the American marten, which would suitably address these effects by alternative, especially for lodgepole pine habitats.

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines would be met provided that the net snag losses (i.e. accounting for snags created by prescribed burns) are mitigated by snag creation. Snag creation will in the long-term also mitigate any losses of down logs to prescribed fire. Refer to the Resource Protection Measures, Chapter 2.

Green Tree Replacements (GTRs): WLTL, *Eastside Screens*

Green Tree Replacements provide future snags and down logs. For variables used to determine target trees per acre, refer to the Project Record, Wildlife Report,
page 8. In general, the target for trees per acre for ponderosa pine is approximately 10-30 trees per acre. Fewer trees are needed as mean diameter increases. For the ponderosa pine/Douglas-fir habitat type DecAID estimates a range of 17 to 43 trees per acre depending upon population objective (i.e. tolerance level) and stand structure/size. Presently, the project area tree densities greatly exceed this range, so GTRs are not limiting.

Alternative 1 (No Action)

Direct and Indirect Effects: The present green tree stocking densities would not be altered in the short-term. In the mid to long-terms it is likely that there would be losses to insects or catastrophic wildfires. Fires originating within the project area would have the potential to affect much larger areas.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: All of the proposed treatments in each action alternative would retain adequate numbers of green trees (ranging from 15 to 50 tree per acre) for future snag/log recruitment. The potential for large-scale losses to insect epidemics and/or catastrophic wildfire would be greatly reduced.

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines including the Eastside Screens would be met.

Species Associated with Various Plant Communities and Successional Stages:

The addition of focal species to this evaluation would partially meet this category.

Most notably the shrub communities of the project area provide habitat for a variety of species including: green-tailed towhee, spotted towhee, bushtit, house wren, fox sparrow, dusky flycatcher, gray flycatcher, dark-eyed junco, deer mouse, yellow-pine chipmunk, long-tailed weasel, and snowshoe hare.

Alternative 1 (No Action)

Direct and Indirect Effects: The shrub communities would not be affected except for potential catastrophic wildfires.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: All of the proposed treatments 67 percent of the planning area by Alternative 2 and 70 percent by Alternative 3) would impact shrub communities with mowing and prescribed fire causing the most adverse effects, particularly in combination or following logging activities. Retaining a mosaic of treated and untreated areas across the landscape would mitigate adverse effects to these species by leaving undisturbed areas.

Structural stage 6 (multi-story) and stage 7 (single story) as related to HRV and direction by the Eastside Screens are addressed in detail in the silviculture report (Project Record and discussion in DEIS titled Forest Vegetation – Trees). Species that orient to these habitat types and are potentially affected by the action alternatives are addressed in this report, including both MIS and focal designated species.

All applicable standards and guidelines would be met where possible. Refer to the sections on Deer (Elk) Forage and Mitigation Measures/Project Design Criteria.

Species with Special or Unique Habitats

There are no riparian, aspen or other special habitats within the project area. The only unique habitats are the rocky outcrops and cliffs throughout the area. Small caves are potentially present but none were located during field surveys. Species potentially using these areas include bobcat, mountain lion, bats, bushy-tailed woodrat, canyon mouse, American pika, lizards and various birds (e.g. rock and canyon wrens, raven, golden eagle, cliff swallow).
Other habitats associated with the project area are:

- **Buttes**

There are a number of buttes within the project area including Rogers, Deadlog, Sixteen, Dry, No Names (3) and several that have no designation. For more information regarding habitat for these buttes refer to the Project Record, Wildlife Report, pages 6 and 7.

- **Rock Outcrops and Cliffs**

Rock outcrops and cliffs are scattered throughout the project area, varying in size and complexity. Quartz Mountain is the most significant geological feature present and is really a complex of ridges. Most of the buttes have rock outcrops with those on Sixteen Butte and the southern most No Name Butte having the most significant features with associated unique plants. For brief descriptions of the buttes, refer to page 8 of the Wildlife Report, Project Record.

- **Xeric shrublands and pumice flats**

These areas are small, localized and often associated with buttes. The largest is Coyote Flat on the south side of Quartz Mountain. The soils there are very dry and loose, which support a diversity of plants.

- **Water sources**

There are three manmade water catchments or guzzlers within the project area that provide a water source for deer and many birds through the dry summer months.

There are no riparian, aspen or other special habitats within the project area. Rocky outcrops and cliffs occur throughout the area. Small caves are potentially present but none were located during field surveys. Species potentially using these areas include bobcat, mountain lion, bats, bushy-tailed woodrat, canyon mouse, American pika, lizards and various birds (e.g. rock and canyon wrens, raven, golden eagle, cliff swallow).

Alternative 1 (No Action)

Direct and Indirect Effects: The habitats would not be affected except for potential catastrophic wildfires.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Treatments such as mowing or timber harvest would generally avoid direct impacts provided that the special habitats are excluded from treatment units or protected. However, the rock outcrops or cliffs within proposed prescribed burns may be impacted if vegetation is removed from the ecotone between the rock and adjoining areas or by direct consumption of vegetation within the rock habitat. In particular, there are unique mountain mahogany patches and rock associated herbaceous plants that are found only in these habitats niches.

All applicable standards and guidelines would be met. Refer to Resource Protection Measures, DEIS, Chapter 2.

Woodpecker Species

Table 54: Management Indicator Species - Woodpeckers

Woodpecker Species			
Species	**Status**	**Habitat**	**Presence**
Lewis' woodpecker	MIS, Landbird focal species, BCC, R6 Sensitive	Ponderosa pine forests, burned forests	Potential habitat in proposed treatment areas. Refer to the Biological Evaluation.
Williamson's sapsucker	MIS, Landbird Focal species, BCC	Mature or old growth conifer forests with open canopy cover; weak excavator	Potential habitat in proposed treatment areas.
Hairy woodpecker	MIS	Mixed conifer and ponderosa pine forests	Habitat in proposed treatment areas
White-headed woodpecker	MIS, Landbird focal species, BCC, R6 Sensitive	Mature ponderosa pine forests; weak excavator	Potential habitat in proposed treatment areas. Refer to the Biological Evaluation.
Black-backed woodpecker	MIS, Landbird focal species	Lodgepole pine forests, burned forests	Habitat in proposed treatment areas
Northern flicker	MIS	Variety of forest types but more associated with forest edges	Habitat in proposed treatment areas
Red-naped sapsucker	MIS	Riparian hardwood forests; especially quaking aspen.	No habitat within or adjacent to proposed treatment areas
Downy woodpecker	MIS	Riparian hardwood forests, aspen; uncommon in ponderosa pine. Will use recent burns.	No habitat within or adjacent to proposed treatment areas
Three-toed woodpecker	MIS	High elevation lodgepole pine forests	No habitat within or adjacent to proposed treatment areas
Pileated woodpecker	MIS	Mature to old-growth mixed conifer forests	No habitat within or adjacent to proposed treatment areas

Rationale for Species Not Considered In Detail

The Lewis' woodpecker is discussed in the previous section of this DEIS, Wildlife – BE.

For the following species, there is no habitat within or adjacent to proposed treatment areas. A lack of habitat assumes a lack of presence and therefore any actions or no action within the proposed treatment areas would have no affect to the following species: Three-toed woodpeckers, pileated woodpecker, red-naped sapsucker, downy woodpeckers. For more specific information refer to the Project Record, Wildlife Report, beginning on page 20.

Species Receiving Further Consideration

Hairy Woodpecker: *S4 Apparently Secure*

Bull et al. (1986) reported hairy woodpeckers using both lodgepole and ponderosa pine habitats and a variety of snags sizes. This species would be in mature stands and utilize (i.e. nest and forage) snags greater than 10 inches in diameter. Ponderosa pine is preferred over lodgepole pine for nesting. Old growth or un-thinned stands are more heavily utilized during the winter. Otherwise, they use open stands more than those that are dense and would readily utilize burns (Marshall et al. 2006).

Alternative 1 (No Action)

Direct and Indirect Effects: Habitat conditions would remain favorable, unless a catastrophic wildfire was to occur within the project area. A wildfire would cause a pulse of snags for foraging and potential nesting in the short-term, but eventually there would be a shortage of suitable snags as they fell. Without wildfire, there would likely be a slow degradation in the numbers of large green trees and snags as insect and competition related mortality increased with time. The loss of understory trees from mistletoe mortality would also contribute to this decline across the landscape.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed actions would have some direct effects to hairy woodpecker habitat due to losses of snags to prescribed fire and safety issues. Some snag recruitment would occur from mortality of green trees from prescribed burns, but the number cannot be estimated. Salvage cutting of snags would not occur. Reducing stand density to create more open conditions would be beneficial. Future potential nest trees would be provided through time from recruitment of retention green trees. Adverse effects may affect individuals but would not likely be significant at the population scale.

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines would be met where possible. Current snag levels are estimated to be below minimum requirements. Snag creation is a possible mitigation tactic. Refer to the Resource Protection Measures, Chapter 2.

Black-backed Woodpecker: *S3 Vulnerable*

According to Goggans (1988) and Bull et al. (1986), the black-backed woodpecker uses mature ponderosa pine and lodgepole pine habitat types at relatively low elevations (generally less than 4,500 feet), but can be found at higher elevations. Altman (2000) designates black-backed woodpeckers as a focal species for old-growth lodgepole pine. The black-backed woodpecker would use smaller snags for nesting as well as foraging. Bull et al. (1986) suggested that this use of smaller diameter snags for nesting is a way of competing with other woodpecker species in the same habitat (e.g. white-headed woodpecker, northern flickers, etc.) that require large snags. The project area and adjacent areas have snags of this size class that can serve as potential habitat. Saab and Dudley (1998) found black-backed woodpeckers selecting for clumps of snags and un-logged control plots in their study on fire and salvage logging.

Alternative 1 (No Action)

Direct and Indirect Effects: Habitat conditions would remain favorable to black-backed woodpeckers in the lodgepole pine stands that are present in the project area. Eventually, insect mortality and/or wildfires would provide high quality habitat in the short-term but the benefits would be reduced as the snags created fell. There would be a significant period of time for the recovery of the green trees and snag recruitment of sizes sufficiently large to support black-backed woodpecker nesting.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed actions would have some direct effects to black-backed woodpecker habitat due to losses of snags to safety issues. Prescribed burns in stands dominated by ponderosa pine with inclusions of lodgepole pine would reduce snags. Some snag recruitment would occur from mortality of green trees from prescribed burns, but the number cannot be estimated. Salvage cutting of snags would not occur. Reducing stand densities may reduce the future mortality of lodgepole from bark beetles, which may have a short-term adverse effect. In the long-term, larger lodgepole pine would likely result from thinning and would eventually be killed by bark beetles and provide habitat. Adverse effects may affect individuals but would not likely be significant at the population scale. This is particularly true given that only 18% of project area has lodgepole pine dominated stands.

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines would be met provided that the net snag losses (accounting for snags created by prescribed burns) are mitigated by snag creation. Refer to the Resource Protection Measures, Chapter 2.

Northern Flicker: *S5 Secure*

Northern flickers are perhaps the most common woodpecker resident in Oregon. They can be found in a range of terrestrial habitats but are generally abundant in open forests and forest edges adjacent to open country (Marshall et al. 2006). Being a large cavity nester (12.5 inches long according to Sibley 2005); they require large snags or large trees with decay in order to build their nests. Large snags are relatively rare within and adjacent to the proposed treatment areas.

Alternative 1 (No Action)

Direct and Indirect Effects: Habitat conditions would remain favorable to northern flickers in semi-open stands and likely decline where trees are dense. Large wildfires would cause a pulse of snags for foraging and potential nesting in the short-term, but eventually there would be a shortage as suitable snags fall. Without wildfire, there would likely be a slow degradation in the numbers of large green trees and snags as insect and competition related mortality increased with time. The loss of understory trees from mistletoe mortality would also contribute to this decline across the landscape.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed actions would have some direct effects to northern flicker habitat due to the loss of snags to prescribed fire and safety issues. Some snag recruitment would occur from mortality of green trees due to prescribed burns, but the number cannot be estimated. Salvage cutting of snags would not occur. Reducing stand density to create more open conditions with larger trees would be beneficial. Future potential nest trees would be provided through time from recruitment of retention green trees. Adverse effects may affect individuals but would not likely be significant at the population scale.

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines would be met provided that the net snag losses (accounting for snags created by prescribed burns) are mitigated by snag creation. Refer to the Resource Protection Measures, Chapter 2.

Williamson's Sapsuckers: *S4 Apparently Secure*

Willamson's sapsuckers are a focal species for large snags in mixed conifer habitat. They would often utilize ponderosa pine habitat. They use dead and live trees for foraging and select for large (greater than 20 inchesdbh) snags for nesting (Bull et al. 1986).

Alternative 1 (No Action)

Direct and Indirect Effects: Habitat conditions would remain favorable, unless a catastrophic wildfire was to occur within the project area. A wildfire would cause a pulse of snags for foraging and potential nesting in the short-term, but eventually there would be a shortage as suitable snags fall. Without wildfire, there would likely be a slow degradation in the numbers of large green trees and snags as insect and competition related mortality increased with time. The loss of understory trees from mistletoe mortality would also contribute to this decline across the landscape.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed actions would have some direct effects to sapsucker habitat due to the loss of snags to prescribed fire and safety issues. Some snag recruitment would occur from mortality of green trees due to prescribed burns, but the number cannot be estimated. Salvage cutting of snags would not occur. Reducing stand density to create more open conditions with larger trees would be beneficial. Future potential nest trees would be provided through time from recruitment of retention green trees. Adverse effects may affect individuals but would not likely be significant at the population scale.

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines would be met provided that the net snag losses (accounting for snags created by prescribed burns) are mitigated by snag creation. Refer to the Resource Protection Measures, Chapter 2.

Waterfowl Species

Table 55: Management Indicator Species - Waterfowl

Waterfowl Species			
Species	**Status**	**Habitat**	**Presence**
Common loon	MIS	Edges of remote freshwater ponds and lakes	No habitat within or adjacent to proposed treatment areas
Pied-billed grebe	MIS	Edge of open water in freshwater lakes, ponds, sluggish rivers and marshes	No habitat within or adjacent to proposed treatment areas
Horned grebe	MIS	Open water with emergent vegetation	No habitat within or adjacent to proposed treatment areas
Red-necked grebe	MIS	Lakes and ponds in forested areas	No habitat within or adjacent to proposed treatment areas
Eared grebe	MIS	Open water with emergent vegetation	No habitat within or adjacent to proposed treatment areas
Western grebe	MIS	Marches with open water and lakes and reservoirs with emergent vegetation	No habitat within or adjacent to proposed treatment areas
Canada goose	MIS	Variety of habitat: shores of lakes, rivers, and reservoirs especially	No habitat within or adjacent to proposed treatment areas

Waterfowl Species			
Species	**Status**	**Habitat**	**Presence**
		with cattails and bulrushes	
Wood duck	MIS	Cavity nester	No habitat within or adjacent to proposed treatment areas.
Gadwall	MIS	Concealed clumps of grasses in meadows and tall grasslands	No habitat within or adjacent to proposed treatment areas
American widgeon	MIS	Clumps of grasses in meadows or tall grasslands	No habitat within or adjacent to proposed treatment areas
Mallard	MIS	Open water with emergent vegetation	No habitat within or adjacent to proposed treatment areas.
Blue-winged teal	MIS	Marshes, lakes, ponds, slow-moving streams	No habitat within or adjacent to proposed treatment areas
Cinnamon teal	MIS	Cover of vegetation near shoreline	No habitat within or adjacent to proposed treatment areas
Northern shoveler	MIS	Grassy areas near water	No habitat within or adjacent to proposed treatment areas
Northern pintail	MIS	Open areas near water	No habitat within or adjacent to proposed treatment areas
Green-winged teal	MIS	Freshwater marshes with emergent vegetation	No habitat within or adjacent to proposed treatment areas
Canvasback	MIS	Emergent vegetation	No habitat within or adjacent to proposed treatment areas
Redhead	MIS	Freshwater marshes and lakes concealed in vegetation	No habitat within or adjacent to proposed treatment areas
Ring-necked duck	MIS	Thick emergent vegetation on shorelines	No habitat within or adjacent to proposed treatment areas
Lesser scaup	MIS	Dry grassy areas near lakes at least 10 ft. deep	No habitat within or adjacent to proposed treatment areas
Common goldeneye	MIS	Cavity nester	No habitat within or adjacent to proposed treatment areas.
Barrow’s goldeneye	MIS	Cavity nester	No habitat within or adjacent to proposed treatment areas.
Hooded merganser	MIS	Cavity nester	No habitat within or adjacent to proposed treatment areas.
Common merganser	MIS	Cavity nester	No habitat within or adjacent to proposed treatment areas.
Ruddy duck	MIS	Freshwater marshes, lakes, ponds in dense vegetation	No habitat within or adjacent to proposed treatment areas.

Rationale for Species Not Considered In Detail

For the species listed in Table 55, there is no habitat within or adjacent to proposed treatment areas. A lack of habitat assumes a lack of presence and therefore any actions or no action within the proposed treatment areas would have no affect to this species. The following species of waterfowl and other aquatic oriented species rely heavily on habitat adjacent to a body of water (often a marsh or lake): common loon, pied-billed grebe, horned grebe, red-necked grebe, eared grebe, Canada goose, wood duck, gadwall, American widgeon, mallard, blue-winged teal, cinnamon teal, northern shoveler, northern pintail, green-winged teal, canvasback, redhead, ring-necked duck, lesser scaup, common goldeneye, Barrow’s goldeneye, hooded merganser, common merganser, and ruddy duck.

LANDBIRD FOCAL SPECIES

Table 56: Deschutes National Forest Landbird Focal Species

Landbird Focal Species			
Species	**Status**	**Habitat**	**Presence**
Pygmy nuthatch	Landbird focal species	Mature ponderosa pine forests and snags	Habitat in proposed treatment areas.
Chipping sparrow	Landbird focal species	Open understory ponderosa pine forests with regeneration	Habitat in proposed treatment areas.
Brown creeper	Landbird focal species	Large trees in mixed conifer forests	Potential habitat in proposed treatment areas.
Flammulated owl	Landbird focal species, BCC	Interspersed grassy openings and dense thickets in mixed conifer forests	Potential habitat in proposed treatment areas.
Hermit thrush	Landbird focal species	Multi-layered/dense canopy in mixed conifer forests	No habitat within or adjacent to proposed treatment areas
Olive-sided flycatcher	Landbird focal species	Edges and openings created by wildfire in mixed conifer forests	No habitat within or adjacent to proposed treatment areas
Clark's nutcracker	Landbird focal species	High elevation old growth whitebark pine but often uses other habitats especially during migration.	No habitat within or adjacent to proposed treatment areas.
Blue grouse	Landbird focal species	Subalpine fir but will also use mixed conifer forests.	No habitat within or adjacent to proposed treatment areas.
Sandhill crane	Landbird focal species	Meadows (wet and dry)	No habitat within or adjacent to proposed treatment areas.

Landbird focal species come from the Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington (Altman 2000)

Rationale for Species Not Considered In Detail

For the species listed in Table 56, there is no habitat within or adjacent to proposed treatment areas. A lack of habitat assumes a lack of presence and therefore any actions or no action within the proposed treatment areas would have no affect to the following species: hermit thrush, olive-sided flycatcher, Clark's nutcracker, blue grouse, and Sandhill crane. For more specific information regarding refer to the Project Record, Wildlife Report.

Species Receiving Further Detail

Pygmy Nuthatch

A focal species for large mature trees in open ponderosa pine forests and mixed conifer forests that have a significant ponderosa pine component (Altman 2000). They some times forage in young ponderosa pine. They may excavate their own cavities in snags for nesting or utilize woodpecker holes (Marshall et al. 2006). The conservation strategies for this species include managing for large diameter trees, restricting firewood cutting, and retaining all snags greater than 10 inches dbh and all ponderosa pine greater than 17 inches dbh.

Alternative 1 (No Action)

Direct and Indirect Effects: Habitat conditions would remain favorable, unless a catastrophic wildfire was to occur within the project area. A wildfire would cause a pulse of snags for foraging and potential nesting in the short-term, but eventually there would be a shortage of suitable snags as they fall. Without wildfire, there would likely be a slow degradation in the numbers of large green trees and snags as insect and competition related mortality increased with time. The loss of understory trees from mistletoe mortality would also contribute to this decline across the landscape.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed actions would have some direct effects to nuthatch habitat due to the loss of snags to prescribed fire and safety issues. Some snag recruitment would occur from mortality of green trees due to prescribed burns, but the number cannot be estimated. Salvage cutting of snags would not occur. Reducing stand density to create more open conditions with larger trees would be beneficial. Future potential nest trees would be provided through time from recruitment of retention green trees. Adverse effects may affect individuals but would not likely be significant at the population scale.

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines would be met provided that the net snag losses (accounting for snags created by prescribed burns) are mitigated by snag creation. Refer to the sections on Mitigation Measures/Project Design Criteria and K-V Projects.

Chipping Sparrow

A focal species for open understory habitat with regenerating pines in ponderosa pine and mixed conifer habitats (Altman 2000). Grassy openings or other areas of low foliage are preferred for foraging. They will also use juniper and lodgepole pine forests. They often prefer young forests with openings over more mature, denser forests (Marshall et al. 2006). Conservation strategies are to conduct understory removal and burning outside the nesting season thinning (April 15-July 15) and overstory thinning to promote large diameter trees and ponderosa pine.

Alternative 1 (No Action)

Direct and Indirect Effects: Habitat conditions would remain favorable, unless a catastrophic wildfire was to occur within the project area. Without wildfire, there would likely be a slow degradation as tree densification continued with the loss of open understories important to this species.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Thinning and prescribed fire prescriptions that create more open conditions and promote grassy habitats and conifer regeneration which would benefit chipping sparrows.

Consistency with LRMP standards and guidelines as amended

No specific requirements, however the provisions for structural diversity and uneven-aged management (TM-56 and 63) would meet chipping sparrow needs. Refer to the section on Mitigation Measures/Project Design Criteria.

Brown Creepers

This is a focal species for large trees within mixed conifer (i.e. white or Douglas-fir) plant association (Altman 2000). They are also associated with mature ponderosa pine forests (Csuti et al. 2001). Creepers nest under loose bark of green trees or snags that are usually of large diameter. Generally, they are more abundant in mature forests (Marshall et al. 2006).

Alternative 1 (No Action)

Direct and Indirect Effects: Habitat conditions would remain favorable, unless a catastrophic wildfire was to occur within the project area. Without wildfire there would likely be a slow degradation in the numbers of large green trees and snags as insect and competition related mortality increased with time. Also losses of understory trees from mistletoe would also contribute to this decline across the landscape.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed actions would have some direct effects to creeper habitat due to losses of snags to prescribed fire and safety issues. Some snag recruitment would occur from mortality of green trees due to prescribed burns, but the number cannot be estimated. Salvage cutting of snags would not occur. Reducing stand density to create more open conditions with larger trees would be beneficial. Future potential nest trees would be provided through time from recruitment of retention green trees. Adverse effects may affect individuals but would not likely be significant at the population scale.

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines would be met provided that the net snag losses (accounting for snags created by prescribed burns) are mitigated by snag creation. Refer to the sections on Mitigation Measures/Project Design Criteria and K-V Projects.

Flammulated Owls

A focal species of grassy opening and dense thickets within late-successional mixed conifer plant associations. Ponderosa pine forests are also important. Drier forests with limited understories appear to be the key attribute. Nesting is most common in stands with moderate to high levels of canopy cover. The majority nest in snags but will also use green trees (Marshall et al. 2006).

Alternative 1 (No Action)

Direct and Indirect Effects: Habitat conditions would remain favorable, unless a catastrophic wildfire was to occur within the project area. Without wildfire there would likely be a slow degradation in the numbers of large green trees and snags as insect and competition related mortality increased with time.

Also losses of understory trees from mistletoe would also contribute to this decline across the landscape.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Thinning and prescribed fire prescriptions that create more open conditions and promote grassy habitats and conifer regeneration would benefit flammulated owls.

Consistency with LRMP standards and guidelines as amended

All applicable standards and guidelines would be met provided that the net snag losses (accounting for snags created by prescribed burns) are mitigated by snag creation. Refer to the sections on Resource Protection Measures, Chapter 2.

BIRDS OF CONSERVATION CONCERN

Table 57: Birds of Conservation Concern

Birds of Conservation Concern (BCC)			
Species	**Status**	**Habitat**	**Presence**
Swainson's hawk	BCC	Open country	No habitat within or adjacent to proposed treatment areas
Ferruginous hawk	BCC	Open sagebrush flats; open country	No habitat within or adjacent to proposed treatment areas
Prairie falcon	BCC	Rimrock, cliffs in open country	No habitat within or adjacent to proposed treatment areas
Greater sage grouse	BCC, R6 Sensitive	Sagebrush flats	No habitat within or adjacent to proposed treatment areas. Refer to the Biological Evaluation.
American golden plover	BCC, Shorebird	Upland tundra, rare in OR in dry mudflats, fields and pastures	No habitat within or adjacent to proposed treatment areas
Snowy plover	BCC, Shorebird	Sandy beaches	No habitat within or adjacent to proposed treatment areas
American avocet	BCC	Shallow water	No habitat within or adjacent to proposed treatment areas
Solitary sandpiper	BCC, Shorebird	Small, freshwater mudflats	No habitat within or adjacent to proposed treatment areas
Whimbrel	BCC, Shorebird	Grassy marshes and tidal flats	No habitat within or adjacent to proposed treatment areas
Long-billed curlew	BCC, Shorebird	Dry grasslands	No habitat within or adjacent to proposed treatment areas
Marbled godwit	BCC, Shorebird	Expansive mudflats and sandflats on beaches	No habitat within or adjacent to proposed treatment areas
Sanderling	BCC, Shorebird	Sandy beaches with wave action	No habitat within or adjacent to proposed treatment areas
Wilson's phalarope	BCC, Shorebird	Shallow ponds within grassy marshes	No habitat within or adjacent to proposed treatment areas
Yellow-billed cuckoo	BCC	Riparian hardwoods	No habitat within or adjacent to proposed treatment areas
Burrowing owl	BCC	Open grassland or agricultural land	No habitat within or adjacent to proposed treatment areas
Black swift	BCC	Damp coastal cliffs	No habitat within or adjacent to proposed treatment areas

Birds of Conservation Concern (BCC)			
Species	**Status**	**Habitat**	**Presence**
Loggerhead shrike	BCC	Open habitat with scattered trees and shrubs	No habitat within or adjacent to proposed treatment areas
Gray vireo	BCC	Rocky, dry hillsides with scattered trees	No habitat within or adjacent to proposed treatment areas
Virginia's warbler	BCC	Mountain mahoghany; uncommon in Oregon.	No habitat within or adjacent to proposed treatment areas
Brewer's sparrow	BCC	Sagebrush habitats	No habitat within or adjacent to proposed treatment areas
Sage sparrow	BCC	Sagebrush habitats	No habitat within or adjacent to proposed treatment areas

Rationale for Species Not Considered In Detail

For the species listed in Table 57, there is no habitat within or adjacent to proposed treatment areas. A lack of habitat assumes a lack of presence and therefore any actions or no action within the proposed treatment areas would have no affect to this species. For more specific information regarding the Swainson's hawk, ferruginous hawk, Prairie falcons, American golden plover, snowy plover, American avocet, solitary sandpiper, whimbrel, and Long-billed curlew, marbled godwits, sanderlings, Wilson's phalarope, yellow-billed cuckoo, burrowing owl, black swift, loggerhead shrike, gray vireo, Virginia's warbler, Brewer's sparrow, sage sparrow, refer to the Project Record, Wildlife Report.

SHOREBIRDS

Table 58: Shorebirds

Shorebirds			
Species	**Status**	**Habitat**	**Presence**
Piping plover	Shorebird	Rare in OR on sandy beaches	No habitat within or adjacent to proposed treatment areas
Mountain plover	Shorebird	Shortgrass prairies	No habitat within or adjacent to proposed treatment areas
Buff-breasted sandpiper	Shorebird	Nests in tundra, forages on shortgrass prairie	No habitat within or adjacent to proposed treatment areas
Black oystercatcher	Shorebird	Coastal rocks	No habitat within or adjacent to proposed treatment areas
Upland sandpiper	Shorebird	Grassy fields (4-8" tall) with open patches	No habitat within or adjacent to proposed treatment areas
Bristle-thighed curlew	Shorebird	Rare in OR in marshes or beaches. Nests in Alaska tundra	No habitat within or adjacent to proposed treatment areas
Hudsonian godwit	Shorebird	Mudflats and shallow water; nests around spruce woods	No habitat within or adjacent to proposed treatment areas
Black turnstone	Shorebird	Tundra, winters on rocky, coastal shores	No habitat within or adjacent to proposed treatment areas
Surfbird	Shorebird	Nests on barren gravel hilltops, winters on rocky shorelines	No habitat within or adjacent to proposed treatment areas
Western sandpiper	Shorebird	Mudflats and sandy beaches	No habitat within or adjacent to proposed treatment areas
Rock sandpiper	Shorebird	Rocky shorelines	No habitat within or adjacent to proposed treatment areas

Shorebirds			
Species	**Status**	**Habitat**	**Presence**
Short-billed dowitcher	Shorebird	Mudflats and shallow muddy ponds along coast	No habitat within or adjacent to proposed treatment areas
American woodcock	Shorebird	Damp, brushy woods	No habitat within or adjacent to proposed treatment areas
Wilson's plover	Shorebird	Rare in OR on sandy beaches, sandflats or mudflats away from shoreline	No habitat within or adjacent to proposed treatment areas
American oystercatcher	Shorebird	Rare in OR on rocky coasts	No habitat within or adjacent to proposed treatment areas
Bar-tailed godwit	Shorebird	Low tundra in western Alaska	No habitat within or adjacent to proposed treatment areas
Ruddy turnstone	Shorebird	Rocky and sandy shorelines	No habitat within or adjacent to proposed treatment areas
Red Knot	Shorebird	Sandy beaches	No habitat within or adjacent to proposed treatment areas
Dunlin	Shorebird	Sandy beaches and mudflats	No habitat within or adjacent to proposed treatment areas

Rationale for Species Not Considered In Detail

For the species listed in Table 58 there is no habitat within or adjacent to proposed treatment areas. A lack of habitat assumes a lack of presence and therefore any actions or no action within the proposed treatment areas would have no affect to this species. For more specific information regarding Piping plover, mountain plover, buff-breasted sandpipers, black oystercatchers, upland sandpipers, bristle-thighed curlew, Hudsonian godwits, black turnstone, surfbird, Western sandpiper, rock sandpiper, short-billed dowitcher, American woodcock, Wilson's plover, American oystercatcher, bar-tailed godwits, ruddy turnstone, red knots, and dunlins refer to the Project Record, Wildlife Report beginning on page 20.

CUMULATIVE EFFECTS

The following table summarizes the known management activities and natural events (e.g. wildfires) that could potentially contribute to the effects of the project's proposed action alternatives on wildlife and habitats.

Table 59: Cumulative Effects Summary for the Wildlife Resource

Cumulative Effects		
Management Activities and Natural Events*	**Description**	**Effects Upon Wildlife Species**
1. KO Timber Sale and Reforestation	Plantation fence maintenance and big game repellent applications. Dwarf mistletoe control activities (pruning and girdling of infected trees). Past harvest/thinning effects.	Reductions of hiding cover for deer and snags/logs for dependent species. Local impacts on individual species but no long-term adverse effects on populations.
2. Road maintenance within and adjacent to the project area.	System roads that remain in place with associated human use and periodic maintenance activities. Management actions past, present and future via travel management (Green Dot) and physical closures to mitigate negative effects.	Direct and indirect (i.e. disturbance, habitat effectiveness reduction) losses of habitat for deer and other species. Permanent adverse effects to individuals at the local scale but unlikely to have measurable effects at the population level.

Cumulative Effects		
Management Activities and Natural Events*	**Description**	**Effects Upon Wildlife Species**
3. Grazing by livestock and associated improvements and maintenance activities. (Quartz Mountain and Sand Springs Allotments)	Active cow allotment. Several water sets are within or adjacent to the planning area. Buried water lines cross the area in several locations. Extensive fencing is present.	Affects upon herbaceous and shrub vegetation that may affect dependent species. Generally, proper utilization management and pasture rotations reduce the adverse effects to infrequent local impacts to individuals. Water sets are the most impacting to vegetation but occupy a very small area. Managed grazing is not likely to affect populations.
4. Aspen Project vegetation treatments.	Within a few miles of the project boundary. Includes prescribed burns, mowing and thinning of pine plantations that have been done and would continue into the future until completed.	Effects upon wildlife species were addressed by the project EA and the appropriate mitigation measures were adopted to reduce potential adverse effects.
5. Wildfires	At least 6 fires greater than 100 acres have happened since 1913 within or near the project area. The fires having occurred within the boundary include: South Ice Cave (S, SW portions of area in 1915) and Quartz Mt. (NE and central portions in 1913 and 1918). The most recent large fire was the Aspen Flat fire of 1959 to the east of the project area.	Habitat related alterations by past fires have been included in assessments done for the project area including hiding cover, structural stage classification, etc. Fires are a natural disturbance and many species have evolved with them and depend upon fire created habitat conditions. Atypically hot fires may be damaging to soils and result in erosion and loss of site productivity which may have long-term adverse effects on many species.
6. Opal mine	Located in the SW portion of Quartz Mountain. Active annually.	Permanent habitat losses but a very small site.
7. Past fuels treatments	Wigtop area.	Conversion of shrub habitats to grass domination in the short to mid-term depending upon site and intensity of treatments. Variable effects on wildlife with some adversely affected and some benefited.
8. Forest Access and Travel Management EIS	Reviews all system roads on the Forest. Final decision will specify closed unless posted open. Prohibits cross country travel.	Benefits many species sensitive to human disturbance.
9. Miscellaneous	Cinder pits, power line corridor maintenance/expansion, illegal motorcycle trails, dispersed camp sites, wildlife guzzlers, cone collection, firewood (snag/log) thefts, noxious/exotic weeds, etc.	Permanent loss of habitat, disturbance, and fragmentation. Effects variable by species resulting in losses of some individuals but unlikely to adversely affect populations.
10. Weed Control EIS	Will allow chemical control of noxious and exotic weeds when approved.	Benefits by reducing competition with native plant species.

*** Notes**: Additional detail for individual management activity/natural events by respective reference numbers:

1. Past changes in habitats (e.g. structural stage, crown cover, etc.) are reflected in hiding cover indices, LOS assessments, etc. thereby incorporating cumulative effects where the measurements were done, e.g. Implementation Units and the project area. Currently the ODFW population indices for mule deer indicate a stable population for the South Paulina deer herd subunit, which is near their Management Objective (MO).

2. Road/motorized trail density assessments (e.g. Implementation Units) and effects determinations for those species where applicable meet the quantification aspect of cumulative effects for this activity.
3. Bounding was generally limited to the Implementation Units where specific effects on mule deer were addressed.

SOILS

INTRODUCTION

The long-term sustainability of forest ecosystems depends on the productivity and hydrologic functioning of soils. Ground-disturbing management activities directly affect soil properties, which may adversely change the natural capability of soils and their potential responses to use and management. A detrimental soil condition often occurs where heavy equipment or logs displace surface organic layers or reduce soil porosity through compaction. Detrimental disturbances reduce the soils ability to supply nutrients, moisture, and air that support soil microorganisms and the growth of vegetation. The biological productivity of soils relates to the amount of surface organic matter and coarse woody debris retained or removed from affected sites. Maintenance or enhancement of soil productivity is an integral part of National Forest management. Therefore, an evaluation of the potential effects on soil productivity is essential for integrated management of forest resources.

SOIL PRODUCTIVITY

The proposed use of ground-based equipment can potentially increase the amount and distribution of detrimental soil conditions within the individual activity areas proposed for mechanical treatments. The removal of trees from activity areas can potentially cause adverse changes in organic matter levels.

Soil productivity measures are:

1. Change in extent of detrimental soil conditions following proposed harvest and mitigation treatments within the individual activity areas proposed for mechanical treatments.
2. Amount of coarse woody debris (CWD) and surface organic matter that would likely be retained to protect mineral soil from erosion and provide both short and long-term nutrient supplies for maintaining soil productivity on treated sites.

SCOPE OF THE ANALYSIS

The soil resource may be directly, indirectly, and cumulatively affected within each of the activity areas proposed within the project area. An activity area is defined as “the total area of ground impacted activity, and is a feasible unit for sampling and evaluating” (FSM 2520 and Forest Plan, page 4-71). For this project proposal, activity area boundaries are considered to be the smallest identified area where the potential effects of different management practices would occur. Thus, the discussion of soil effects and soil quality standards will be focused on the EIS units (activity areas) proposed for silvicultural and fuel reduction treatments. The activity areas range in size from approximately 5 acres to 400 acres.

Quantitative analyses and professional judgment were used to evaluate and compare existing conditions to anticipated conditions following project implementation. The Geographic Information System (GIS) was used to assess disturbed areas associated with the transportation system and logging facilities.

The temporal scope of the analysis is defined as 1) short-term effects: changes to soil properties that would generally revert to pre-existing conditions within 5 years or less, and 2) long-term effects: substantial effects that would remain for 5 years or longer. The analysis also considered the effectiveness and probable success of implementing management requirements, mitigation measures, and Best Management Practices (BMPs) designed to avoid, minimize or reduce potentially adverse impacts to soil productivity.

AFFECTED ENVIRONMENT

Landscape Characteristics

The Deadlog planning area covers approximately 16,055 acres east of Newberry Crater in the southeastern portion of the forest. All landforms, rocks, and soil are products from volcanic events that occurred over various time periods. Approximately 80 percent of the planning area is comprised of gently sloping plains and uneven lava flows that lie below and surround cinder cones, buttes and mountain side slopes that account for about 20 percent of the total acreage. Dominant landforms have average slope gradients that range from 0 to 30 percent. Steeper slopes (30 to 70 percent) are associated with cinder cones, escarpments of buttes and mountains, and the edges of lava flows. Volcanic ash and pumice deposits from Mount Mazama (Crater Lake) and Newberry Crater volcanoes have covered most of the planning area, except for a few barren lava flows of minor extent. Elevation ranges from about 4,800 feet in the southwestern portion of the planning area to approximately 6,150 feet on the upper ridges of Quartz Mountain. Mean annual precipitation varies across the landscape due to changes in elevation, but it generally ranges from about 12 to 20 inches. Topography affects climate by creating a moisture gradient of lower precipitation along the desert fringe that increases with elevation. Topography also affects climate where cold air drainages influence cooler soil temperatures that reflect differences in vegetation.

Most of the water yielded from these lands is delivered to streams as deep seepage and subsurface flows that emerge at lower elevations. The sandy textures of these ash-influenced soils have high infiltration and percolation rates that account for low amounts of overland flow. Surface runoff generally occurs only in areas with shallow soils and disturbed sites during high intensity storms or when the ground is frozen. There are no known perennial or intermittent streams within the planning area. Any surface flows within ephemeral channels are discontinuous and of short duration. There are no riparian areas or riparian-dependent resources within the planning area.

The project area contains 15 landtype units based on similarities in landforms, geology, and climatic conditions that influence defined patterns of soil and vegetation (Soil Resource Inventory, Larsen, 1976). Except for some of the youngest lava flows, the majority of the planning area (over 90 percent) has been covered by volcanic ash and pumice deposits that consist mostly of sand-sized soil particles. Previously developed soils typically overlay hard bedrock that consists dominantly of basalt and andesite lava. Cindery soil materials are generally exposed on the top portions of cinder cones and buttes, while ash deposits have accumulated to greater depths on the northern and mid-to-lower slope positions of all aspects due to wind and dry ravel erosion. The more productive soils are commonly found on north and east aspects, and on concave slope positions such as toe slopes, swales and depressions. The less productive soils consist mainly of barren lava flows, non-vegetated slopes of cinder cones and buttes with south and west aspects, or other sparsely vegetated sites with scattered non-commercial trees. Approximately 25 percent of the project area is comprised of landtypes that contain shallow soils (less than 20 inches) and areas of exposed bedrock.

Dominant soils are moderately deep (20 to 40 inches) to deep (greater than 40 inches) with loamy-sand textures and moderate productivity potential for the growth of vegetation. These soil types tend to be non-cohesive (loose) and they have very little structural development due to the young geologic age of the volcanic parent materials. Soils derived from volcanic ash have naturally low bulk densities and low compaction potential. However, mechanical disturbances can reduce soil porosity to levels that limit vegetative growth, especially where there is a lack of woody debris and surface organic matter to help cushion the weight distribution of equipment. Due to the absence of rock fragments on the surface and within soil profiles, these ash-influenced soils are well suited for tillage treatments (subsoiling) that loosen compacted soil layers and improve the soils ability to supply nutrients, moisture, and air that support vegetative growth and biotic habitat for soil organisms. The sandy surface layers are easily displaced by equipment operations, especially during dry moisture conditions. The maneuvering of equipment is most likely to cause soil displacement damage on the steeper landforms. The dominant sandy-textured soils within the planning area are not susceptible to soil puddling damage due to their lack of plasticity and cohesion.

On undisturbed sites with gentle slopes, surface erosion occurs at naturally low rates because soils are protected by vegetation and organic litter layers. At the present time, soils within the planning area are adequately protected to control erosion rates within tolerable limits. Surface erosion by water is not a concern because dominant landtypes have low-to-moderate erosion hazard ratings. Accelerated surface erosion is usually associated with disturbances that reduce vegetative cover, displace organic surface layers, or reduce soil porosity through compaction. Soils derived from volcanic ash are easily eroded where water becomes channeled on disturbed sites such as road surfaces, recreation trails, and logging facilities.

Land Suitability and Inherent Soil Productivity

The suitable lands database for the Deschutes National Forest LRMP identifies areas of land which are considered to be suitable for timber production using criteria affecting reforestation potential (FSH 2409.13). Lands that do not meet these criteria are considered unsuitable or partially suitable for timber harvest due to regeneration difficulties or the potential for irreversible damage to resource values from management activities.

Dominant landtypes within the planning area generally have moderate productivity ratings. All activity areas proposed for commercial timber harvest and non-commercial thinning treatments meet criteria for land suitability that would allow them to be regenerated or resist irreversible resource damage. The locations of proposed activity areas exclude areas of exposed bedrock on rocky lava flows, sparsely-vegetated cinder cones and other miscellaneous landtypes with site conditions and soil properties which are too variable for classifying a suitability rating.

Sensitive Soil Types

Based on criteria for identifying sensitive soils to management (Deschutes LRMP (Appendix 14, Objective 5), sensitive soils within the planning area include the following categories:

- Soils on slopes greater than 30 percent (582 total landtype acres): forested cinder cones (south aspects) and escarpments/side slopes (ridges, buttes and edges of lava flows, and steep side slopes of mountains and lava domes).
- Soils associated with frost pockets in cold air drainages and basins: 1,778 acres on plains with ponderosa pine and 1,492 acres on plains with mixed ponderosa pine and lodgepole pine.
- Soils that occur in localized areas of rocky lava flows: 1,101 acres of ponderosa pine, site index 50 to 80 with areas of barren lava flows.

It should be emphasized that only portions of these total landtype acres actually contain sensitive soils. Areas with sensitive soils are typically confined to specific segments of the dominant landform and they are generally too small to delineate on maps. Sensitive soil areas that occur within proposed activity areas are discussed under the direct and indirect effects of implementing the action alternatives.

EXISTING CONDITION

Natural Events

There is currently no evidence of detrimental soil conditions from natural disturbance events within the Deadlog planning area. Fire history data indicate that the 1915 South Ice Cave Fire (11,910 acres), the Quartz Mt. Fire (138 acres) and the Quartz Butte Fire (1918) burned vegetation and natural fuels over extensive portions of the planning area. There is currently no evidence of severely burned soil. Enough time has passed that the recovery of native vegetation and forest litter are providing adequate ground cover protection and surface erosion rates have returned to natural levels.

There are no natural or management-related landslides known to exist within the planning area. Dominant landtypes do not meet criteria for landslide prone terrain and the high permeability of the volcanic ash-influenced soil generally precludes the buildup of hydraulic pressures that could trigger landslides.

Management-Related Disturbances

- ***Detrimental Soil Disturbance***

    - **Timber Management**

The existing condition of the soil resource has mainly been influenced by the transportation system and ground-based logging facilities which were used between 1963 and 1999. Previous silvicultural treatments included approximately 130 acres of commercial thinning and salvage, 3,057 acres of intermediate (partial removal), and 6,238 acres of regeneration harvest. Ground-based logging equipment disturbed soils on portions of 109 of the 132 EIS units proposed for mechanical harvest under Alternative 2, and 120 of the 146 EIS units proposed under Alternative 3. There was no overlap of previously harvested areas within the remaining EIS units proposed under either of the action alternatives.

Ground-based railroad logging was used to selectively harvest ponderosa pine in portions of the project area during the 1920s and early 1930s. Natural regeneration of tree seedlings was successful and adequate stocking of ponderosa pine and lodgepole pine currently exists throughout the area. Most soil impacts occurred on and adjacent to heavy-use areas (such as roads, railroad grades, main skid trails) where surface soils were displaced and multiple equipment passes caused compaction. Visual evidence of old logging facilities from that period is difficult to observe due to the abundance of ground cover vegetation and forest litter. Since volcanic ash soils have naturally low bulk densities and compaction potential, it is expected that natural processes have gradually restored soil quality over the past 70 to 80 years. Soils on previously compacted sites have likely returned to near-natural density levels through root penetration, frost heaving, rodent activity, freeze-thaw and wetting-drying cycles. The establishment of native vegetation and accumulation of organic matter has improved areas of past soil displacement. Therefore, these older soil disturbances are not included as existing sources of detrimental soil conditions within any of the activity areas proposed for this project.

The primary sources of detrimental soil conditions are associated with the transportation system and existing logging facilities which were used for timber harvest and yarding activities. Temporary roads, log landings, and primary skid trails were constructed and used to access individual harvest units of past timber sales. Most project-related impacts to soils occurred on and adjacent to these heavy-use areas where mechanical disturbances removed vegetative cover, displaced organic surface layers, or compacted soil surface layers. Much of the random disturbance between main skid trails and away from landings has decreased naturally over time. Research studies and local soil monitoring have shown that soil compaction and soil displacement account for the majority of detrimental soil conditions resulting from ground-based logging operations (Page-Dumroese, 1993; Geist, 1989; Powers, 1999; Deschutes Soil Monitoring Reports).

The extent of detrimentally disturbed soil is dependent on a number of variables including the types of silvicultural prescriptions, the intensity of equipment use with each entry, and the spacing distances between main skid trails. Local knowledge and experience with past and current harvest practices, research references, local monitoring reports, and field investigations were used to estimate detrimental soil conditions within each of the activity areas planned for this project. Soil monitoring results on local landtypes and similar soils have shown that 15 to 30 percent of the unit area can be detrimentally disturbed by ground-based harvest systems depending on harvest prescriptions and soil conditions at the time of harvest (Deschutes Soil Monitoring Reports, 1995, 1996, 1997, and 1999).

Soil condition assessments were conducted for a representative sample of past harvest treatments that included commercial thinning, intermediate (partial removal) and regeneration harvest prescriptions. The primary objective was to verify previous monitoring results of similar management practices on similar landscapes and volcanic-ash soils of the Deschutes National Forest. Qualitative assessments of soil surface conditions were made by establishing line transects and recording visual evidence of soil disturbance at 5 foot intervals. Detrimental soil compaction was the primary disturbance category observed where equipment operations were intensive. Shovel probing was used to assess compaction using resistance to penetration as a measure. Soil displacement, as defined by FSM 2521.03, was more difficult to distinguish due to the establishment of native vegetation and the accumulation of forest litter. Observations suggested that equipment turns or movement generally caused more mixing of soil and organic matter than actual removal from a site. Results showed that the average amount of soil impacts was actually less than monitoring results from previous soil condition assessments of past thinning, intermediate, and regeneration harvest treatments. Based on the proportionate extent of overlap of sampled areas with the proposed activity areas, these field assessment results are included in the percentages of existing detrimental soil conditions displayed in Appendix B (Table 80 and Table 81).

Since multiple entries have been made in some past harvest areas and most soil disturbances occurred prior to LRMP direction (1990), conservative estimates were used to predict how much surface area is currently impacted by existing roads and logging facilities within each of the activity areas proposed for this entry. The majority of past harvest treatments were intermediate (partial removal) and regeneration harvest prescriptions that typically cause more soil disturbance than thinning prescriptions because equipment use is more intensive throughout activity areas (Deschutes Soil Monitoring Reports 1996, 1997, and 1999). Activity areas which were managed with intermediate harvest prescriptions generally have about 23 percent detrimental soil conditions associated with existing roads and logging facilities. Past regeneration treatments (e.g., shelterwood, seed tree harvest, final removal, and overstory removal) generally cause about 6 percent more detrimental soil impacts (29 percent) and commercial thinning treatments result in about 6 percent less soil impacts (17 percent) than disturbed area estimates based solely on the design of skid trail systems and log landings. Based on the proportionate extent of overlap of past treatments within the proposed activity areas, these percentages were used to calculate existing amounts of detrimental soil conditions within the activity areas planned for this project.

Much of the random disturbance between main skid trails and away from landings has decreased naturally over time. Research has shown that the detrimental effects of soil compaction generally require more than 3 to 5 equipment passes over the same piece of ground (McNabb, Froehlich, 1983). Where logs were skidded with only 1 or 2 equipment passes, soil compaction was shallow (2 to 4 inches) and the bulk density increases did not qualify as a detrimental soil condition. Frost heaving and freeze-thaw cycles have gradually restored soil porosity in areas with slight to moderately compacted layers near the ground surface. Other factors that have helped the recovery process include root penetration, rodent activity, wetting and drying cycles, and surface organic matter. The establishment of vegetative ground cover and the accumulation of litter and organic matter has also been improving areas of past soil displacement.

There is no evidence that mechanical site preparation and/or brush removal treatments caused any long-term, detrimental soil displacement within any of the activity areas proposed for this project. There is no evidence that post-harvest, broadcast burn treatments caused any severely burned soil in random locations off designated logging facilities in previously managed areas. The extent of illegal firewood cutting in this planning area has been relatively minor compared to other areas on the district that have better quality firewood. Random disturbances from woodcutting activities are not included as existing sources of detrimental soil conditions within any of the activity areas proposed for this project.

Subsoiling treatments have rehabilitated detrimentally compacted soil on temporary roads and primary logging facilities in portions of 40 past harvest areas within the planning area. Soil restoration treatments were conducted in seven of the activity areas proposed under Alternative 2, and nine activity areas which are now scheduled for re-entry under Alternative 3. Disturbed area estimates for these activity areas are balanced because subsoiled areas are expected to reach full recovery through natural processes within the short-term. Therefore, soil restoration acres were deducted in the calculated estimates of existing detrimental soil conditions (Appendix B, Table 80 and Table 81). Soils committed to existing logging facilities in other portions of the project area would remain in a detrimental condition until reclamation activities are implemented to improve the hydrologic function and productivity on disturbed sites with compacted soils.

Based on the best available information regarding past harvest and soil restoration activities, the overall extent of soil impacts associated with existing logging facilities is estimated to be approximately 1,154 acres under Alternative 2, and 1,286 acres under Alternative 3. It was concluded that 75 of the 132 proposed activity areas (Alternative 2) and 83 of the 146 activity areas (Alternative 3) currently have detrimental soil conditions that exceed 20 percent of the unit area.

- ***Roads, Mine Site, and Rock Borrow Pits***

Roads detrimentally disturb soil properties and convert the soil resource to a non-productive condition. Most of the precipitation that falls on compacted road surfaces is transmitted as surface runoff, and roads are primary sources of accelerated surface erosion. The project area contains approximately 120 miles of classified system roads. This equates to approximately 191 acres or 1.0 percent of the planning area. Segments of existing roads, ranging from less than 0.1 to 2.2 miles (0.2 to 3.3 acres), cross through portions of 101 activity areas (Alternative 2) and 110 activity areas (Alternative 3) proposed for mechanical harvest treatments. The estimated amount of detrimentally disturbed soil committed to existing system roads is included in acres and percentages of existing soil impacts in shown in Table 80 and Table 81 of Appendix B. Road surveys will be conducted to identify where maintenance may be necessary to correct drainage problems on existing system roads that would be used as haul routes for this project. Several segments of local system road are recommended for long-term road closures and road decommissioning (subsoiling) treatments.

Soil has been removed from production from an opal mine site and associated camping area (approximately 1 acre), two cinder or rock borrow pits (approximately 3 acres each), and a water tank and pump house (approximately one-quarter acre). This equates to a total of approximately 7 acres or less than 0.1 percent of the planning area. None of these disturbed sites are located within any of the activity areas proposed for mechanical harvest treatments under either of the action alternatives.

- ***Recreation Activities***

Current recreational activities include dispersed camping, hiking, mountain biking, horseback riding, and off-highway vehicle (OHV) use. There are no developed recreation facilities, including campgrounds, day-use picnic areas, motorized or non-motorized system trails. Soil impacts from dispersed recreation activities are usually found along existing roads, trails and other management facilities where vegetation has been cleared and soils have been previously disturbed by other land use activities. Campfires usually consume available sources of down woody debris. Livestock water developments (water sets) often become dispersed campsites because vegetation has already been cleared on relatively level ground, so dispersed activities do not cause a cumulative increase in detrimental soil conditions. The extent of user-created trails within individual activity areas is unknown. Many of these disturbances often occur on or adjacent to existing roads and old skid trail networks of past harvest areas. Conservative estimates were used to account for soil disturbances from existing roads and logging facilities. Due to the average size of the EIS units, the minor extent of soil disturbances from dispersed camping and other incidental recreation uses would not be expected to have a measurable effect on site productivity. Therefore, soil disturbances from dispersed recreation activities were not included as existing sources of detrimental soil conditions within any of the individual activity areas proposed for this project.

- ***Livestock Grazing***

The planning area contains portions of the Quartz Mountain and Sand Springs Allotments. Current range records indicate that forage conditions are generally good with a vegetative trend that is stable. There are no site-specific areas where livestock movement and grazing effects have caused unsatisfactory soil conditions. Livestock impacts to the soil resource are found mainly in localized areas of concentrated use, such as around water developments, salt licks, bedding areas, and major travel routes. The majority of detrimental soil conditions are confined to relatively small areas (about 1.0 acre) around water developments (six historic water-set locations and three water troughs) needed to manage livestock. Salt licks are commonly placed in the immediate vicinity of water sets and these sites are often used as bedding areas, especially where scattered trees exist to provide shade. Eight water developments occur within EIS Units 16, 65, 69, 70, 77, 129, 130, and 132 proposed for mechanical harvest under each action alternative. One acre of disturbed soil is included in the estimated amounts of existing detrimental soil conditions for each of these eight activity areas (Appendix B, Table 80 and Table 81).

Summary of Detrimental Soil Disturbances

The primary sources of detrimental soil conditions are associated with the transportation system and existing logging facilities which were used for past timber harvest activities. The extent of detrimentally disturbed soil associated with recreation use and livestock grazing is relatively minor in comparison.

Based on the extent of overlap with past activity areas, it was concluded that 75 of the 132 proposed activity areas (Alternative 2) and 83 of the 146 activity areas (Alternative 3) currently have detrimental soil conditions that exceed 20 percent of the unit area. Existing detrimental soil conditions for these activity areas range from 21 to 32 percent with an average of 27 percent. The remaining EA units (57 units in Alternative 2 and 63 units in Alternative 3) have existing detrimental soil conditions that range from 0 to 20 percent and average 6 percent.

The extent of existing soil impacts associated with roads, logging facilities, and livestock water developments is included in the estimated acres and percentages shown in Appendix B, column 3 of Table 80, page 294 and Table 81, page 298.

Coarse Woody Debris (CWD) and Surface Organic Matter

The effects of management activities on soil productivity also depend on the amount of coarse woody debris (CWD) and surface organic matter retained or removed on affected sites. Decaying wood on the forest floor is critical for maintaining the soils ability to retain moisture and provide both short and long-term nutrient supplies and biotic habitat for microorganism populations. Mycorrhizal fungi and other soil organisms depend upon the continuing input of woody debris and fine organic matter. A balance between fuel management objectives and ensuring adequate amounts of CWD is an important goal for maintaining long-term soil productivity. Using mycorrhizal fungi as a bio-indicator of productive forest soils, research studies were used to develop conservative recommendations for leaving sufficient CWD following management activities (Graham et al. 1994, Brown et al. 2003). A minimum of 5 to 10 tons per acre of coarse woody debris (greater than 3 inches in diameter) should be retained on dry, ponderosa pine sites and 10 to 15 tons of CWD per acre on mixed conifer sites to maintain soil productivity. A sufficient number of standing dead snags and/or live trees should also be retained for future recruitment of organic matter.

Conserving surface litter (i.e., organic materials such as leaves, twigs and branches less than 3 inches in diameter) is also important for protecting mineral soil from erosion, buffering the effects of soil compaction, and supplying nutrients that support the growth of vegetation and native populations of soil organisms. Surface litter also provides on-site moisture retention.

Current levels of coarse woody debris and surface litter are not known for site-specific locations throughout the planning area. However, it is expected that adequate amounts of each currently exist to protect mineral soil from erosion and provide nutrients for maintaining soil productivity within the majority of previously managed areas. There are some older activity areas, prior to LRMP direction (1990), where management activities likely resulted in less than desired amounts of coarse woody debris (CWD) on the ground. In other portions of the project area, fire suppression has resulted in vegetation conditions that have fuel loadings in excess of historic pre-settlement conditions. Levels of CWD and surface litter in forested areas have been improving towards optimum conditions as additional woody materials have accumulated through natural mortality, windfall, and recruitment of fallen snags over time. Annual leaf/needle fall, small diameter branches, twigs and other forest litter have increased organic matter levels for short-term nutrient cycling and humus development in the mineral soil (Cochran and Hopkins 1990).

MANAGEMENT DIRECTION

The Pacific Northwest Region developed soil quality standards and guidelines that limit detrimental soil disturbances associated with management activities (FSM 2520, R-6 Supplement No. 2500-98-1). This Regional guidance supplements the Deschutes Land and Resource Management Plan (LRMP) standards and guidelines and provides policy for planning and implementing management practices which maintain or improve soil quality. It is consistent with LRMP interpretations for standards and guidelines SL-3 and SL-4 that limit the extent of detrimental soil conditions within activity areas. Standard and Guideline (SL-4) directs the use of rehabilitation measures when the cumulative impacts of management activities are expected to cause damage exceeding soil quality standards and guidelines on more than 20 percent of an activity area. Standard and Guideline (SL-5) limits the use of mechanical equipment in sensitive soil areas.

Management direction requires that when initiating new activities:
- Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area, including the permanent transportation system;
- In activity areas where less than 20 percent detrimental soil impacts exist from prior activities, the cumulative amount of detrimentally disturbed soil must not exceed the 20 percent limit following project implementation and restoration;
- In activity areas where more than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effects from project implementation and restoration must, at a minimum, not exceed the conditions prior to the planned activity and should move conditions toward a net improvement in soil quality.

Detrimental soil conditions are those that meet the following criteria:
- ***Detrimental Compaction*** in volcanic ash/pumice soils is an increase in soil bulk density of 20 percent, or more, over the undisturbed level.
- ***Detrimental Puddling*** occurs when the depth of ruts or imprints is six inches or more.
- ***Detrimental Displacement*** is the removal of more than 50 percent of the A horizon from an area greater than 100 square feet, which is at least 5 feet in width.
- ***Severely Burned*** soils are considered to be detrimentally disturbed when the mineral soil surface has been significantly changed in color, oxidized to a reddish color, and the next one-half inch blackened from organic matter charring by heat conducted through the top layer on an area 100 square feet or greater with a width of at least five feet.

TARGET LANDSCAPE CONDITION

The primary goal for managing the soil resource is to maintain or enhance soil conditions at acceptable levels without impairment of the productivity of the land. The extent of detrimental soil disturbances is minimized through the application of project design elements, management requirements and mitigation measures designed to minimize, avoid or eliminate potentially significant impacts, or rectifying impacts in site-specific areas by restoring the affected environment. The land effectively takes in and distributes water, and erosion rates are controlled to near-natural levels. The biological productivity of soils is ensured by management prescriptions that retain adequate supplies of surface organic matter and coarse woody debris without compromising fuel management objectives and the risk of soil damage from large-scale stand replacement wildfire.

ENVIRONMENTAL CONSEQUENCES

Introduction

The magnitude and duration of potential effects, both physical and biological changes in soil productivity, depend on the intensity of site disturbance, the timing and location of activities, and the inherent properties of the volcanic ash-influenced soils within affected activity areas. Direct effects occur at essentially the same time and place as the actions that cause soil disturbance, such as soil displacement and compaction from equipment operations. Indirect effects occur sometime after or some distance away from the initial disturbance, such as increased runoff and surface erosion from previously compacted areas. Cumulative effects include all past, present, and reasonably foreseeable actions that cause soil disturbance within the same activity areas proposed with this project.

The potential for detrimental changes to soil physical properties was quantitatively analyzed by the extent (surface area) of temporary roads, log landings, and designated skid-trail systems that would likely be used to facilitate yarding activities within each of the proposed activity areas. Professional judgment was used to evaluate changes in the amount and composition of coarse woody debris and surface organic matter. This analysis also considered the effectiveness and probable success of implementing the soil mitigation and resource protection measures which are designed to avoid, minimize or reduce potentially adverse impacts to soil productivity.

Alternative 1 (No Action)

Direct and Indirect Effects

- **Detrimental Soil Disturbance**

The extent of detrimental soil conditions would not increase above existing levels because no additional land would be removed from production to build roads or other management facilities. Implementation of project design criteria and mitigation measures would not be necessary. The existing amount of detrimentally disturbed soil associated with roads, logging facilities, and livestock water developments is included in the unit-specific information in Appendix B and the summarized estimates in Table 60, page 169.

Although disturbed soils would continue to recover naturally from the effects of past management, the current percentages of detrimental soil conditions would likely remain unchanged for an extended period of time. This alternative would defer opportunities for soil restoration treatments that reduce existing impacts and help move conditions toward a net improvement in soil quality.

Soil productivity would not change appreciably unless stand-replacing wildfires cause severely burned soils from intense ground-level heating. Detrimental changes to soil properties typically result from extreme surface temperatures of long duration, such as the consumption of stumps and large diameter logs on the forest floor. Although hazardous fuels have been reduced in some previously managed areas, fire exclusion has resulted in undesirable vegetation conditions and excessive fuel loadings in other portions of the planning area (see Fire/Fuels Section). Alternative 1 would defer fuel reduction opportunities at this time.

If a large amount of fuel is present during a future wildfire, soil temperatures can remain high for an extended period of time and excessive soil heating would be expected to produce detrimental changes in soil chemical, physical, and biological properties. Severe burning may cause soils to repel water, thereby increasing surface runoff and subsequent erosion. The loss of protective ground cover would also increase the risk for accelerated wind erosion on the loose, sandy textured soils which are widespread throughout the planning area. The loss of soil nutrients from fire volatilization would likely have the greatest impact on soil productivity during the fire recovery period. Recent research studies within experimental plots burned by the 2002 Biscuit Fire showed that losses of carbon and nitrogen from intense soil heating were much higher than most previous estimates (Bormann et al. 2008).

- **Coarse Woody Debris (CWD) and Surface Organic Matter**

In the short term, the amount of coarse woody debris and surface litter would gradually increase or remain the same. In forested areas, coarse woody materials would continue to increase through natural mortality, windfall, and recruitment of fallen trees and snags over time. Short-term nutrient sources would also increase through the accumulation of small woody material from shrub and tree branches, annual leaf and needle fall, and decomposition of grass and forb plant materials.

In the long term, fuel loadings would continue to increase thereby increasing the potential for an uncharacteristic, high intensity wildfire. Existing and projected high fuel loadings would be expected to support a future wildfire that is capable of killing and/or consuming large areas of vegetation, coarse woody material, and surface organic matter. Intense ground-level fire would likely create areas of severely burned soil and increase the potential for accelerated wind and water erosion. The loss of surface organic matter would adversely affect ground cover conditions and the nutrient supply of affected sites. Over time, at least some of the CWD losses in timber stands would be replaced as fire killed trees are recruited to the forest floor.

Alternative 2 (Proposed Action) and Alternative 3

Important Interactions

The action alternatives are similar because the same types and locations of soil disturbance would occur on the same landtypes and existing soil conditions. There is little difference between Alternatives 2 and 3 in terms of the number of activity areas and treatment acres proposed for mechanical harvest (Alternative 2: 132 activity areas totaling 6,919 acres and Alternative 3: 146 activity areas totaling 7,559 acres). The primary differences between alternatives are: 1) Alternative 2 proposes approximately 420 acres of commercial harvest on steep slopes where skyline logging would be used to minimize soil disturbance by partial suspension of logs during transport. 2) Under Alternative 3, approximately 1,321 acres of biomass removal would be used in tree plantations and where smaller diameter trees occur in some activity areas proposed for commercial harvest. Biomass removal would require log landings and designated skid trails similar to conventional ground-based harvest systems. The nature of the effects to the soil resource is similar for project activities that use mechanical harvest equipment to accomplish management objectives. After project implementation, including subsoiling mitigation, Alternative 3 is expected to result in approximately 152 acres more detrimental soil conditions than Alternative 2.

The development and use of temporary roads, log landings, and skid trail systems are the primary sources of physical disturbance that would result in adverse changes to soil productivity. Soil condition assessments for similar soils and the same types of ground-based harvest systems, research references, local monitoring reports (including the effectiveness of subsoiling treatments), Deadlog field investigations, and personal communications with local, sale administration personnel were used to predict the potential extent of detrimental soil disturbance within activity areas. Research studies and local soil monitoring have shown that soil compaction and soil displacement account for the majority of detrimental soil conditions resulting from ground-based logging operations (Page-Dumroese, 1993; Geist, 1989; Powers, 1999; Deschutes N.F., Soil Monitoring Reports). For the commercial harvest prescriptions proposed for this entry, conservative estimates were used to predict how much surface area would likely be impacted by logging facilities that would be needed to accommodate the harvest and yarding activities.

Under Alternative 2, road reconstruction (widening) would likely be required to provide access in activity areas proposed for skyline yarding. Reconstruction of existing roads has substantially less impacts than new construction. Design standards and Best Management Practices would be used to stabilize disturbed sites and control soil erosion.

No new roads would be constructed and retained as part of the transportation system. Some currently closed roads may be opened to provide necessary access, but these roads would be re-closed following harvest activities. Alternative 2 and Alternative 3 propose closing an additional 16 miles of local system road following project activities. Road closures do not change the number of acres of detrimentally disturbed soil because the road prism remains in place. Under Alternatives 2 and 3, approximately 21 miles of local system road would be subsoiled and decommissioned from the transportation system following their use. Segments of these existing roads (0.1 to 1.1 miles) cross through portions of 17 activity areas proposed for commercial harvest.

Under Alternative 2, approximately 14.8 miles (total) of temporary roads would be established or re-established to allow access to 54 activity areas proposed for commercial harvest. Under Alternative 3, about 15.3 miles of temporary road would be required to allow access to 55 proposed activity areas. Over half of these temporary roads, approximately 8 miles (Alternative 2) and 9 miles (Alternative 3), would consist of reopening segments (less than 0.1 to 0.8 miles) of old access roads from previous entries. The re-use of existing road prisms would not cause additional soil impacts because machinery access would occur on previously disturbed sites. Temporary roads are built to low specification with the amount of surface area limited to the minimum necessary to get equipment into log landing areas. On gentle to moderately sloping terrain, the magnitude of soil disturbance associated with temporary roads would be essentially the same as the disturbed widths of primary skid trails. Under Alternative 2, some temporary road locations would likely require excavation of cut-and-fill slopes on the steeper portions of activity areas proposed for skyline yarding. Alternative 3 avoids temporary road locations on slopes over 30 percent because no activity areas are proposed for skyline logging. Design standards and Best Management Practices would be used to minimize short-term negative effects during construction and use. All temporary road segments would be subsoiled (obliterated) following their use, so disturbed area estimates are balanced by restoration treatments which are designed to improve soil quality by reclaiming and stabilizing compacted road surfaces.

Commercial harvest would likely be accomplished using a tractor-mounted feller buncher equipped with a felling head (harvester shear). Mechanically harvested trees would be whole-tree yarded to main skid trail networks and rubber-tired grapple machines would then transport the bunched trees to landings for processing and loading. The grapple skidding equipment would be restricted to designated skid trails at all times.

It is estimated that skid trails would have an average disturbed width of 12 feet and the average spacing distance between main trails would be approximately 100 feet. On moderately flat ground with small timber, research found that skid trail spacing of 100 feet would account for approximately 11 percent of the unit area (Froehlich, 1981, Garland, 1983). The primary skid trails are not constructed trails where the terrain is gentle to moderately sloping, so surface organic layers are not scraped away by equipment blades or removed off site. These organic materials are either retained near the top of the skid trail, or through operations fluffed to the edges of the trail. It is not mixed deeper into the soil profile, and these organic materials are easily redistributed onto the skid trails during rehabilitation treatments. Based on personal communications with timber sale administrators, the Forest average for log landings is one landing (100 feet by 100 feet) for 10 acres of harvest (approximately 2 percent of the unit area). Disturbed area calculations for log landings are added to the acreage estimates for main skid trails to determine the overall soil disturbance.

The majority of soil impacts would consist of soil compaction on heavy use areas (i.e., roads, log landings, and main skid trails) in known locations that can be reclaimed when these facilities are no longer needed for future management. In unmanaged portions of the proposed activity areas where slopes are less than 30 percent, the development and use of new logging facilities would result in approximately 13 percent of the harvest unit areas (11 percent in skid trails plus 2 percent in log landings). This amount was used to analyze the proportionate extent of detrimental soil conditions which are expected to occur in unmanaged portions of activity areas proposed for mechanical harvest treatments.

Machine traffic off designated logging facilities would be limited in extent. Mechanical harvesters would only be allowed to make no more than two equipment passes on any site-specific area between main skid trails or away from log landings. Physical impacts to the soil resource incurred by off-trail machine traffic are generally considered to be detrimental where multiple passes are made by heavy equipment. Research has shown that the detrimental effects of soil compaction generally require more than 3 to 5 equipment passes over the same piece of ground (McNabb and Froehlich, 1983). Therefore, the effects of only two passes are not expected to qualify as a detrimental soil condition. On gentle to moderately sloping terrain, the maneuvering of equipment generally does not remove soil surface layers in areas that are at least 5 feet in width to qualify as detrimental soil displacement (FSM 2520, R-6 Supplement). Smaller areas of displacement or the mixing of soil and organic matter does not constitute a detrimental soil condition.

Past monitoring information was used to predict the extent of new soil disturbance in activity areas that overlap with previously managed areas. The estimates of detrimental soil conditions account for the expected amount of volume removal, the type of logging equipment, the spacing of skid trails, the number of log landings that would be needed to deck accumulated materials, and the fact that not all existing logging facilities can be reutilized due to their orientation within units. For the mechanical harvest prescriptions proposed for this entry, conservative estimates were used to predict how much surface area would likely be impacted by additional logging facilities that would be needed to accommodate the yarding of commercial material. Although existing skid trail networks and log landings would be used wherever possible, soil condition assessments have shown that the extent of detrimental soil conditions can be expected to increase by 5 to 10 percent with each successive entry into a stand (Craigg, 2000). An average increase of 7 percent detrimental soil conditions associated with additional logging facilities was used to analyze the proportionate extent of overlap for previously managed areas that occur within activity areas proposed for commercial thinning, regeneration harvest prescriptions (e.g., overstory removal, and shelterwood treatments) and biomass removal. Appendix B (Table 80 and Table 81) displays acres and percentages of detrimental soil conditions for existing conditions and the predicted effects from project implementation, including soil restoration treatments, for each of the activity areas proposed for commercial harvest.

Under Alternative 2, activity areas proposed for skyline yarding (approximately 420 acres) are expected to incur lower levels of detrimental soil conditions than those estimated for conventional ground-based logging. No skyline logging is proposed under Alternative 3. Harvested trees would be hand-felled and yarded material would be pulled to landings with one-end log suspension. Skyline corridors would average 15 feet in width and the average spacing distances between corridors would be approximately 150 feet. Skyline systems generally involve only minor areas mineral soil exposure or mixing of litter and soil by logs. This degree of disturbance is usually of little consequence unless it occurs on highly erodible soils. None of the proposed activity areas overlap landtypes that contain soils with high erosion hazards. A mitigation measure for soil disturbances in skyline corridors is included in Chapter 2. It is expected that the greater number of log landings within skyline units would impact more surface area than landings used for conventional ground-based systems. It is estimated that log landings for skyline yarding would detrimentally disturb soils on approximately 5 percent of the unit area in EIS Units 136, 137, 138, 139, 140, 141, and 144. All temporary roads and log landings used for skyline units would be subsoiled (obliterated) following their use.

Pre-commercial thinning and ladder fuel reduction treatments on approximately 7,985 acres (Alternative 2) and 8,586 acres (Alternative 3) would be accomplished by hand felling small-diameter trees with chainsaws following commercial harvest treatments. Manual thinning treatments would not cause cumulative increases in detrimental soil conditions because machinery would not be used for yarding non-commercial materials. Mitigation and resource protection measures would not be necessary for these non-mechanical treatments. Some of these trees would remain on the ground to provide surface cover and a source of nutrients as these organic materials gradually decompose. Fuel accumulations from these activities would not be expected to increase the risk of wildfire to an unacceptable level. This would have beneficial effects to site productivity by improving the soils ability to resist surface erosion and providing fine organic matter for humus development in mineral soil.

- **Fuel Reduction Activities**

Recent research studies within experimental plots burned by the 2002 Biscuit Fire showed that losses of carbon and nitrogen from intense soil heating were much higher than most previous estimates (Bormann et al. 2008). Under both action alternatives, a combination of various fuel reduction treatments would be implemented to reduce the potential for intense wildfires and their rates of spread. Fuel treatments include thinning trees and ladder fuel reduction treatments, mechanical and hand piling and burning slash materials, mechanical shrub/slash treatments (mowing), and the use of prescribed fire.

Most of the slash generated from commercial harvest would be machine piled and burned on log landings and/or main skid trails. Burning large concentrations of machine-piled logging slash would cause severely burned soil because heat is concentrated in a localized area. However, this slash disposal method would not result in a net increase in detrimental soil conditions because burning would occur on previously disturbed sites. Therefore, there would be no cumulative increase from the predicted amount of detrimentally disturbed soil associated with the mechanical harvest and yarding activities.

Machine piling from designated logging facilities is proposed in portions of 84 activity areas that total approximately 5,061 acres under Alternative 2 and approximately 6,114 acres in 103 activity areas under Alternative 3**.** Machine piling on temporary roads or main skid trails would have no effect on the extent of detrimentally disturbed soil because equipment would operate off the same logging facilities used during yarding operations. The same designated skid trail systems would be used as primary travel routes. The use of specialized equipment such as tracked excavators and small backhoes with grapple arms are capable of accumulating woody materials without moving appreciable amounts of topsoil into slash piles. This fuel reduction method would not cause additional soil impacts because the piling and burning would occur on previously disturbed sites that already have detrimental soil conditions.

The proposed management activities also include hand treatments for reducing and/or rearranging activity-created fuels where fuel accumulations would not increase the risk of wildfire to an unacceptable level. Lopping and scattering slash materials would be used in portions of 28 activity areas that total approximately 765 acres under Alternative 2 and approximately 928 acres in 28 activity areas under Alternative 3. The rearrangement of logging slash by the lop-and-scatter method helps protect the soil surface from erosion, and these woody materials also provide a source of nutrients as they gradually decompose.

The hand pile-and-burn method would be used to burn small concentrations of slash materials that are well-distributed within portions of 34 activity areas that total approximately 2,334 acres under Alternative 2 and 19 activity areas that total approximately 1,691 acres under Alternative 3. This non-mechanical fuels treatment does not cause soil displacement or compaction damage. Due to the relatively small-size of hand piles, ground-level heating is usually not elevated long enough to detrimentally alter soil properties that affect long-term site productivity. These activities are conducted at times and under conditions that reduce the risk of resource damage, including impacts to soils and understory vegetation. Soil heating is reduced when the soil surface layer is moist, so piles are typically burned following periods of precipitation. Nutrient releases may actually benefit site productivity in small localized areas. Conservative estimates were used to account for the cumulative amount of surface area that could be potentially impacted from harvest and yarding activities. The cumulative effects to soils from this activity would be minor in comparison. Therefore, the overall extent of detrimental soil conditions is not expected to increase above the predicted levels in any of the activity areas proposed for this post-harvest treatment.

Specialized machinery with attachments for mowing would be used to reduce the height of tall shrubs and small trees to within six to eight inches of the ground. These activities are proposed in portions of 80 activity areas that total approximately 5,874 acres under Alternative 2 and 92 activity areas that total approximately 6,668 acres under Alternative 3. Brush mowing activities may occur on as much as 70 percent to 80 percent of an activity area. Only brush and light fuels would be mowed leaving any large-diameter downed logs in place. Brush mowing does not cause detrimental soil displacement and increases in soil bulk density are inconsequential. The primary factors that limit soil compaction are the low ground pressure of the tractor and mowing heads, the limited amount of traffic (one equipment pass), and the cushioning effect of surface organic matter. These activities have been monitored in the past, and results show that increases in soil displacement and compaction do not meet the criteria for detrimental soil conditions (Soil Monitoring Report, 1997).

Prescribed fire would be used to reduce fuel accumulations in activity areas proposed for mechanical harvest as well as other treatment units where prescribed burning would be used to treat the shrub layer. Prescribed underburning would be implemented in portions of 161 activity areas that total approximately 8,912 acres under Alternative 2 and 168 activity areas that total approximately 9,443 acres under Alternative 3. Underburning would occur as a sole treatment or it may be implemented in combination with other fuel reduction treatments in other activity areas. Prescribed burning activities are conducted at times and under conditions that maximize benefits while reducing the risk of resource damage. The degree of soil heating depends upon fuel type (grass, brush, trees), fuel density, nature of the litter and duff layers (thickness, moisture content), and burn conditions at the time of ignition. For the treatment areas proposed within harvest areas, natural fuel accumulations consist mainly of fine fuels (i.e., decadent brush, tree branches, and needle cast litter) that typically do not burn for long duration and cause excessive soil heating. Ponderosa pine logs and existing snags would be retained to meet coarse woody debris requirements for wildlife habitat and soil productivity. It is expected that adequate retention of coarse woody debris and fine organic matter (duff layer) would still exist for protecting mineral soil from erosion and supplying nutrients that support the growth of vegetation and populations of soil organisms.

Prescribed burn plans would comply with all applicable LRMP standards and guidelines and Best Management Practices (BMPs) prior to initiation of burn treatments. Soil moisture guidelines would be included in burn plans to minimize the risk for intense ground-level heating. Duff moisture levels of approximately 50 percent are typical during light intensity underburns. Soil heating during spring burns would be negligible because higher moisture levels at this time of year generally result in cooler burns with lower potential for causing severely burned soil. Ground cover vegetation is expected to recover rapidly, and it is not anticipated that these burn treatments would accelerate surface erosion above tolerable limits. Fall burning would be conducted following brief periods of precipitation. Prescribed underburns in timber stands would be accomplished under carefully controlled conditions to minimize damage to standing trees. These activities are planned to meet fuel and visual management objectives without exposing extensive areas of bare mineral soil through the complete consumption of surface organic matter. It is expected that adequate retention of coarse woody debris and fine organic matter (duff layer) would still exist for protecting mineral soil from erosion and supplying nutrients that support the growth of vegetation and populations of soil organisms. Therefore, it is expected that there would be no detrimental changes in soil properties. The successful implementation of prescribed underburning would likely result in beneficial effects by reducing fuel loadings and wildfire potential as well as increasing nutrient availability in burned areas.

It is anticipated that fire lines, both mechanical and hand lines, would be used in conjunction with existing roads and natural barriers to effectively control the spread of fire within treatment units. The extent of disturbed soil would be limited to the minimum necessary to achieve fuel management objectives. In locations where mechanical fuel breaks are necessary, a low-ground pressure machine would pull a small plow to expose mineral soil in areas approximately 2.5 feet to 3 feet wide. No mechanical fire line would be constructed on sensitive soils or steep slopes over 30 percent. Hand lines would likely be less than 18 to 24 inches in width. Neither method would result in the removal of surface organic layers in large enough areas, at least 5 feet in width as defined in FSM 2520, to qualify as detrimental soil displacement. Soil compaction is not a concern because this activity would be accomplished with a single equipment pass. Displaced topsoil and unburned woody debris would be redistributed over mechanical fire line following prescribed burning activities. Litter from adjacent trees, coupled with the establishment of herbaceous grasses, forbs, shrubs, and tree seedlings would provide new sources of fine organic matter for humus development in the mineral soil.

- **Soil Restoration Treatments on Temporary Roads and Logging Facilities**

Soil restoration treatments would be applied with a self-drafting winged subsoiler to reduce the cumulative amount of detrimentally compacted soil within 93 activity areas proposed under Alternative 2 and 100 activity areas proposed under Alternative 3 to comply with management direction. This would include subsoiling all temporary roads and some of the primary skid trails and log landings following post-harvest activities. The majority of existing and new soil impacts would be confined to known locations in heavy use areas which facilitates where subsoiling treatments would need to be implemented on compacted sites. The tables in Appendix B (column 5) display the number of acres within each harvest unit that would be subsoiled and the percentage of detrimental soil conditions that would remain upon completion of the subsoiling treatment. These restoration activities comply with Regional policy (FSM 2520, R-6 Supplement No. 2500-98-1) by reducing the cumulative levels of detrimental soil conditions anticipated from this project proposal.

Under Alternatives 2 and 3, approximately 21 miles of local system road would be subsoiled and decommissioned from the transportation system following their use. Segments of these existing roads, ranging from 0.1 to 1.1 miles (0.2 to 1.7 acres), cross through portions of 17 activity areas proposed for commercial harvest. Five of these activity areas only require subsoiling to meet road decommissioning objectives for each of the action alternatives. Road closure and decommissioning treatments that include subsoiling result in a further reduction in the amount of detrimentally compacted soil within activity areas. Soil restoration acres were deducted from the disturbed area estimates for these EIS Units (Appendix B, Table 80 and Table 81) because subsoiled areas are expected to reach full recovery within the short-term. Decommissioned road segments outside of activity areas also help reduce the overall amount of detrimental soil conditions within the larger project area.

Soil restoration treatments were previously implemented in seven of the activity areas proposed under Alternative 2, and nine proposed activity areas which are now scheduled for re-entry under Alternative 3. Subsoiled logging facilities within previously managed areas would be avoided, as much as possible, to protect established vegetation. However, some of these reclaimed sites may need to be re-used to facilitate yarding activities, depending upon their orientation within activity areas. Since disturbed or undisturbed soils both lack structural development, it is expected that subsequent subsoiling on these sites would have similar effects as described below. The primary effects would be a temporary reduction in existing ground-cover vegetation.

Subsoiling treatments are designed to promote maintenance or enhancement of soil quality. Subsoiling directly fractures compacted soil layers, thereby reducing soil strength and increasing macro pore space with the soil profile. Subsequently, this contributes to increased water infiltration, enhanced vegetative root development, and improves the soils ability to supply nutrients, moisture, and air that support vegetative growth and biotic habitat for soil organisms. Additional treatment options for improving soil quality on disturbed sites include redistributing topsoil in areas of exposed mineral soil and pulling available logging slash and woody materials over the treated surface. These conservation practices comply with Regional policy and LRMP interpretations for Forest-wide standards and guidelines SL-3 and SL-4 that limit the extent of detrimental soil conditions.

As previously described under Affected Environment, extensive areas of the planning area have been covered by loose, non-cohesive ash and pumice deposits that consist mostly of sand-sized soil particles. These coarse-textured soils have little or no structural development within the principal root development zone (4 to 12 inches in depth) where changes in soil compaction (bulk density) are assessed according to Regional direction (FSM 2521.03). Dominant soils are well suited for tillage treatments due to their naturally low bulk densities, low compaction potential, and absence of rock fragments on the surface and within soil profiles. These are the soil properties which are typically affected by mechanical forces that either reduce or improve soil porosity in the compaction zone. Although equipment traffic during harvest operations can decrease soil porosity on these soil materials, compacted sites can be mitigated physically by tillage with a winged subsoiler (Powers, 1999).

Monitoring of past subsoiling activities on the Deschutes National Forest has shown that these treatments are highly effective in restoring detrimentally compacted soils. The winged subsoiling equipment used locally has been shown to lift and shatter compacted soil layers in greater than 90 percent of the compacted zone with one equipment pass (Craigg, 2000). Field observations have shown that bulk densities return to natural levels after a year or two of physical settling and moisture percolation through the soil profile (Deschutes Soil Monitoring, 1995). Most of the surface organic matter remains in place because the equipment is designed to allow adequate clearance between the tool bar and the surface of the ground for allowing smaller logging slash to pass through without building up. Any mixing of soil and organic matter does not cause detrimental soil displacement because these materials are not removed off site. Since the winged subsoiler produces nearly complete loosening of compacted soil layers without causing substantial displacement, subsoiled areas on this forest are expected to reach full recovery within the short-term (less than 5 years) through natural recovery processes.

Although the biological significance of subsoiling is less certain, these restoration treatments likely improve subsurface habitat by restoring the soils ability to supply nutrients, moisture, and air that support soil microorganisms. Research studies on the Deschutes National Forest have shown that the composition and distributions of soil biota populations rebound back toward pre-impact conditions following subsoiling treatments on compacted skid trails and log landings (Moldenke et al., 2000).

The subsoiling specialist and trained crew members work with the equipment operator to identify locations of detrimentally compacted soil. Implementation and effectiveness monitoring is then conducted on treatment areas to assure that soil restoration objectives have been met.

- **Effects of Implementing Sale Area Improvement Activities**

Sale area improvement opportunities include road closures, weed monitoring, stocking surveys, flagging removal, wildlife guzzler maintenance, and non-commercial thinning. Road closures that use signs or barriers do not reduce the number of acres of detrimentally disturbed soil because the road prism remains in place. Road decommissioning treatments that include subsoiling result in a reduction in the amount of detrimentally compacted soil. This would have a beneficial effect to site productivity by reducing the potential for erosion damage and promoting the recovery of native vegetation on disturbed sites in other portions of the planning area. Manual thinning treatments would not require mitigation or resource protection measures. None of the remaining activities would increase the extent of detrimental soil conditions within any of the proposed activity areas. There would be no cumulative increase in the estimated percentages of detrimental soil conditions disclosed in Appendix B (Table 80 and Table 81).

Direct and Indirect Effects

- **Detrimental Soil Disturbance**

The nature of the effects to the soil resource was previously described under Effects Common to Alternatives 2 and 3 (Important Interactions). The use of ground-based equipment for commercial harvest activities would increase the amount and distribution of soil impacts within the proposed activity areas (Table 60 and Appendix B). The development and use of temporary roads, log landings, and skid trail systems are the primary sources of new soil disturbance that would result in adverse changes to soil productivity. Most soil impacts would occur on and adjacent to these heavy-use areas where multiple equipment passes typically cause detrimental soil compaction. Resource protection measures (EIS Chapter 2) would be applied to avoid or minimize the extent of soil disturbance in random locations between main skid trails and away from log landings. Non-commercial thinning by hand felling small-diameter trees with chainsaws would not cause additional soil impacts because machinery would not be used for yarding activities. Under the action alternatives, the overall extent of detrimental soils conditions from post-harvest fuel reduction activities is not expected to increase above the predicted levels following commercial harvest within any of the proposed activity areas.

The amount of surface area committed to temporary roads and new logging facilities would be limited to the minimum necessary to achieve management objectives. Although existing facilities would be used to the extent possible, temporary roads and some additional skid trails and log landings would be needed to accommodate harvest and yarding activities in all activity areas proposed for mechanical harvest. A total of approximately 14.8 miles (22.2 acres) of temporary road would be established or re-established to allow access to 54 activity areas proposed for commercial harvest under Alternative 2 and about 15.3 miles (23.0 acres) of temporary road would be required to allow access to 55 activity areas proposed under Alternative 3. Over half of these temporary roads, approximately 8 miles (Alternative 2) and 9 miles (Alternative 3), would consist of reopening segments of old access roads from previous entries. The re-use of existing road prisms would not cause additional soil impacts because machinery access would occur on previously disturbed sites. All temporary road segments would be subsoiled (obliterated) following their use, so the disturbed area estimates are balanced by restoration treatments which are designed to improve soil quality by reclaiming and stabilizing compacted road surfaces.

Conservative estimates indicate that a total of approximately 700 acres of soil would be removed from production to establish designated skid trail systems and log landings within portions of the 132 activity areas proposed under Alternative 2. Approximately 772 acres in 146 activity areas would be detrimentally disturbed by logging facilities under Alternative 3. Appendix B (Table 80 and Table 81) display existing and predicted amounts of detrimental soil conditions in acres and percentages for each of the individual activity areas following mechanical harvest and subsoiling mitigation treatments.

Under both action alternatives, soil restoration treatments would be applied with a self-drafting winged subsoiler to reduce the cumulative amount of detrimentally compacted soil within proposed activity areas which are expected to exceed the Regional guidance provided in FSM 2520, R-6 Supplement No. 2500-98-1. Surface area calculations (acres) of designated areas such as roads, main skid trails, and log landings determine how much area needs to be reclaimed within individual activity areas of known size.

Under Alternative 2, portions of 93 activity areas would receive subsoiling treatments to rehabilitate approximately 411 acres of compacted soil on all temporary roads and some of the primary skid trails and log landings. Under Alternative 3, it is predicted that approximately 463 acres of compacted soil would be subsoiled within portions of 100 activity areas to comply with management direction.

Subsoiling would also be implemented within portions of 5 activity areas to decommission existing road segments that total approximately two acres under both action alternatives. Since commercial thinning is proposed under both action alternatives, the transportation system (including main skid trails and log landings) is typically left in place so these facilities can be reused for future entries. For regeneration harvest prescriptions, such as overstory removal, all or most of the logging facilities are typically subsoiled due to a much longer time period before the next return entry. Activity areas that would receive soil restoration treatments are identified by unit number in a site-specific mitigation measure (EIS, Chapter 2).

Following soil restoration treatments (subsoiling), the analysis indicates that the extent of detrimental soil conditions relative to existing conditions would either: 1) remain the same, 2) increase, but remain within the LRMP standard of 20 percent, or 3) decrease levels below existing conditions.

Table 60 summarizes current, post-harvest, and post-rehabilitation soil conditions within the proposed vegetation treatment units under both Alternatives 2 and 3. This summarized information from Appendix B reflects the net change in detrimental soil conditions for the total area of soil impacts for the combined number of activity areas (EIS units) proposed with the action alternatives.

Table 60: Summary [1] of Net Change in Detrimental Soil Conditions following Mechanical Harvest and Soil Restoration (Subsoiling) Treatments

Net Change in Detrimental Soil Conditions from Existing Condition	Alternative 2			Alternative 3		
	Detrimental Soil Conditions			Detrimental Soil Conditions		
	<=20%	>20%	Total	<=20%	>20%	Total
Existing Condition	57 units 262 acres	75 units 976 acres	132 units 1,238 acres	63 units 268 acres	83 units 1,108 acres	146 units 1,376 acres
Following Harvest	41 units 296 acres	91 units 1,558 acres	132 units 1,854 acres	46 units 323 acres	100 units 1,735 acres	146 units 2,058 acres
Post-Project Condition Following Subsoiling	77 units 642 acres	55 units 799 acres	132 units 1,441 acres	80 units 627 acres	66 units 966 acres	146 units 1,593 acres

[1] Summarizes unit specific information found in Appendix B of this DEIS. .

The following conclusions summarize the potential increases in detrimental soil conditions associated with additional logging facilities that would be needed to accommodate commercial harvest and yarding operations.

Under Alternative 2, it is anticipated that ground-based logging equipment would be used in portions of 132 activity areas that total approximately 6,919 acres. An estimated total of approximately 1,238 acres of soil are currently impacted by existing roads, livestock water developments, log landings, and skid trail systems within 122 of the 132 activity areas. The analysis indicates that 75 of these activity areas have pre-harvest detrimental soil conditions in excess of 20 percent of the unit area. It is predicted that the direct effects of the proposed harvest and yarding activities would result in a total increase of approximately 616 acres of additional soil impacts associated with skid trail systems and log landings. Soil compaction would account for the majority of these impacts and the total amount of detrimental soil conditions would be approximately 1,854 acres prior to soil restoration activities. Portions of 98 activity areas would receive subsoiling treatments to rehabilitate approximately 413 acres of detrimentally compacted soil on specific local system roads, all temporary roads and some of the primary logging facilities. This would include 93 activity areas which are expected to exceed the LRMP standard plus five (5) additional activity areas where subsoiling would be used to decommission short segments of existing system roads following mechanical harvest activities. Following subsoiling mitigation, the total amount of detrimentally disturbed soil associated with management facilities is predicted to be approximately 1,441 acres.

The analysis concludes that after project implementation, including subsoiling mitigation, 77 activity areas would have percentages of detrimental soil conditions that are less than or equal to 20 percent of the unit area. It is estimated that 52 activity areas would increase levels above existing conditions by approximately 1 to 13 percent but detrimental soil conditions would remain within the LRMP standard. Four activity areas would maintain existing percentages of detrimental soil conditions. Seventy six activity areas would result in a 1 to 7 percent net improvement in soil quality (less than existing conditions) following soil restoration treatments: Twenty three of these EIS Units would be at or below the 20 percent standard. Fifty three EIS units would maintain percentages of detrimental soil conditions above the LRMP standard, but they would not exceed existing conditions following subsoiling mitigation (Table 60 and Appendix B, Table 80 and Table 81).

Under Alternative 3, it is anticipated that ground-based logging equipment would be used in portions of 146 activity areas that total approximately 7,559 acres. An estimated total of approximately 1,376 acres of soil are currently impacted by existing roads, livestock water developments, log landings, and skid trail systems within 134 of the 146 activity areas. The analysis indicates that 83 of these activity areas have pre-harvest detrimental soil conditions in excess of 20 percent of the unit area. It is predicted that the direct effects of the proposed harvest and yarding activities would result in a total increase of approximately 682 acres of additional soil impacts associated with skid trail systems and log landings. Soil compaction would account for the majority of these impacts and the total amount of detrimental soil conditions would be approximately 2,058 acres prior to soil restoration activities. Portions of 105 activity areas would receive subsoiling treatments to rehabilitate approximately 465 acres of detrimentally compacted soil on specific local system roads, all temporary roads and some of the primary logging facilities. This would include 100 activity areas which are expected to exceed the LRMP standard plus five additional activity areas where subsoiling would be used to decommission short segments of existing system roads following mechanical harvest activities. Following subsoiling mitigation, the total amount of detrimentally disturbed soil associated with management facilities is predicted to be approximately 1,593 acres.

The analysis concludes that after project implementation, including subsoiling mitigation, 80 activity areas would have percentages of detrimental soil conditions that are less than or equal to 20 percent of the unit area. It is estimated that 58 activity areas would increase levels above existing conditions by approximately 2 to 13 percent but detrimental soil conditions would remain within the LRMP standard. Five activity areas would maintain existing percentages of detrimental soil conditions. Eighty two activity areas would result in a 1 to 13 percent net improvement in soil quality (less than existing conditions) following soil restoration treatments: Twenty one of these EIS Units would be at or below the 20 percent standard. Sixty one EIS units would maintain percentages of detrimental soil conditions above the LRMP standard, but they would not exceed existing conditions following subsoiling mitigation (Table 60 and Appendix B, Table 80 and Table 81).

There is little difference between Alternatives 2 and 3 in terms of the percentage of harvested acres with detrimental soil impacts following mechanized harvest and soil rehabilitation activities. Implementation of Alternative 3 would result in a greater extent of detrimental soil conditions (approximately 204 acres) than Alternative 2 following harvest activities due to more activity areas and treatment acres. Following subsoiling mitigation, however, the total number of acres with detrimental soil conditions is predicted to be approximately 1,441 acres under Alternative 2 and 1,593 acres under Alternative 3 or a difference of 152 acres. Compacted soils on main skid trails and log landings would be reclaimed back to a productive status because subsoiled areas are expected to reach full recovery within the short-term.

Although a few activity areas (55 EIS units in Alternative 2 and 66 EIS units in Alternative 3) would exceed the 20 percent standard following project implementation, the intent for this project is to move toward and eventually meet the 20 percent standard over time. Since thinning treatments are mainly proposed for these EIS units, the transportation system (including main skid trails and log landings) is typically left in place so these facilities can be reused for future entries.

The harvest and restoration treatments (subsoiling) proposed in both action alternatives are consistent with Regional policy (FSM 2520, R-6 Supplement) and LRMP interpretations for Forest-wide standards and guidelines SL-3 and SL-4 that limit the extent of detrimental soil conditions (Final Interpretations, Document 96-01, Soil Productivity, 1996). In harvest units where less than 20 percent detrimental impacts exist from prior activities, the cumulative amount detrimentally disturbed soil would not exceed the 20 percent limit following project implementation and restoration activities. In harvest units where more than 20 percent detrimental impacts currently exist from prior activities, the cumulative detrimental effects would not exceed conditions prior to the planned activity and some units would result in a net improvement in soil quality. Both action alternatives balance the goal of maintaining and/or improving soil quality following project implementation and soil restoration activities.

- **Sensitive Soils**

Most activity areas proposed for mechanical vegetation treatments do not occur on landtypes that contain sensitive soils. Under Alternative 2, approximately 356 acres (5 percent) of the 6,919 total acres proposed for commercial harvest treatments are located on landtypes that contain sensitive soils on steep slopes (greater than 30 percent). Under Alternative 3, approximately 72 acres (1 percent) of the 7,559 total acres of proposed activity areas occur on landtypes with steep slopes. As previously discussed under Affected Environment, areas with sensitive soils are typically confined to specific segments of the dominant landform and only portions of these total landtype acres contain localized areas with sensitive soils. Limitations for equipment use would be enforced to avoid and/or minimize potentially adverse effects in activity areas that contain steep slopes with sensitive soils (EIS, Chapter 2). None of the proposed activity areas overlap landtypes that contain sensitive soils with a high hazard for surface erosion or potentially wet soils with seasonally high water tables that would require special mitigation.

Compliance with LRMP standard and guideline SL-5 is addressed by avoiding or controlling the use of mechanical equipment in areas with sensitive soils. With the exception of seven activity areas proposed for skyline yarding under Alternative 2, activity area boundaries would be adjusted to prohibit equipment operations on the steeper portions of activity areas (greater than 30 percent slopes) proposed for conventional ground-based logging. Ground-based equipment would be restricted to existing roads and designated skid trails at all times and operators would be required to winch logs to skidders (Chapter 2, Project Design Criteria). There would be no new development of temporary roads or logging facilities on the steeper portions of activity areas proposed for conventional ground-based logging. It is expected that many of the steep portions of proposed harvest units would be included as untreated patches to meet wildlife objectives.

Under Alternative 2, skyline logging would be used to minimize soil disturbance by partial suspension of logs during transport. Seven activity areas (EIS Units 136, 137, 138, 139, 140, 141, and 144) proposed for skyline yarding are expected to incur lower levels of detrimental soil conditions than those estimated for conventional ground-based logging. Some temporary road locations would likely require excavation of cut-and-fill slopes but design standards and Best Management Practices would be used to minimize short-term negative effects during construction and use. All temporary roads and log landings used for skyline units would be subsoiled and reclaimed following their use. A mitigation measure for soil disturbances in skyline corridors is also included in Chapter 2. No skyline logging is proposed under Alternative 3.

The majority of overlap of landtypes with sensitive soils (approximately 85 to 95 percent) occurs where the potential for successful regeneration is limited by variable soil depths on rocky lava flows or where climatic factors such as frost pockets and cold air drainages affect site productivity. Under both action alternatives, all proposed activity areas currently have adequate stocking levels and meet criteria for land suitability that would allow them to be regenerated or resist irreversible resource damage. This indicates that management concerns associated with these sites were successfully addressed by past silvicultural practices. Dominant soils generally have moderate productivity ratings and actual treatment areas would exclude areas of barren lava and other site conditions which are considered to be unsuitable for timber production. With the thinning prescriptions proposed for this entry, reforestation objectives are not a major concern.

Subsoiling treatments would occur on portions of some activity areas that overlap landtypes containing soils with variable depths on rocky lava flows. Subsoiling would not be required in areas of exposed bedrock. Soils in areas with high amounts of rock fragments near the soil surface are typically not susceptible to deep, determintal compaction because the rock in the soil acts sas a cushion against the forces of equipment traffic.Although rock fragments on the surface and within soil profiles can limit subsoiling opportunities, hydraulic tripping mechanisms on winged subsoiling equipment helps reduce the amount of subsurface rock that could potentially be brought to the surface by other tillage implements. Most of the surface organic matter and smaller logging slash would remain in place because the equipment is designed to allow adequate clearance between the tool bar and the surface of the ground.

Coarse Woody Debris (CWD) and Surface Organic Matter

CWD and surface organic matter were evaluated qualitatively based on the probable success of implementing appropriate Best Management Practices and recommended guidelines that address adequate retention of these important landscape components to meet soil productivity and wildlife habitat objectives (see Wildlife Section and Chapter 2, Resource Protection Measures). A minimum amount of 5 to 10 tons per acre of CWD on ponderosa pine sites and 10 to 15 tons per acre on mixed conifer or lodgepole pine sites is recommended to ensure desirable biological benefits for maintaining soil productivity without creating an unacceptable fire hazard (Brown et al., 2003, Graham et al. 1994). Based on guidelines for estimating tons per acre of CWD (Brown, 1974 and Maxwell, Ward, 1980), the levels of CWD retention to meet wildlife habitat objectives (Eastside Screen direction) would also meet objectives for maintaining soil productivity.

The proposed harvest activities would reduce potential sources of future CWD, especially where mechanized whole-tree yarding is used in activity areas. However, both action alternatives would likely retain sufficient amounts of CWD following post-harvest activities to meet recommended guidelines. Existing down woody debris would be protected from disturbance and retained on site to the extent possible. Harvest activities would recruit CWD to the forest floor through breakage of limbs and tops during felling and skidding operations. Understory trees, damaged during harvest operations, would also contribute woody materials that provide ground cover protection and a source of nutrients on treated sites. It is expected that enough broken branches, unusable small-diameter trees, and other woody materials would likely be available after harvest activities to provide ground cover protection and a source of nutrients for maintaining soil productivity on treated sites.

Fuel reduction treatments would also reduce CWD by burning logging slash at the log landings. Some of the logging slash generated from commercial harvest may also be machine piled and burned on temporary roads, main skid trails or other previously disturbed sites. Burning small concentrations of logging slash by the hand-pile-and-burn method would have only a minor effect on the overall amount of CWD and surface organic matter within the proposed activity areas.

Post-harvest review by fuel specialists would determine the need for prescribed underburn treatments, especially where fine fuel accumulations increase the risk of wildfire to unacceptable levels. If prescribed fire is recommended, burning would occur during moist conditions to help ensure adequate retention of CWD and surface organic matter following treatment. Fuel reductions achieved through planned ignitions usually burn with low-to-moderate intensities that increase nutrient availability in burned areas. Low intensity fire does not easily consume material much larger than 3 inches in diameter, and charring does not substantially interfere with the decomposition or function of coarse woody debris (Graham et al., 1994). Although prescribed burn treatments are not intended to kill residual trees, tree mortality in varying amounts would likely occur during project implementation. Any dead trees killed from prescribed burn treatments would eventually fall to the ground and become additional sources of CWD. Depending on the rate of decay and local wind conditions, many of the small-diameter trees (less than 10 inches) would be expected to fall within the short-term (less than 5 years). Alternative 3 proposes the use of underburn treatments on more acres than Alternative 2. Assuming the same or similar burning prescriptions and conditions, the beneficial effects in short-term nutrient availability would be somewhat greater under Alternative 3 than Alternative 2. In the long term, there is likely to be no measurable difference in the quantity or distribution of CWD associated with fuel treatments under either action alternative.

A cool-temperature prescribed burn would remove some of the surface litter and duff materials without exposing extensive areas of bare mineral soil. Some of the direct and indirect beneficial effects to the soil resource include: 1) a reduction of fuel loadings and wildfire potential, 2) increased nutrient availability in localized areas, and 3) maintenance of organic matter that supports biotic habitat for mycorrhizal fungi and microorganism populations.

- **Project Design Criteria and Mitigation**

Under both action alternatives, project implementation includes the application of management requirements, project design elements, and mitigation measures (refer to Chapter 2, Resource Protection Measures) to avoid, minimize, or rectify potentially adverse impacts to the soil resource (EA, Chapter 2). Various references and Forest Service Manual direction were used as guidance to determine project design and mitigation needs for the Deadlog Vegetation Management project. These information sources are based on the best available technical data, past monitoring of similar activities on representative soils, Forest Plan direction, and nationally and regionally approved soil quality standards and guidelines.

Operational guidelines for equipment use are included in project design elements to provide options for limiting the amount of surface area covered by logging facilities and controlling equipment operations to minimize the potential for soil impacts in random locations of activity areas. Existing logging facilities would be reutilized to the extent possible. Grapple skidders would only be allowed to operate on designated skid trails spaced on average of 100 feet (11 percent of the unit area). Machine traffic off designated logging facilities would be limited in extent. The short-term effects of only two passes by mechanical harvesters and other specialized machinery off designated logging facilities are not expected to qualify as a detrimental soil condition. Natural processes, such as frost heaving and freeze-taw cycles, can generally offset soil compaction near the soil surface. Conventional ground-based logging operations would be avoided in random locations of activity areas that contain sensitive soils on steep slopes over 30 percent. Other requirements include avoiding equipment operations during periods of high soil moisture and operating equipment over frozen ground or a sufficient amount of compacted snow. The successful application of these management practices would help lower the estimated percentages of detrimental soil conditions displayed in (Table 60 and Appendix B, Table 80 and Table 81).

The direct and indirect effects to soils is greatly reduced or eliminated by skidding over frozen ground or compacted snow. Best results are achieved by skidding over frozen ground (at least 6 inches in depth) or on a compacted snow base (at least 12 inches in depth) if the soil is not frozen. Skidding over shallower snow packs should only be considered during snow accumulation periods and not during melt periods. If the compacted snow base begins to melt due to warmer temperatures or rain-on-snow events, skidding operations would be discontinued until freezing temperatures and/or additional snowfall allows operations to continue. There is no potential for soil puddling damage because the dominant, sandy textured soils lack plasticity and cohesion. If project implementation includes the use of winter logging operations, it is anticipated that there would be very little or no visual evidence of soil compaction, rutting, displacement, or loss of protective plant and litter cover.

All reasonable Best Management Practices (BMPs) would be applied to minimize the effects of road systems and timber management activities on the soil resource. A variety of BMPs are available to control erosion on roads and logging facilities. The BMPs are tiered to the Soil and Water Conservation Practices Handbook (FSH 2509.22), which contains conservation practices that have proven effective in protecting and maintaining soil and water resource values. The Oregon Department of Forestry evaluated more than 3,000 individual practices and determined a 98 percent compliance rate for BMP implementation, with 5 percent of these practices exceeding forest practice rules (National Council for Air and Stream Improvement, 1999).

Soil restoration treatments (subsoiling) would be applied with a self-drafting winged subsoiler to rectify impacts by reclaiming and stabilizing detrimentally disturbed soils committed to roads, log landings, and main skid trails. The majority of existing and new soil impacts would be confined to known locations in these heavy use areas which facilitates where soil restoration treatments need to be implemented on compacted sites. The predicted amount of detrimental soil conditions was evaluated for each activity area proposed for commercial harvest. Individual activity areas that would receive subsoiling treatments are identified by unit number in a site-specific resource protection measure (DEIS, Chapter 2). The predicted amount of subsoiled acres within specific activity areas were used for deductions in the estimated percentages of detrimental soil conditions in Table 60 and Appendix B (Table 80 and Table 81).

Monitoring of past subsoiling activities on the Deschutes National Forest has shown that these treatments are highly effective in restoring detrimentally compacted soils. Restoration treatments, such as subsoiling, are designed to promote maintenance or enhancement of soil quality, and they are consistent with Regional policy (FSM 2520, R-6 Supplement) and LRMP interpretations of standards and guidelines SL-3 and SL-4.

Soil moisture guidelines would be included in prescribed burn plans to minimize the potential for intense ground-level heating and adverse effects to soil properties. Under both action alternatives, guidelines for adequate retention of coarse woody debris and fine organic matter are included as management requirements to assure both short-term and long-term nutrient cycling on treated sites.

Cumulative Effects

- **Detrimental Soil Disturbance**

The combined effects of past and current disturbances and those anticipated from implementing the proposed actions were previously addressed under existing conditions and the discussion of direct and indirect effects. The effects of future management activities are addressed in a following subsection entitled Foreseeable Actions Common to All Alternatives.

Under Alternative 1 (No Action), the extent of detrimental soil conditions would not increase above existing levels because no additional land would be removed from production to build temporary roads and logging facilities. The unit-specific information in Appendix B, Table 80 and Table 81.

Alternatives 2 and 3 would both cause some new soil disturbances where ground-based equipment is used for mechanical harvest and yarding activities during this entry. The primary sources of detrimental soil conditions from past management are associated with existing roads and ground-based logging facilities which were used for harvest activities between 1963 and 1999. Likewise, the majority of project-related soil impacts from this entry would also be confined to known locations in heavy use areas (such as roads, log landings, and main skid trails) that can be reclaimed through subsoiling treatments. Appendix B displays acres and percentages of detrimental soil conditions for existing conditions and the predicted effects from project implementation, including soil restoration treatments, for each of the activity areas proposed for commercial harvest under the action alternatives. The net change in detrimental soil conditions is associated with additional logging facilities that would be retained following post-harvest soil restoration treatments.

As previously described for the direct and indirect effects, the combined effects of slash disposal and other fuel reduction treatments are not expected to cause cumulative increases in detrimental soil conditions beyond the predicted levels displayed for each of the proposed activity areas in Appendix B (Table 80 and Table 81).

There are no violations of Regional policy (FSM 2520, R-6 Supplement) or LRMP Standards and Guidelines SL-3 and SL-4 under either action alternative because the project would not cause an activity area to move from a detrimental soil condition less than 20 percent to one that is greater than 20 percent; nor would the project increase detrimental soil conditions in activity areas that currently exceed 20 percent of the unit area.

- **Coarse Woody Debris (CWD) and Surface Organic Matter**

Under Alternative 1, the amount of coarse woody debris and surface organic matter will gradually increase over time. In the long term, the accumulation of CWD and forest litter would increase the risk for wild land fires.

It is expected that Alternatives 2 and 3 would both comply with the recommended management guidelines (refer to Chapter 2, Resource Protection Measures) that ensure adequate retention of snags, coarse woody debris, and fine organic matter for surface cover, biological activity, and nutrient supplies for maintaining soil productivity on treated sites.

- **Foreseeable Actions Common to Alternatives**

Future management activities are assumed to occur as planned in the schedule of projects for the Deschutes National Forest. From what is known about reasonably foreseeable future actions, no out year timber sales or fuel reduction projects, including timber sales associated with the Opine and Aspen projects, are currently scheduled in areas that would overlap with any of the activity areas proposed within the Deadlog planning area.

Reforestation activities associated with the KO Timber Sale would overlap with some of the activity areas proposed with this project. The localized effects of fence maintenance and the application of protective measures for plantation trees would have no measurable effect on site productivity within planted units. Manual treatments that prune or girdle mistletoe infected trees would not cause ground disturbances because the use of machinery would not be necessary. Consequently, reforestation activities would not result in a cumulative increase in detrimental soil conditions above the predicted levels in any of the affected activity areas.

The planning area contains portions of the Quartz Mountain and Sand Springs Allotments. Livestock grazing and associated development of structural improvements were previously accounted for under existing conditions. There are no site-specific areas where livestock movement and grazing effects have caused unsatisfactory soil conditions within the forested, transitional range sites. Fence lines have local, site-specific effects on soils, but they are not considered to be structures that convert the soil to a non-productive condition. The majority of detrimental soil conditions are confined to relatively small areas (about 1.0 acre) around water developments needed to manage livestock. The limited amount of ground disturbance from past waterline installation did not result in a measurable increase in detrimental soil conditions. One acre of disturbed soil is included in the estimated amounts of existing detrimental soil conditions for eight activity areas proposed for mechanical harvest under each of the action alternatives (Appendix B). Maintenance of existing structural improvements would not increase the extent of detrimentally disturbed soil above the predicted levels in any of the proposed activity areas.

There are three water developments (guzzlers) used for wildlife management within the planning area. As previously discussed under Effects of Implementing Sale Area Improvement Activities, maintenance of these existing facilities would not result in a cumulative increase in detrimental soil conditions above the existing levels.

The Noxious Weed Control EIS would likely implement various treatments to control invasive plants in site-specific areas within the planning area. These future activities are not expected to cause any detrimental changes in soil properties. Hand removal of individual plants would result in small areas of soil displacement or the mixing of soil and organic matter which would not meet criteria considered detrimental to soil productivity. It is also unlikely that herbicide treatments would cause any adverse direct or indirect effects to soil productivity (18 Fire Herbicide Treatment Environmental Assessment, Soils Report, 2005).

The Forest Access Management Plan will address travel management issues and the need to change current policy and management direction regarding OHV use. There is no accurate inventory of the number or miles of existing user-created roads and trails within the planning area. The proposed new direction would identify a system of roads and trails for motorized travel and eliminate cross-country motorized travel except on designated routes or areas. The exact locations of these travel routes are unknown at this time. Future implementation of this new direction would have a beneficial effect on the soil resource because it would help prevent cumulative increases in the extent of detrimental soil conditions in random locations off authorized roads and trails. None of these future actions are expected to result in a cumulative increase in the extent of detrimental soil conditions beyond the predicted levels displayed for each of the proposed activity areas in Appendix B (Table 80 and Table 81).

Other foreseeable future activities include continued recreation use, standard road maintenance, and prescribed maintenance burning to reduce fuel densities and the risk for future wildfires.

The effects of recreation use would be similar to those described for Existing Condition of the Soil Resource. Future soil disturbances would be confined mainly to small concentration areas that would have a relatively minor effect on overall site productivity. Impacts from dispersed recreation activities are usually found along existing roads and trails where vegetation has been cleared on or adjacent to old logging facilities in past harvest areas. Future impacts from dispersed camping and incidental use by hikers and mountain bikers are expected to occur in similar locations. Soil disturbances from future recreation use are not expected to have a measurable effect on site productivity within the individual activity areas proposed for this project. There are no major soil-related concerns associated with the combined effects of these future activities.

Road maintenance activities would reduce accelerated erosion rates where improvements are necessary to correct drainage problems on specific segments of existing road. Surface erosion can usually be controlled by implementing appropriate Best Management Practices (BMPs) that reduce the potential for indirect effects to soils in areas adjacent to roadways. There are no major soil-related concerns associated with the combined effects of these future activities.

The effects of prescribed maintenance burning would be similar to those described for the direct and indirect effects common to Alternatives 2 and 3. These complimentary activities would be conducted under carefully controlled conditions that maximize benefits while reducing the risk for resource damage. Prescribed burn plans would comply with all applicable LRMP standards and guidelines and BMPs prior to initiation of burn treatments. Soil moisture guidelines would be included in burn plans to minimize the risk of intense heating of the soil surface. The successful implementation of these proposed activities would likely result in beneficial effects by reducing fuel loadings and wildfire potential as well as increasing nutrient availability in burned areas.

Under Alternatives 2 and 3, the cumulative effects from the proposed actions combined with all past, present, and reasonably foreseeable management activities comply with Regional policy (FSM 2520, R-6 Supplement) and LRMP direction for planning and implementing management practices in previously managed areas. There are no measurable cumulative effects expected on the amount or presence of CWD and surface organic matter associated with any reasonable and foreseeable actions.

Table 61 summarizes reasonably foreseeable future actions that could potentially cause cumulative effects within the proposed activity areas.

Table 61: Summary of Foreseeable Future Actions on Soil Productivity

Activity/Project	Action Description	Effects on Soil Productivity
KO Timber Sale and Reforestation/Maintenance Activities	Plantation fence maintenance, Repellent applications, and Dwarf Mistletoe control activities (pruning/girdling infected trees)	Past harvest accounted for under existing conditions. No measurable adverse cumulative effects from manual treatments.
Wildlife Improvement Maintenance	Maintenance on three wildlife guzzlers.	Addressed under Effects of Sale Area Improvement Activities. No measurable adverse cumulative effects from maintenance activities.
Livestock grazing and Maintenance of Structural Improvements	Portions of Quartz Mt. and Sand Springs Allotments. Cattle grazing, fence maintenance, water developments and buried waterlines within planning area.	Livestock grazing and existing improvements accounted for under existing conditions. No measurable adverse cumulative effects from maintenance of existing facilities.
Aspen Project Fuels Treatments	Ongoing maintenance activities include prescribed burns, mowing and thinning	No adverse cumulative effects; No overlap with activity areas proposed with Deadlog project.
Road Maintenance	Ongoing road maintenance. Danger tree removal, roadside brushing, drainage repair, spot surfacing.	System roads are accounted for under existing conditions. Maintenance on existing road beds and brushing or hand felling hazard trees in adjacent areas would have no measurable adverse cumulative effects.
Green Dot road Closure	Administrative closure of roads during hunting season.	Road closures have no adverse cumulative effects because the road prism remains in place.
Opal mine including Camp Site, Cinder/Rock Borrow Pits	Opal mine operations are active annually.	Accounted for under existing conditions. None of these disturbed sites are located within proposed activity areas
Travel Management	Access Management Plan will identify a system of roads and trails for motorized travel. This would change current policy regarding OHV use.	No cumulative adverse effects on soil productivity. Implementation would have beneficial effects to soils by reducing the extent of user-created roads and trails.

Activity/Project	Action Description	Effects on Soil Productivity
BPA power line Maintenance	Power line maintenance within right of way includes mowing of brush and seedlings and scattered tree and snag removal. Outside of the right of way individual hazard trees would also be removed. Cycle varies 3 - 5 years.	Access roads for maintaining power lines are accounted for under existing conditions. Maintenance on existing road beds and hand felling hazard trees in adjacent areas would have no measurable adverse cumulative effects.

LRMP (FOREST PLAN) CONSISTENCY

LRMP Management Areas MA-7, MA-8, MA-9, and MA-15 do not contain specific standards and guidelines for the soil resource in this area. The Forest-wide standards and guidelines apply to this project proposal.

Under the action alternatives, equipment operations would cause some new soil disturbances in portions of previously managed areas where ground-based logging is proposed for this entry. As previously discussed under direct and indirect effects, the project design elements, management requirements, and Best Management Practices (BMPs) built into the action alternatives are all designed to avoid or minimize potentially adverse impacts to the soil resource. The amount of disturbed soil associated with temporary roads and logging facilities would be limited to the minimum necessary to achieve management objectives. Compliance with LRMP standard and guideline SL-5 is addressed by avoiding or controlling the use of mechanized equipment in activity areas with sensitive soils. With the exception of seven activity areas proposed for skyline yarding under Alternative 2, activity area boundaries would be adjusted to prohibit equipment operations on the steeper portions of activity areas proposed for conventional ground-based logging. There would be no new development of temporary roads or logging facilities on the steeper portions of activity areas proposed for conventional ground-based logging. None of the proposed activity areas overlap landtypes that contain soils with a high erosion hazards or potentially wet soils with seasonally high water tables that would require special mitigation.

All reasonable Best Management Practices for Timber Management and Road Systems would be applied to protect the soil surface and control erosion on and adjacent to roads and logging facilities that would be used during project implementation. These conservation practices are to be implemented during and following project activities to meet the stated objectives for protecting and maintaining soil productivity.

Soil restoration treatments would be applied to rectify impacts by reducing the amount of detrimentally compacted soil dedicated to existing roads, all temporary roads, and some of the primary logging facilities within specific activity areas. Restoration treatments, such as subsoiling, are designed to promote maintenance or enhancement of soil quality. These conservation practices comply with LRMP interpretations of Forest-wide standards and guidelines SL-3 and SL-4. Subsoiling mitigation is also supported by the Forest Service Manual and Regional direction for planning and implementing management activities (FSM 2520, R-6 Supplement No. 2500-98-1).

Some activity areas (53 EA units in Alternative 2 and 61 EA units in Alternative 3) would still have detrimental soil conditions that exceed the 20 percent standard. However, there are no violations of Regional policy (FSM 2520, R-6 Supplement) or LRMP Standards and Guidelines SL-3 and SL-4 because the project would not cause an activity area to move from a detrimental soil condition less than 20 percent to one that is greater than 20 percent; nor would the project increase detrimental soil conditions in activity areas that currently exceed 20 percent of the unit area. Both action alternatives balance the goal of maintaining and/or improving soil quality following project implementation and soil restoration activities.

The proposed actions are also expected to comply with recommended guidelines for snags and coarse woody debris retention following both harvest and fuel reduction treatments.

Under all alternatives, the combined effects of all past, present, and reasonably foreseeable management activities would be within allowable limits set by Regional direction and LRMP standards and guidelines for protecting and maintaining soil productivity within each of the proposed activity areas.

CULTURAL RESOURCES

SUMMARY OF CONSULTATION AND FINDING OF EFFECT

This summary follows the Oregon State Historic Preservation Office (SHPO) Consultation and Finding of Effect under Section 106 of the National Historic Preservation Act. Following guidelines in our 2003 Regional Programmatic Agreement among USDA-Forest Service, the Advisory Council on Historic Preservation, and the Oregon State Historic Preservation Office, a finding of *No Historic Properties Affected* has been determined for this project. This finding is based on the knowledge that although cultural resource sites may be impacted by the proposed undertaking, site avoidance and project design criteria will provide protection of eligible site characteristics. The probability that certain eligible sites may be impacted during project activities leads to this finding of effect as described in 36CFR800.5 (b) and 36CFR800.16(i) (Federal Register Vol. 65, No. 239; Tuesday, December 12, 2000; pages 77730 & 77738).

MANAGEMENT DIRECTION

Management direction for cultural resources is found in the Deschutes National Forest Resource Management Plan, in the Forest Service Manual section 2360, in Federal Regulations 36CFR64 and 36CFR800 (amended December 2000), and in various federal laws including the National Historic Preservation Act (NHPA) of 1966 (as amended), the National Environmental Policy Act, and the National Forest Management Act.

The Forest Service is directed to consider the effects on cultural resources when proposing projects that fall within the Forest's jurisdiction. Further direction indicates that the Forest will determine what cultural resources are present on the forest, evaluate each resource for eligibility to the National Register of Historic Places (National Register), and protect or mitigate effects to resources that are eligible.

Relevant Forest Plan Standards and Guides include:

- CR-2 states that cultural resource properties located during inventory will be evaluated for eligibility to the National Register.
- CR-3 states that in concert with inventories and evaluations the Forest will develop thematic National Register nominations and management plans for various classes of cultural resources.
- CR-4 indicates that project level inventories or the intent to conduct such shall be documented through environmental analysis for the project.

DESIRED CONDITION

The desired condition is not clearly stated in the Forest Plan but can be derived from the implied goals of the Standards and Guides and the Monitoring Plan. It would be desirable to know the location and extent of all cultural resources, to have evaluated each one for eligibility to the National Register, and to have developed management plans for all eligible properties that would provide protection or mitigate effects that would occur to the resources.

EXISTING CONDITION

Previous and recently conducted cultural resource inventory survey in the Deadlog Project area has covered approximately 44 percent (7,082 acres) of the proposed 16,055 acre project area. Roughly 5,591 acres of this coverage represents past surveys and approximately 1,491 acres is from recent (2008) surveys in high probability areas.

As a result of these inventory surveys, 111 previously identified and new cultural resource sites have been documented. Fifty-one of the sites have been evaluated for eligibility to the National Register and of these, 49 are eligible while two are not eligible. The remaining 60 sites have not been evaluated for eligibility. There are 101 prehistoric sites, three historic sites, and seven sites that have components from both time periods.

Prehistoric site types currently identified in the project area include tool stone quarries (obsidian flows and outcrops), lithic scatters, lithic scatters with flaked stone tools, lithic scatters with ground stone tools, and lithic scatters with flaked and ground stone tools. Historic era sites represent early Forest Service administrative use and extensive railroad logging operations on formerly private timberlands. A fire lookout, a telephone line, historic debris dumps and scatters, and railroad grades are examples of the historic site types present in the project area. According to historic records, an active homestead was located in the project area, although it has not yet been verified on the ground. Additionally, there are two historic wagon roads within the project area that have not been field verified.

PROPOSED TREATMENTS

Connected actions common to the two action alternatives involve removal of danger trees, road reconstruction, road maintenance, and temporary road development where commercial harvest is proposed. Danger trees along project area travel routes are removed prior to project activities commencing. Road reconstruction takes place within the existing road prism and involves restoring drainage features, slope stabilization, guardrail replacement, and applying spot surfacing, a multi-layer bituminous surface treatment, or resurfacing with crushed aggregate prior to commercial hauling on specific roads

Road maintenance (blading and shaping the roadbed and brush removal) would occur on roads used for commercial timber hauling. Temporary roads would be needed for commercial harvest operations. These roads would be subsoiled following the project activities. Subsoiling is a method of tilling the compacted sediments for rehabilitation.

Danger trees along project area travel routes and where treatment units border the road system must be felled prior to harvest as per Federal and State safety regulations.

During project treatments in units where a waterline is present as part of the range management program, a mitigation measure has been identified to place fill material on top of the waterline at designated crossings or along the length of any travel routes to protect the waterline. This material must be a minimum of 12 inches deep.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: No treatments of any type would occur under this alternative. There would be no change in current management direction or in the level of ongoing management activities.

Effects would derive from unmanaged fuels consumed during a wildfire event. By not treating the fuels, burn temperatures in many areas would likely be extreme, endangering cultural resource sites and artifacts. The analysis value of obsidian artifacts for chronology and sourcing information would be compromised by extreme temperatures. Metal artifacts would be further oxidized, becoming more brittle. Glass melts and fractures. Ceramic objects fracture and lose decorative elements from smoke and heat. Organic materials such as wood shell, bone, antler, horn, leather and fabric may be consumed by fire or altered by smoke.

None of the following sites have been identified in the project area: 1) Potential sites for radiocarbon sampling would be contaminated by modern carbon and ash from a wildfire and 2) Sensitive site features such as rock art panels made with pigment or etched into the stone would also likely have negative effects from the heat and carbon residue of a wildfire, especially if vegetation is touching the decorated rock panels.

Physical damage or destruction of artifacts or sites during wildfire suppression activities could occur from fire control lines, temporary roads, staging areas, or disturbances from machinery and vehicles placed within site boundaries are all sources of damage. Loss of site and artifact integrity can result from displacement, compaction, churning, and mixing of surface and subsurface soils and deposits of archaeological materials, historic and prehistoric.

If a new “temporary” road developed for suppression activities that provides easier access to a site is not immediately closed or rehabilitated, the site becomes more vulnerable to looting and vandalism due to the easier access. This effect applies whether closure or rehabilitation of the temporary road occurs or not.

Restoration of hand or bulldozer created fire lines, staging areas, temporary roads, and other fire-related disturbances constitute additional impacts to non-renewable cultural resources. Every time soils containing previously undisturbed deposits of cultural resources are moved, compacted, churned, mixed, or rearranged, there is a loss of integrity to the archaeological context of those materials. Integrity refers to both the deposits themselves and the individual artifacts or features (from breakage and or destruction). Features are site components that would be destroyed if they were collected or rearranged in any way (e.g. a fire hearth, a rock cairn, a panel of rock art, a cache pit, a hunting blind, etc.).

Obscuring vegetation provides a certain level of protection to otherwise high visibility objects on the ground surface. In the event of a large wildfire, much of this vegetation would be removed by burning. Suppression activities, such as fire line construction, can also expose these objects. Higher visibility of sensitive materials at cultural resource sites would then be more vulnerable to looting and vandalism, an on-going problem on public lands in Central Oregon.

The loss of surface litter from intense wildfire combined with increased hydrophobic soil conditions could lead to erosion due to runoff of surface water. Erosion across sites can remove artifacts or deposit sediment from slopes above. Increased trampling from deer and elk on thinner forest floors has also resulted from wildfires.

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

For known sites, these areas are to be excluded from treatment unless it is determined that there would be no effect. The following discussion of effects (direct, indirect, and cumulative) assumes, that for other presently unknown sites, what the effects could be.

Direct and Indirect Effects: Treatment activities that use heavy equipment machinery for harvest or grapple piling could have a direct effect on cultural resource site integrity due to damage by crushing, breaking, mixing, displacing, compacting, and otherwise disturbing the context of the artifacts and the associated soils on and in which they are deposited. An exception to this is the machinery used to mow brush. This will be discussed further.

With cable logging (Alternative 2), dragging either end of a log up a slope would cause a direct effect to a cultural resource site by gouging, displacing, crushing, breaking, or otherwise affecting the integrity of site materials.

Two types of machinery are used for mechanical shrub treatments (mowing). The first is a rubber tired tractor using a rotary mower for slopes under 20 percent. Steeper slopes require a light tracked machine with a front-mounted mow deck that provides greater stability. The weight rating for the equipment is low, between 4 to 5 pounds per square inch (psi), and has a limited potential to cause damage more typical of the heavier skidders, shearing machines, and biomass machinery. The one function of the mowing equipment that causes some churning, mixing, and displacement of soils is when the machinery makes a turn; the tighter the turn the greater the amount of disturbance. The only direct effect anticipated from mowing would be when the equipment turns around.

Slash disposal using burn piles directly effects the more “durable” artifacts (made of inorganic materials) as well as perishable artifacts (made from organic materials). Burn temperatures reached in slash piles (up to 800 degrees F) are much higher than those in a broadcast underburn in light fuels conditions (250 to 300 degrees F). Placing burn piles within known cultural resource site boundaries can affect artifact integrity as a result of high burn temperatures.

Underburning poses a potential effect where fuels are greater than 2.5 tons per acre, or classified as more than light fuels. Research on prescribed fire and obsidian indicates that hydration rind analysis results are not affected when temperatures are 149 degrees C (300 degrees F) or less (Benson 2002; p. 100). Obsidian sourcing analysis using trace elements does not appear to be affected at temperatures below 1000 degrees C (1832 degrees F; Shackley and Dillian 2002; p. 128). Trembour (1979; in Agee 1993, p.185) notes that obsidian hydration rinds are obliterated at temperatures over 425 degrees C (797 degrees F).

Fire line construction by hand poses a potential for direct effects on significant cultural resource sites from displacement, churning, mixing, and breakage of artifacts. Loss of artifact associations and context are examples of lost site integrity. Hand line construction is more limited in effect than using machinery, since it is generally a much smaller fuel break.

Road reconstruction, road maintenance, and temporary road development in or through a cultural resource site would have a direct effect on site integrity with damage from crushing, breaking, mixing, displacing, compacting, and otherwise disturbing the context of the artifacts. Road reconstruction effects may be limited to potential impacts from restoring drainage features when they are related to the out sloping or water barring needed in association with culverts as well as without culverts. If a road crosses a site and water bars or culvert maintenance occurs outside the road prism disturbing new areas of the site, there is a direct effect on site integrity from the equipment used to complete the work. The loss of integrity is similar to that lost by using machinery for harvest activities.

Activities that occur within an established road prism, including guardrail replacement, applying surface treatments of any sort, watering and blading, or slope stabilization within the road prism should not have any new effects on a site, even if the road goes through a known site. The damage has already occurred during initial construction, while the reconstruction activities do not impact previously undisturbed site areas.

Temporary road development through a site, either by advance preparation or through actual use by equipment, has a direct effect on site integrity from crushing, breaking, mixing, displacing, compacting, and otherwise disturbing the site's context. Once the harvest and associated activities are complete, the temporary roads are subsoiled by tilling to loosen compacted sediments and make the routes undesirable for unauthorized travel.

Falling danger trees along travel routes and where units border roads may have a minor, direct effect on cultural resource sites due to the potential use of equipment off of existing disturbed areas. The effects of machinery on site integrity would be similar to other proposed treatments using heavy equipment. Additionally, there may be a direct effect, similar to that from cable yarding, if the trees or portions thereof are dragged to the road.

Should any new cultural resource site be discovered during project implementation, there would likely be an effect because the site was not discovered in advance. An example of this could be a small site that had previously only been identified as an isolated find due to a limited number of artifacts (less than 10 items) observed at the time of initial discovery. Often, by the time that such a site is relocated, some physical damage has already occurred, since increased visibility through mechanical disturbances lead to discovery.

Mowing shrubs and underburning the resulting slash material would remove vegetation that currently obscures artifacts on the ground surface and increases surface visibility. Greater visibility that exposes sensitive materials affects site integrity, since these materials would become more vulnerable to looting and vandalism.

Mitigating the potential breakage of the waterlines with 12 inches or more of imported material, to protect range improvements from equipment at crossings or along a travel route, a foreign substance is introduced to site deposits. These materials eventually migrate into subsurface deposits that may contain artifacts. Even though the intent would be to just cover the waterlines that have already impacted a site's deposits, those materials eventually move beyond the waterline's disturbance "footprint" because of displacement and churning by equipment tread and tracks.

Cultural resource sites located on sloping ground below treatment units may experience erosion and run-off of surface water, melting snow, and heavy rains. While not a direct effect of harvest, fuels, or reforestation activities, a site located down slope and outside of a harvest unit may be affected by either erosion or the depositing of sediments from outside the site proper, or both

Cumulative Effects: Road maintenance using a blade on native surfaced roads that cross cultural resource sites adds a cumulative effect to the original road construction or development. Blading a disturbed surface tends to remove additional undisturbed deposits along with material that may have slumped or blown into the roadbed. The original effect of building a road through a site is compounded through additional equipment operation for maintenance.

Road maintenance that adds gravel or drainage features (culverts, water bars, etc.) to a previously native surfaced road through a cultural resource site would affect the site. The impacts may also occur in a larger area than the original impact from the road itself if culverts or water bars are placed to drain across the site. Deposition of sediments in new locations on the site and erosion could occur in previously undisturbed portions of the site, leading to loss of artifact context and integrity.

Subsoiling temporary roads following use would affect a site due to the initial, direct effect of building the road. Subsoiling would add another level of effect because the tiller teeth tend to extend below the compacted zone of soil deposits created by road development and or use.

Harvesting, thinning, or otherwise treating plantations when cultural resource sites have been identified after the plantation was established constitutes a cumulative effect on the site. Since the site was initially impacted during the first harvest, followed by creation of the plantation, another harvest/thinning entry compounds the previous damage.

Alternative 2 (Proposed Action)

Alternative 2 proposes to treat 10,752 acres (Refer to Table 10, page 50). This alternative proposes to use cable logging methods, where one end of the log is suspended, on slopes over 30 percent. The other end of the log would be dragged up the slope. All other harvest or commercial thinning would be done with ground based equipment. Some of the modern equipment “grabs” one or more trees, cuts it, and then places it on the ground.

Alternative 2 proposes to treat 2,334 acres with hand piling and burning of slash and 5,061 acres of machine piling and burning slash. All other fuels treatments would be greater in Alternative 3. Some of the treatment units would have more than one entry for fuel reduction to provide cooler underburn temperatures. Equipment would be used for mowing and machine piling of slash; all other fuels treatments would be accomplished by hand with chain saws.

Alternative 2 proposes TSI treatments on 8,493 acres. Timber stand improvement (TSI) activities occur following harvest and fuels treatments and include precommercial thinning of small diameter trees, whip felling, and pruning branches. These activities are done using hand tools and chain saws.

Alternative 3

Alternative 3 proposes to treat 11,281 acres (Refer to Table 10, page 50). There would be no cable logging or harvest on slopes greater than 30 percent. There would be 900 acres of biomass removal. There would be 530 acres of additional underburning that would occur in more open ponderosa pine stands. All harvest, thinning, and biomass removal would be done with ground based equipment.

Biomass removal would occur in plantations and commercial harvest units. Similar technologies would be used as for ground based logging. Landings and skid trails would be needed in plantations for on-site chipping for removal; temporary roads would not be needed since plantations are currently accessible by system roads.

The types of proposed fuels treatments in Alternative 3, including possible hand line construction, are the same as in Alternative 2. More acres would be treated in Alternative 3 by each treatment type, except approximately 645 fewer acres of hand piling and burning of slash, than in Alternative 2.

RANGE

MANAGEMENT DIRECTION

All of the project area is within active grazing allotments with term grazing permits, where grazing is permitted annually. "Livestock grazing both sheep and cattle would be permitted with associated range improvements such as fences and water developments (1990 LRMP, page 4-113)".

Current livestock grazing activities utilize the available forage in the allotments while meeting the following Forest Plan Goals: to manage the forage resources for long-term sustained productivity through attainment of upward or stable vegetative trends, to protect basic soil and water resources, and to meet public needs for multiple resource outputs (LRMP, page 4-49).

- RG-7: Annual operating plans (instructions) will be prepared with each permittee. They will identify specific permittee responsibilities and will schedule livestock distribution and use patterns to prevent or resolve resource conflicts.
- RG-10: Improvements will be maintained as assigned and to the standards Identified in the grazing permit and AMP.
- RG-12: Transitory range will be managed in coordination and cooperation with timber management. Forage may be enhanced where no conflict with reforestation goals will result.
- RG-13 Allotment Management Plans will be monitored using allotment Inspections, utilization studies/checks, and condition and trend studies.
- M7-8: Forage utilization by livestock would be maintained at a level so that sufficient forage is available to support the desired number of deer. Grazing systems … would be designed to be compatible with or complementary to the habitat management objective
- M7-9: Allotment management plans will be written to reflect the management direction for this Management Area. They will include the grazing system to be used, season of use, class of livestock, stocking levels, range improvements needed, and forage production and utilization standards.
- M8-9 Timber harvesting and post-harvesting activities…should be scheduled to accommodate grazing systems.
- M8-10 Allotments will be managed to achieve or maintain a forage condition rating of fair or better to the site's capacity.
- M8-14 Transitory range will be managed in conjunction with timber management to achieve higher levels of forage production and the desired level of forage utilization. Livestock grazing on transitory ranges will take place under the following situations;
  - Where forage occurs as a result of site disturbance and/or timber canopy removal on a continuing basis.
  - Where disturbed sites and/or areas under timber management can be seeded with species which improve forage production and do not restrict tree establishment and growth.
- M9-75 Utilization standards will be established to avoid an over-used appearance.
- M9-76 Salt blocks, water developments, or other improvements which attract livestock and result in a trampled appearing setting should be avoided in highly scenic areas. New corrals and loading chutes will be made of native materials and will be designed to be visually pleasing.
- M15-7 Livestock grazing is generally not compatible with old growth areas.

RANGE OVERVIEW

Livestock grazing was historically a common use of the Deadlog Project Area. Official Forest Service records document that grazing occurred as early as the 1930s. The project area overlaps portions of two grazing allotments. The present Allotment Management Plans for the Quartz Mountain, and Sand Springs Allotments were adopted in 2006 and are based on the Cluster II Environmental Assessment. The allotments were each designed to operate at the upper limit of 600 cow/calf pairs, are in active status, and use a rest rotation grazing system. Grazing can occur on an annual basis from June 1 to September 30. Forage utilization by livestock is maintained at a level such that sufficient forage is available to support the desired number of deer. Grazing systems, stocking levels, forage use standards and range improvement projects are designed to be compatible with or complementary to the deer habitat objectives (M7-8, page 4-114). Heavy snow accumulations in severe winter conditions on winter mule deer range would concentrate herds and can cause over use of shrubs in specific areas. The rest-rotation system provides flexibility in all but the most extreme conditions where early removal of livestock from an allotment may be required as it was in 2002 on the Quartz Mountain Allotment. Early removal comes at some cost to the permittee. In some situations and under agreement with the permittee, rangelands have been rested for a growing season to allow for recovery.

Water haul and the China Hat Water System provide the only sources of water. Within the project area, most livestock water is hauled in by the permittee to established waterset locations or through the water pipeline (32.5 miles) to established water troughs. There are 17 historic waterset locations and one water trough on the two allotments within the project area. Some livestock water is also provided by rainwater catchments called trick tanks. Other improvements include barbed wire fences, cattleguards, OHV cattleguards, range study enclosures, and condition & trend study plots.

Table 62: Grazing Allotments within the Deadlog Project Area and their Status

Allotment	Acres	Livestock Type, Status, Year Last Grazed	Acres Within Project Area
Quartz Mountain	34,087	Cattle, Active, 2007	9,328
Sand Springs	55,967	Cattle, Active, 2008	6,727
Total Acres	**90,054**		**16,055**

CURRENT ALLOTMENT CONDITIONS

Historic records about vegetation on the District area prior to 1910 consist mostly of photo evidence and are limited, especially in regards to the specific area under consideration. Given the proximity of the area to Bend where much of the photo record exists one could presume that the area was mainly forested by large ponderosa pine trees and that the understory was mainly grasses and forbs with some shrub component. Along the fringe of the forested areas the shrub component naturally increased. There is no indication that juniper was ever present as a major vegetation component but it possible that it existed on some ridges such as those found on the slopes of Sixteen Butte or Deadlog Butte. Fire was frequent played a significant role in shaping vegetation communities.

Logging began around 1920 and lasted into the 1940s, removing some of the tree component and opening up the canopy. Logging was moderate on the west side of the project area and as it moved south and east the number of stems per acre that were removed decreased as a more selective harvest method was implemented.

Utilization of forage is within the Forest Plan Standards and Guidelines (RG-13 (D), page 4-50), which suggest a maximum utilization of 50%. Allotment Management Plans and the Condition and

Trend (CT) Analysis Plots indicate that the forage condition on the allotments is generally good and the trend stable. CT plots indicate vegetation changes over time in areas where management actions have occurred and vegetation has evolved under livestock grazing and fire exclusion. The trend is for shrubs to increase on these sites. Grasses have tended to be stable or increased in conjunction with the changes in the shrub component.

Monitoring has shown that areas with resource impacts caused by livestock are water set locations, water haul roads, and resting or bedding areas. These areas contain compacted soils and less diverse plant communities (occasionally, dominated by cheatgrass) and are also used intermittently by campers. Impacted areas are estimated to be less than 0.08 percent of the total analysis area.

In forested areas there has been an increase in the tree canopy, often in both percent cover and in the number of stems per acre. In shrublands, a few sites have been invaded by pine or juniper. Soil conditions have remained fairly stable with some increase in bare soil as plant communities mature on some sites.

The present grazing system allows for full rest of at least one pasture in each allotment per grazing season and use on each pasture is rotated (occurs at a different time period) during the grazing season. This allows for grazed plants to periodically complete one season or growth stage unencumbered by domestic livestock. The objective is to manage rangeland vegetation on a sustainable basis to not only provide feed for grazing livestock, but also to hold soil in place, to filter water, and recycle nutrients.

The current condition of the forage species (grasses and forbs) is in fair to good production. Most of the allotment is classified as transitional range due to the overstory of lodgepole pine, ponderosa pine, and antelope bitterbrush (*Purshia tridentata* – PUTR). The understory (grasses and forbs) are subject to increased competition. Forage quality is declining, except in areas where vegetation management activities such as tree harvest, tree thinning, prescribed burning and brush mowing have occurred. Wildfires temporality increase forage quality and quantity.

Cattle are primarily grazers, as opposed to browsers, preferring grass species when available. What is generally accepted is that when forage grasses dry out and go dormant, cattle shift to shrubs as they contain higher protein levels (Severson and Urness, 1994). Within primary range areas livestock and big game are allowed to utilize up to 50 percent of annual shrub production (1990 LRMP, page 4-50).

Due primarily to its abundance and palatability to cattle, Idaho fescue (*Festuca idahoensis* – FEID) is the primary grass species available to cattle. FEID is a perennial bunch grass that begins new growth early in the spring, produces seed in mid July, and goes dormant in the fall. Based on the life cycle of FEID and palatability of the plant, grazing is permitted during the growing season between May and October each year. FEID is the key indicator species for pasture management. In order to utilize the existing forage resource on these public lands, the 1990 LRMP allows for cattle to remove up to 50 percent of the annual growth on FEID.

Based on photo records and CT plots, the current age of many existing shrublands within the project area are from 25 to 90 years of age. Foliage production of PUTR is reported by McConnell and Smith (1977) to peak at around 60 years of age with early season grazing (Clements and Young 2001). Some acres contain shrubs that are within their most productive age range, 25 to 30 years old. Areas that provide optimum browse conditions are generally areas where wildfire and vegetation treatments have altered conditions in the last 20 to 40 years. Shrub recovery on activity and wildfire sites is taking in excess of eight years but is likely to be completed after 25 years in conjunction with grazing and fire suppression activities. Recovery is variable depending on the micro site and the climate over the recovery period. Grasses and forbs respond well to these disturbances, initially increasing their production and sustaining this well into mature vegetation conditions in shrubland areas. Bare soil is almost always increased and reduction takes longer than eight years to occur. Invading trees are reduced or eliminated, reducing competition with grasses and forbs.

Livestock operations usually require “improvements” to facilitate the control of livestock and to allow for controlled vegetation management. All existing range improvements for the two allotments, including those within the project area are displayed in Table 2A and 2B, Range Report, Project Record. The Sand Springs Allotment is classified as an intensive management level allotment and includes high investment improvements such as the China Hat Water System. The China Hat Water System includes over 32 miles of waterline and water distribution features such as troughs and tanks. Sections of this system lie within the project area and need protection.

Invasive species have not been found on the CT plots. Populations of spotted knapweed and Canada thistle are the primary invasive species found in this area but have not been found at watersets used for livestock watering within the project area. Current grazing practices within the project area, along with existing management strategies for the control of noxious weeds, do not appear to support the concept of widespread invasive species invasions into these native communities.

Exotic plant species such as cheatgrass have been found on some CT plots and where wildfire has been a factor near existing populations and records going back to the 1950s document the presence of cheatgrass. Small areas, primarily watersets and random livestock resting/bedding sites within the project area, have been heavily used by livestock over a long period of time and are detrimentally compacted. Cheatgrass, horehound, and quackgrass do well at sites that are compacted and continually disturbed. These areas have plant communities with fewer species of plants than adjacent areas and comprise approximately 0.1 percent (17 acres) of the project area. The same watersets are used each season as needed to achieve proper livestock distribution. Occasionally watersets are rested, allowing for some recovery.

Another rangeland monitoring system, other than CT plots and photos, provides a separate method of determining vegetative responses to livestock use in relation to native ungulate use. Study enclosures on the east side of the Bend & Fort Rock Ranger District were established in the 1950’s and 1960’s to track range condition as affected by livestock and deer exclusion. Much of the area where these enclosures are located is mule deer winter range habitat. Sites indicate a trend to older decadent shrubs and, in some cases, an increase in ponderosa pine trees within the enclosures.

Fire was frequent, shaping vegetative communities. This would seem to indicate that along with frequent ground type fires, occasionally large wildfires occurred such as the 1959 Aspen Flat Fire that burned to the east of the Deadlog Project Area. This mix of conditions would seem to indicate that where pine stands existed and large stand replacement fires occurred there were areas between stands of mature ponderosa pine where areas of vegetation recovery from wildfire occurred. In such locations grasses likely flourished for 10 to 20 years.

ENVIRONMENTAL EFFECTS

ALTERNATIVE 1 (NO ACTION)

Direct and Indirect Effects: Vegetation conditions would continue to change in a direction that would not be beneficial to livestock forage production over the long run. Canopy closure would increase and forage species such as FEID and PUTR would decline. Without the influence of a catastrophic event such as wildfire, ecosystems within the Deadlog Project Area would evolve toward older climax communities. The expected result would be decreased availability of forbs, grasses and shrubs. The existing quantity of browse for winter range would be unaffected.

The status of existing roads would not be changed and access for permittees would remain the same.

If catastrophic wildfires become the dominant influence on ecosystems by changes in the intensity and/or frequency then native ecosystems may be replaced with non-native species. With the presence of exotic and invasive species, control of wildfires is important.

With the passing of time and the continued lack of fire influence, grasslands would begin to give way to a shrub component and eventually convert to a shrubland community. Then after 30 to 40 years pine trees would begin to return to the burn areas and eventually these sites in the absence of fire would convert to forests which have lower levels of preferred forage.

The annual removal of forage vegetation through grazing by livestock at allowed levels combined with the mixing and incorporation of organic materials into the soil through the hoof action of cattle reduces hazardous fuels. Research indicates that "Livestock also reduced the frequency of surface fire consuming the herbaceous vegetation, which otherwise will have dried into fine fuels necessary to carry the fire (Belsky & Blumenthal 1997)" in western rangelands.

ALTERNATIVE 2 (PROPOSED ACTION)

Direct and Indirect Effects: Alternative 2 would improve existing range conditions once recovery from project activities begins. Over the long term project implementation will be beneficial to rangeland management.

Cattle would utilize treatment areas differently, depending on various factors such as the size and pattern of the treatment areas, the type of vegetation area treated, treatment intensity,and timing of treatment. Implementation of treatment activities would, in general, benefit rangelands by increasing available and palatable forage. This would be accomplished by reducing tree and shrub overstory, allowing grasses and forbs to increase. Fuels treatment reducting PUTR production generally benefits grazing providing greater amounts of available forage. Activities would reduce the density of juniper and slow the conversion of mixed shrubland communities to forested communities.

Livestock utilize PUTR to some degree depending on season of use, animal preference, and availability of preferred quality forage. Cattle are generally attracted to and prefer to graze open areas that have palatable grasses and forbs. Cattle would tend to utilize treatment areas such as prescribed burn and mow units and thinning areas where grass species would increase their production after treatment. This preferential grazing would to some degree offset cattle utilization of PUTR that remains on site after treatment.

In the short-term, treatment activity could reduce the existing amount of available browse for a period of a decade or more (response of shrubs is variable and very dependent on local site conditions). A reduction of PUTR browse available for wintering mule deer might lead to a reduction of livestock use. This activity is a trade-off, as treatment reduces fuel loads and wildfire concerns, allowing stands of older shrubs to “regenerate” and provide more viable browse in the future.

Treating additional vegetation in a unit that was previously treated would alter livestock grazing patterns in the short-term as they respond to a more open vegetative condition and use of the area would likely increase. Successive years or months of treatment and/or multiple types of treatment such as mow/burn could extend vegetative recovery time.

Roads are used to trail livestock from pasture to pasture and from the allotment. Changes in road status and the resultant changes in access would impact the permittees by reducing standard vehicle access into to some areas. This would be offset by the permittees using alternative modes of transportation such as horses and ATV’s. Reduced motorized access can also reduce vandalism to range fences and improvements.

Implementation of treatments over ten years could conflict with livestock operations by shared and increased use of roads and road systems during activities. Closed gates that control livestock movement could be left open, water haul may be difficult from shared road use, livestock are more vulnerable to injury or death by equipment on roadways or in treatment units, and livestock use patterns may be altered by activities. Although conflicts could occur, impacts would be expected to be limited to the time when treatments are being implemented with no measurable impacts on grazing.

Water sets are often used for camping and parking locations, particularly in the fall during hunting season when this area sees its greatest use period. OHV users also select these sites and a concern arises that they may use livestock trails accessing the water sets as OHV trails.

Alternative 3 (Preferred Alternative)

Direct and Indirect Effects: Alternative 3 would treat an additional 529 acres in seven additional units. Actual treatments may vary unit by unit between Alternative 2 and Alternative 3. This alternative would improve existing range conditions once recovery from project activities begins. Over the long term project implementation will be beneficial to rangeland management.

Because some planned fuel treatment units are large, overlap more than one pasture, or because multiple units may be treated within one year, or successive years, an adaptive implementation plan would minimize impact to range permittees. This would be accomplished by managing treatment activities so that no more than one pasture of each of the two affected allotments (up to two pastures in a given year) within the project area would require non-use by a single permittee during a given grazing season (Range, Resource Protection Measures). Other possibilities, such as permittee agreed non-use of more than one pasture in a given season, use of alternative pastures/allotments and deferred rotation may be used to meet treatment objectives.

Cumulative Effects – Alternative 2(Proposed Action) and Alternative 3

Cumulative effects, such as slow vegetative recovery due to multiple entries, wildfire impacts, and declines in mule deer populations, may facilitate the need for longer rest periods and repetitive impacts to livestock operations such as altered pasture rotation or shortened use periods.

The future use of roads and trails by the public, as well as uncontrolled off-road use, will likely result in the introduction and/or spread of invasive plants within the project area.

The effect of prolonged drought may include an increase in plant species which are drought tolerant and have a competitive edge during periods of drought over other vegetation. This could include both native and non-native species.

A number of miles of Bonneville Power Administration (BPA) powerline transmission line rights-of-way traverse the eastern portion of the project area. BPA has a periodic need to control vegetation within and adjacent to the right-of-way and substation. This commonly includes mowing or manual cutting of brush and small trees within the right-of-way corridor. Occasional removal of larger trees that could potentially fall and strike lines and/or transmission towers also occurs with the slash lopped and scattered and left on site. Cattle are generally attracted to these areas as they are more open then the surrounding forest and tend to produce more forage (grasses and shrubs). When moisture content of the air is high (humidity) such as during thunderstorm development, cattle will sometimes leave the area when static electricity is detected. There are multiple instances where the corridors are used as locations to water cattle and troughs are actually placed under towers.

Table 6 Deadlog Cumulative Effects Action

Activity/ Project	Action Description	General Effects to Rangeland Management
KO Timber Sale Reforestation maintenance	Fence Maintenance or removal and Big Game Repellant application. Dwarf Mistletoe control Pruning and Girdling.	No effect.
Wildlife Improvement Maintenance	Guzzler maintenance on three guzzlers.	No effect.
Cluster II Grazing allotment EA 2006. Grazing allotment Maintenance and Improvement	Fence Repair, Fence building, Water sets, Cattle Grazing, waterline installation and maintenance	No effect.
Aspen Project Fuels Treatments	Adjacent to planning area Machine Shrub treatment and thinning	No effect.
Road Maintenance	Danger tree removal, roadside brushing, drainage repair, and spot surfacing.	Minimal effect with protection and the maintenance of cattleguards.
Green Dot road Closure	Closure of roads during hunting season	Livestock are generally removed from the forest by the time hunting season begins. Administrative use is permitted.
Opal mine	Opal mine operations on mine claim including camping site.	Livestock use the area. A waterset is located along the 600 road that can concentrate livestock around the mine. Harvest activities would open up the stands around the mine and could increase cattle use of the area,. No effect is expected.
Travel Management	Travel Management EIS. Shared use roads.	The East Fort Rock OHV area lies to the west of the project area. This managed motorized use area has in general had negative effects on the allotments it overlaps by competing for resources such as waterset locations that become OHV camps, access routes that become trails, and impacts to existing roads through increased use and no change in maintenance level causing shared route to

Activity/ Project	Action Description	General Effects to Rangeland Management
		become almost impassable to standard vehicles and water haul trucks. These effects are associated with designated routes and system roads. An increase in public use impacts grazing operations by potentially increasing accidents between users and livestock. There is a potential to disturb livestock using shared travel routes. Camping use is generally not controlled which leads to user created trails. Travel management will establish management guidelines for the Deschutes National Forest. Travel management rules for off road vehicle use and camping restrictions along roads will be beneficial for rangeland management activities.
BPA power line Maintenance	Power line maintenance within right of way includes mowing of brush and seedlings and scattered tree and snag removal.	No Effect.

Since the allotments will likely be in an active status within the implementation cycle of Deadlog, there may be an effect on implementation activities, mainly timing and shared use. Some alterations, such as changing annual operating plans for grazing and managing (maintaining, repairing) existing improvements, may be needed for range activities that may be compromised by proposed activities.

BOTANY – BIOLOGICAL EVALUATION

SUMMARY OF EFFECTS TO SENSITIVE SPECIES

Threatened, Endangered, or Rare Plant Species: No adverse impacts to Threatened, Endangered or Rare (TES) species, or to their potential habitat, are anticipated due to the implementation of this project

INTRODUCTION

Direction to conserve plant species on Deschutes National Forest is found in several sources. Direction for the conservation of Threatened, Endangered and Sensitive (TES) plant species is found in the Forest Service Manual (FSM Sections 2670.5 and 2672.4), the Endangered Species Act of 1973 Subpart B; 402.12, Section 7, Consultation), and the LRMP (4-60 and 4-61). The FSM states that habitats for all existing native and desired non-native plants, fish and wildlife should be managed, at minimum, to maintain viable populations for each species. The FSM and the LRMP each direct that habitat for sensitive plant and animal species be managed to ensure that these species not trend toward being listed as Federal Endangered or Threatened species.

DESIRED FUTURE CONDITION

Habitat for late seral, rare, and uncommon plant species, and special habitat (such as wetlands) is well distributed and of high quality. For local late seral, rare, and uncommon plant species, connectivity of habitat and availability of vectors for spores, pollen, seed or vegetative propagules would allow genetic exchange between populations, and/or establishment of new populations, both within and beyond the borders of the project area. Local populations would be sufficiently robust and resilient to permit loss of some individuals or habitat, and natural disturbances would not threaten persistence of the species at other than a local scale within the project area.

The extent of non-native, invasive plant species would be in decline. Direction within the existing Deschutes and Ochoco National Forests and Crooked River National Grassland Invasive Plant EIS would allow effective treatment of existing sites and prompt treatment of newly discovered sites. Forest staff, contractors and recreationists would be aware of the primary importance of prevention as a means of limiting the spread of invasive plant species.

EXISTING CONDITION

The relatively dry climatic regime in the area is reflected in the flora, which is predominately Dry Ponderosa Pine (89 percent) and Dry Lodgepole Pine (10 percent). Less than 1 percent of vegetation cover is classified as Dry Mixed Conifer, while only six acres of Wet Ponderosa Pine are documented in GIS. The most extensive plant associations documented within the project area are ponderosa pine/bitterbrush/Idaho fescue-pumice (38.8 percent), ponderosa pine/bitterbrush-greenleaf manzanita/Idaho fescue-pumice (33.1 percent), lodgepole pine/bitterbrush/Idaho fescue-pumice (10.0 percent), ponderosa pine/bitterbrush-big sagebrush/Idaho fescue-pumice (8.5 percent) and lodgepole pine/big sagebrush/Idaho fescue-pumice (7.9 percent). These five plant association types account for 98.3 percent of vegetative cover within the project area. Several other plant associations are recognized within the project area, all present in essentially trace amounts (less than 1 percent). Of these, the association reflecting the dampest/coolest sites within the project area is white fir/snowbrush-greenleaf manzanita-pumice. Perennial water features such as streams, springs and seeps are lacking within the project area. The absence of these features significantly limits potential botanical biodiversity within the Deadlog project area.

Threatened, Endangered or Sensitive (TES) Plants

The R6 Regional Forester's Sensitive Species List (RFSSL) was officially updated on January 31, 2008. In accordance with options provided by the Regional Forester, in a letter accompanying the new List (USFS, 2008), the Deadlog Vegetation Management Project is using the 2004 R6 Sensitive Species List that was in effect at the date of this project's formal initiation. There are no federally listed Threatened or Endangered plant species known to exist on Deschutes National Forest. With reference to the 2004 RFSSL, the Deschutes National Forest Sensitive Plant List includes 31 taxa, either known (18) or suspected (13) to occur on the Forest. Relevant information concerning Deschutes National Forest Sensitive Plant Species, and an assessment of the probabilities of their occurrence within the Deadlog Vegetation Management Project, is presented in Table 63.

Table 63: Region 6 Sensitive Plant Species Documented or Suspected – Deschutes National Forest

R6 Sensitive Plant Species Documented or Suspected on Deschutes National Forest [1]	Range within Pacific Northwestern United States	Habitat	Known to Occur in Project Area/ On Forest?	Probability of Occurrence in Project Area
Agoseris elata (VP)	Cascades: Oregon, California Washington,	Somewhat diverse; typically lower elevation forest openings and alluvial terraces.	No/Yes	Low; potential habitat lacking.
Arabis suffrutescens var. *horizontalis* (VP)	Southern to central Oregon; California	Alpine to subalpine meadows, woods; summits, ridges; steep exposed rock outcrops.	No/No	Low; generally at higher and moister sites than present in project area; project may be north and east of the OR Cascades distribution of this taxon.
Arnica viscosa (VP)	Southern to central Cascades of Oregon; California	Subalpine or higher scree, talus gullies and slopes w/ seasonal water runoff; lava flows; may be in moraine lake basins or crater lake basins.	No/Yes	Low; generally at higher and moister sites than present in project area.
Artemisia ludoviciana ssp. *estesii* (VP)	Central Oregon	Upper riparian zone, away from aquatic plants.	No/Yes	Low; riparian habitat lacking within project area.

R6 Sensitive Plant Species Documented or Suspected on Deschutes National Forest [1]	**Range within Pacific Northwestern United States**	**Habitat**	**Known to Occur in Project Area/ On Forest?**	**Probability of Occurrence in Project Area**
Astragalus peckii (VP)	Southern to central Oregon	Basins, benches, gentle slopes, pumice flats; generally non-forest but known from five sites in lodgepole pine openings.	No/Yes	Moderate; some lodgepole pine habitat w/in project area is fairly similar to habitat occupied by ASPE4 elsewhere on DES NF.
Botrychium pumicola (VP)	Central Oregon	Alpine-subalpine ridges, slopes and meadows. Montane forest openings, open forest in basins with frost pockets, pumice flats.	No/Yes	High; a documented habitat type (CLS2-14) well represented (1600 acres) within project area; known sites within 2000m of project boundary.
Calamagrostis breweri (VP)	Western Cascades of Oregon; California	Subalpine to alpine meadows, open slopes, stream banks, lake margins.	No/No	Low; riparian habitat lacking within project area.
Calochortus longebarbatus var. *longebarbatus* (VP)	Cascades of Northern California, Oregon and Southern Washington	Lodgepole and ponderosa pine forest openings and forest edges of vernally moist grassy meadows, occasionally along seasonal streams.	No/No	Low; available moisture levels probably too low to provide suitable habitat.
Carex hystericina (VP)	Oregon, Idaho, Washington and California	Mid-elevations in wet to moist conditions in riparian zones; in or along ditches/canals in prairies and wetlands.	No/Yes	Low; riparian habitat lacking within project area.
Carex livida (VP)	Oregon, Idaho, Washington and California	All forest types; peatlands, wet meadows with still or channeled water.	No/No	Low; riparian habitat lacking within project area.
Castilleja chlorotica (VP)	Central Oregon	Ponderosa pine, lodgepole pine and mixed conifer forest openings; PP at lower, LP at middle to upper, mixed conifer at highest elevations.	No/Yes	Moderate; a documented habitat type (CPS2-12) present within project area, but rare (13 acres).

R6 Sensitive Plant Species Documented or Suspected on Deschutes National Forest [1]	**Range within Pacific Northwestern United States**	**Habitat**	**Known to Occur in Project Area/ On Forest?**	**Probability of Occurrence in Project Area**
Cicuta bulbifera (VP)	Eastern Cascades of Oregon and Washington; California	Shoreline marshes.	No/No	Low; suitable habitat lacking within project area.
Collomia mazama (VP)	Southern to central Cascades, Oregon	Mid- to high elevations,; meadows, stream banks and bars, lakeshores and vernal pool margins, forest edges and openings.	No/No	Low; suitable habitat lacking within project area.
Eucephalus gormanii (VP)	Western Cascades, Oregon	Rocky ridges, outcrops, or rocky slopes in alpine or subalpine mixed conifer forest.	No/Yes	Low; available moisture levels probably too low to provide suitable habitat.
Gentiana newberryi (VP)	Eastern and western Cascades of Oregon; California	Alpine to subalpine mixed conifer openings, wet to dry montane meadows, sometimes adjacent to springs, streams, or lakes.	No/Yes	Low; available moisture levels probably too low to provide suitable habitat.
Lobelia dortmanna (VP)	Eastern Cascades, Oregon; Washington	In water of lake, pond, slow river or stream, or wet meadow.	No/Yes	Low; suitable habitat lacking within project area.
Lycopodiella inundata (VP)	Oregon, Idaho, Washington, California	Deflation areas in coastal back-dunes; montane bogs, less often, wet meadows.	No/Yes	Low; suitable habitat lacking within project area.
Lycopodium complanatum (VP)	Oregon, Idaho, Washington	Middle elevations; edge of wet meadow; dry, forested midslope.	No/No	Low; suitable habitat lacking within project area.
Ophioglossum pusillum (VP)	Oregon, Washington, California	Low to mid-elevations in dune deflation planes, marsh edges, vernal ponds and stream terraces in moist meadows.	No/No	Low; suitable habitat lacking within project area.

R6 Sensitive Plant Species Documented or Suspected on Deschutes National Forest [1]	**Range within Pacific Northwestern United States**	**Habitat**	**Known to Occur in Project Area/ On Forest?**	**Probability of Occurrence in Project Area**
Penstemon peckii (VP)	Central Oregon	Ponderosa pine or mixed conifer with ponderosa pine, in openings or in relatively open stands; on recovering fluvial terraces and shallow intermittent drainages.	No/Yes	Low; likely that available moisture levels too low, elevations too high, to support suitable habitat for this taxon.
Pilularia americana (VP)	Oregon, California	Alkali and other shallow vernal pools; not recently used stock ponds; reservoir shores.	No/No	Low; suitable habitat lacking within project area.
Rorippa columbiae (VP)	Oregon, Washington, California	Low to mid-elevations; wet to vernally moist sites; meadows, fields, playas, lakeshores, intermittent stream beds, banks of perennial streams, along irrigation ditches, river bars and deltas.	No/No	Low; suitable habitat lacking within project area.
Scheuchzeria palustris ssp. *americana* (VP)	Washington, Oregon, Idaho, California	Mid-elevations; open-canopied bogs, fens, and other wetlands where often in shallow water.	No/Yes	Low; suitable habitat lacking within project area.
Schoenoplectus subterminalis (VP)	Washington, Oregon, Idaho, California	Generally submerged to emergent in quiet water 2-8 decimeters deep, in peatlands, sedge fens, creeks, ditches, ponds and lakes.	No/Yes	Low; suitable habitat lacking within project area.
Thelypodium howellii (VP)	East of Cascade crest in Oregon; Washington, California	Marshes at mid-elevations in ponderosa pine and fir forests.	No/No	Low; suitable habitat lacking within project area.
Rhizomnium nudum (B)	Oregon and Washington Cascades	Mid-elevation forests on humus or mineral soil in seepages, seasonally wet depressions or intermittently wet, low gradient channels.	No/Yes	Low; suitable habitat lacking within project area.

R6 Sensitive Plant Species Documented or Suspected on Deschutes National Forest [1]	Range within Pacific Northwestern United States	Habitat	Known to Occur in Project Area/ On Forest?	Probability of Occurrence in Project Area
Schistostega pennata (B)	Oregon, Idaho, Washington	Usually on mineral soil in crevices on lower and more sheltered parts of root wads of fallen trees. Often near streams or other wet areas. High local humidity essential.	No/Yes	Low; suitable habitat lacking within project area.
Scouleria marginata (B)	Oregon, Washington, California	Often forming dark mats on exposed to shaded rocks in perennial streams; seasonally submerged or emergent.	No/No	Low; suitable habitat lacking within project area.
Dermatocarpon luridum (L)	Oregon, Washington	On rocks or bedrock in streams or seeps; usually submerged or inundated for most of the year.	No/Yes	Low; suitable habitat lacking within project area.
Leptogium cyanescens (L)	Oregon, Washington	Generally riparian but recently documented in upland settings on vine maple, big leaf maple and intermixed with moss on white oak.	No/No	Low; suitable habitat lacking within project area.
Ramaria amyloidea (F)	Oregon, Washington, California	Associated with fir species, Douglas fir, and western hemlock; on humus or soil; fruits in fall.	No/Yes	Low; suitable habitat lacking within project area.

[1] Codes: "VP = vascular plant; "B" = bryophyte; "L" = lichen; "F" = fungus.

No sensitive plant species are known to exist within the project area (Table 63), and all but three of the 31 sensitive plant species that are documented or suspected to occur on Deschutes National Forest are considered to have a low probability of occurrence within the project area. Plant association types, in which two sensitive species are known to occur elsewhere on the Bend/Ft. Rock District, occur within the project area.

Montane populations of *Botrychium pumicola* occurring in previously logged sites are typically in the lodgepole pine/bitterbrush/fescue plant association. This plant association represents about 10 percent of the project area and is included, at least in part, in 65 of the 200 proposed treatment units.

Castilleja chlorotica is known to occur in the ponderosa pine/bitterbrush/needlegrass-pumice plant association. This plant association has been recognized on only 13 surveyed acres within the project area, and all within a single proposed treatment unit. Based on the acreage of these habitat types within the project area it is reasonable to anticipate that there is a high probability of occurrence of

Botrychium pumicola, and a low to moderate probability of occurrence of *Castilleja chlorotica* within the project area.

Surveys conducted in 1990, 1998 and 2005, which targeted high-probability habitat for these species, resulted in no detections. Collectively, these surveys covered nearly 1,700 acres, including a high percentage of high-probability habitat for *Botrychium pumicola*, within the project area.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action), Alternative 2 (Proposed Action), and Alternative 3

Direct, Indirect and Cumulative Effects. No effects have been identified because no TES plants are known to occur within or closely adjacent to the project area. While abundant suitable habitat for *Botrychium pumicola* appears to occur within the project area, surveys within much of this habitat have failed to locate this species. And while this habitat may be regarded as potentially available for colonization by *Botrychium pumicola*, there appears to be little evidence to suggest that the activities proposed in this project will significantly alter the quality of this habitat (Powers, 2006). This project would have No Impact to any TES species. A summary of anticipated effects to TES species is presented in Appendix A of the Botany BE, page 18

BOTANY - INVASIVE SPECIES

SUMMARY OF EFFECTS

This project has a HIGH risk ranking for the introduction and spread of invasive plant species. Included mitigations will reduce, but not eliminate, the invasive plant species risk associated with this project.

INTRODUCTION

Aggressive, non-native, invasive plant species can displace native plant communities causing long-lasting management problems. In displacing native vegetation, invasive plant species can 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.

It should be noted that the terms "noxious weed" and "invasive plant species" are not, in current use, synonymous. The former term is used by the Oregon Department of Agriculture (ODA) and is used in many older USDA/USFS documents. Not all non-native plants that are causing economic and/or ecological damage in the state of Oregon are listed in the ODA "Noxious Weed Index". Examples of damaging, non-native, non-listed plant species include cheatgrass (*Bromus tectorum*) and ventenata grass (*Ventenata dubia*). The term "invasive plant species" is currently widely used to include all non-native plant species currently causing, or capable of causing, local economic and/or ecological damage, regardless of their status on any particular state list. Invasive plant species known to occur on Deschutes National Forest are listed in Table 64, page 202.

National Direction

The Forest Service Manual 2080 (1995) requires that Noxious Weed Risk Assessments be prepared for any project that includes ground-disturbing activities. For projects anticipated to have a moderate to high risk of introducing or spreading noxious weeds, decision documents must identify noxious weed management measures that will be undertaken during project implementation. The Forest Service Guide to Noxious Weed Prevention Practices (2001) presents a large number of desirable weed prevention actions that should be evaluated for efficacy, and compatibility with project objectives, during the process of project planning.

Regional Direction

A USFS Region 6 Invasive Plant Program Record of Decision was signed in 2005. This ROD has forest-level significance as noted below.

Forest Direction

The Deschutes National Forest Land and Resource Management Plan (1990) includes limited general and specific directives regarding noxious weed management. The 1998 Deschutes National Forest Noxious Weed Control Environmental Assessment (EA) includes a Noxious Weed List, a supplemental Integrated Weed Management Plan (IWMP), and direction and authority for management of noxious weeds This EA and IWMP identify and promote specific actions to be associated the general weed management practices of prevention, early treatment, maintenance, and education. Associated products of this EA and IWMP included a formalized weed risk analysis process to be utilized during project planning, and a cooperative agreement with the Oregon Department of Agriculture for the application of herbicides at selected sites on Deschutes National Forest. Development of the Invasive Plant Treatments on Deschutes and Ochoco National Forests and Crooked River National Grassland Final EIS is in its final stages. This document is tiered to the 2005 Region 6 Invasive Plant Program ROD. When implemented, the ROD of the former document will increase the number of treatment options for local invasive plant species.

DESIRED FUTURE CONDITION

The extent of non-native, invasive plant species would be in decline. Direction within the existing Deschutes and Ochoco National Forests and Crooked River National Grassland Invasive Plant EIS would allow effective treatment of existing sites and prompt treatment of newly discovered sites. Forest staff, contractors and recreationists would be aware of the primary importance of prevention as a means of limiting the spread of invasive plant species.

EXISTING CONDITION

Twenty three invasive plant species are known to occur on Deschutes National Forest. This list was extracted from the FEIS for Invasive Plant Treatments, Deschutes and Ochoco National Forests and Crooked River National Grassland (2007).

Table 64: Invasive Plant Species Documented to Occur on Deschutes National Forest

Species	Common Name	Code
Cardaria pubescens	hairy whitetop	CAPU6
Centaurea biebersteinii	spotted knapweed	CEBI2
Centaurea diffusa	diffuse knapweed	CEDI3
Centaurea solstitialis	yellow star-thistle	CESO3
Cirsium arvense	Canada thistle	CIAR4
Cirsium vulgare	bull thistle	CIVU
Convolvulus arvensis	field bindweed	COAR4
Cynoglossum officinale	hound's tongue	CYOF
Cytisus scoparius	Scotch broom	CYSC4
Elymus repens	quackgrass	ELRE4
Euphorbia esula	leafy spurge	EUES
Hypericum perforatum	St. Johnswort	HYPE
Iris pseudacorus	yellow flag iris	IRPS
Kochia scoparia	kochia	KOSC
Linaria dalmatica	Dalmatian toadflax	LIDA
Linaria vulgaris	butter & eggs	LIVU2
Melilotus officinale	yellow sweetclover	MIOF
Onopordum acanthium	Scotch thistle	ONAC
Phalaris arundinacea	reed canarygrass	PHAR3
Phalaris arundinacea var. picta	ribbongrass	PHARP
Salsola kali	Russian thistle	SAKA
Senecio jacobaea	tansy ragwort	SEJA
Taeniatherum caput-medusae	medusahead	TACA8

Review of a 2006 Forest invasive plants GIS layer indicates the presence of three invasive plant species within the project area. Information available in this GIS layer is included in Table 65.

Table 65: Invasive Plant Species Present within Deadlog Project Boundary (Forest GIS)

Site ID	Location/Unit(S)		Comments	Gross Acres
6110012CEBI2	In	77	At jct. 2268/2268-600 roads.	1.4
6110094CEBI2	In	144	Along 2268-500 road, about 370 m SW of jct. w/ 2268 road.	0.05
6110254CEBI2	Not in unit		Along 23 road, NE of jct. w/ 2325-330 road.	0.1
6110369CEBI2	In	44,45	Along 2268-600 road, S of jct. w/ 2269-465 road.	0.1
6110370CEBI2	In	41,45	Along 2268-600 road, between 2269-410 and 2269-465 roads.	0.1
6110049CIAR4	Not in unit		Along 2325-300 road, about 300 m E of jct. w/ 23 road.	1.0
6110201CIAR4	Not in unit		Along 2325-300 road, about 150 m E of jct. w/ 23 road.	1.0
6110202CIAR4	Not in unit		Immediately E of 2325-300 road, about 350 m E of jct. with 23 road.	1.0
6110203CIAR4	Not in unit		Along 2325-300 road, about 570 m SE of jct. w/ 23 road.	1.0
6110012CIVU	In	77	At jct. 2268/2268-600 roads.	1.4
6110025CIVU	In	49,50	Along 22 road, shortly S of jct. w/ 2268-660 road.	3.5
6110045CIVU	Not in unit		Along 2316 road, about 350 m NW of jct. w/ 2316-700 road.	3.0
6110048CIVU	Not in unit		Along 2269 road, about 350 m SW of jct. w/ 2269-300 road.	1.4
6110049CIVU	Not in unit		Along 2325-300 road, about 300 m E of jct. w/ 23 road.	1.0

Centaurea biebersteinii (CEBI2): Spotted knapweed and its close relative, diffuse knapweed (*C. diffusa*) are understood to be among the most abundant and aggressive invasive plants, in upland settings, on Deschutes National Forest. It is common, particularly on private land adjacent to the Forest, to see sites where communities composed of a mix of native and introduced plants have been displaced by near-monocultures of knapweed. Spotted knapweed lives for multiple years, dying back to a basal rosette of leaves each winter, and producing a more profuse and taller array of flowering branches with each successive year. Although tap-rooted, plants can be very resistant to hand-pulling, and plants recover well from incomplete removal of the tap root. Sites occupied for several years by large numbers of plants can have seed beds that will produce many new plants annually, for a decade or more, even if annual mechanical treatments prevent further fruit set at those sites.

Cirsium arvense (CIAR4): Canada thistle is of particular concern at sites with high soil moisture levels during much of the growing season. The plant is commonly found in riparian zones, damp meadows and in or adjacent to wetlands of various types. Its spiny habit makes it difficult to treat manually, and its deep, creeping roots allow plants to persist even when the above-ground shoots have been pulled or cut. Rates of local spread and length of persistence at individual sites is not well documented.

Cirsium vulgare (CIVU): Local observations over the past decade have led to the understanding that bull thistle is not long persistent at specific sites. Although this tap-rooted, biennial species may be quick to establish itself in very recently disturbed settings, it seems to be rather soon displaced by herbaceous natives. Occurrences of this species in the proximity of Sensitive plant species, or in high-use recreational areas are of concern, but occurrences elsewhere are not consistently recorded.

Wildfire, Burn Intensity and Weed Risk

There is anecdotal evidence on Deschutes NF, that with the presence of pre-existing weed populations, wildfire tends to promote the spread of noxious weeds. At this time, it is assumed that weed risk increases in a direct relationship with burn intensity. The relationship between burn intensity and risk of introduction and/or spread of noxious weeds is not clearly documented on the Forest. While there may be a direct relationship between burn intensity and weed seed survivorship, it is currently assumed that this possible risk-lowering factor is more than offset by the increasing level of disturbance associated with increasing levels of burn intensity. As burn intensities increase, survivorship/cover of existing native vegetation declines, reducing, in turn, the effectiveness of local native plant species in their competition with invasive weed species. It is reasonable to predict an increased risk of spread of invasive plants species within burned areas due to 1) ground disturbance and loss/reduction of competitive native vegetation, 2) introduction or spread of weed seed from within or outside of the burned area, by vectors associated with fire suppression efforts and 3) introduction or spread of weed seed from within or outside of the project area, by project and non-project-related vectors in the several years immediately subsequent to the fire.

ENVIRONMENTAL CONSEQUENCES

Forest Service Manual 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, Forest Service policy requires that decision documents must identify noxious weed control measure that will be undertaken during project implementation (FSM 2081.03.29; November 1995).

Discussion of Ranking: This project has been given a **HIGH** risk ranking for the introduction and spread of noxious weeds because noxious weed sites exist adjacent to and within proposed treatment units in both action alternatives, and project operations will include the use of heavy equipment.

Risk Ranking: Deschutes National Forest has developed a standardized noxious weed risk assessment process to be conducted as a part of the project planning process. Risk rankings are based on the following sets of criteria.

- High Risk results if:

    1. Known weeds in or adjacent to project area.
    2. Any of vector #s 1-8 in project area.
    3. Project operations in or adjacent to weed sites.

- Moderate Risk results if:

    1. Any of vector #s 1-5 are present in project area.

- Low Risk results if:

    1. Any of vector #s 6-8 present in project area,
       OR
    2. Known weeds present in or adjacent to project area, even if vectors lacking.

Vectors ranked in order of weed introduction/spread risk:

1. Heavy equipment (implied ground disturbance).
2. Importing soil/cinders/gravel.
3. Use by OHVs.
4. Grazing (long-term disturbance).
5. Pack animals (short-term disturbance)
6. Plant restoration.
7. Use by recreationists.
8. Presence of USFS project vehicles.

Alternative 1 (No Action)

Direct and Indirect Effects: Under this alternative, no actions would be taken that would directly promote the spread of noxious weeds. It is reasonable to anticipate that no action within the project area would leave the included plant communities at least somewhat more susceptible to intense and extensive wildfire within the near future (0-20 years). As noted earlier, wildfire is associated with its own set of actions and consequences that promote the introduction and spread of noxious weeds. It is anticipated that the plant communities would experience a reduced level of disturbance (soils, native plants) if subjected to wildfire.

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

While minor differences in type and extent of treatments exist between Alternatives 2 and 3, each alternative is similar with regard to both the type and extent of principal ground disturbing and weed-vectoring activities, as well as total acres of disturbance. The level of weed risk posed by each alternative is also similar.

Direct and Indirect Effects: With no consideration of the potential for, and possible effects of, wildfire in the project area in the near future (0-20 years), it is anticipated that the Action alternatives, relative to the No Action alternative, pose the greater risk of introduction and spread of invasive plant species. When wildfire is considered, the relative weed risk associated with the No Action and Action alternatives becomes rather ambiguous, as discussed below.

The vegetation management activities proposed in the action alternatives would result in soil disturbance and a reduction in native vegetative cover and litter. These habitat alterations would potentially promote establishment of invasive plant species. The heavy equipment used in affecting these habitat alterations would, locally at least, cause a high risk of inadvertent dispersal of any existing weed propagules within the project area. The mitigation measures and project design criteria will reduce, but not eliminate weed risks associated with this project.

Cumulative Effects: The noxious weed sites that are documented within the project boundary are relatively few and small in area. There are no documented noxious weed sites within a two mile perimeter beyond the project area boundary and very few sites within a six-mile perimeter. This is likely due to several factors, including the dryness of the area, its remoteness, and possibly special features, which probably has long been associated with relatively low visitation by both agency staff and the public. While past, present and future activities can be identified (Table 66), the rate, scale, and intensity likely provide a relatively low rate and area of ground disturbance. This provides a low level of opportunities for introduction and spread of noxious weeds and invasive plant species in general. Cattle grazing may represent one of the most persistent and significant local causes of ground disturbance and spread of weeds.

Table 66: Potential Sources of Cumulative Weed Effects for the Deadlog Project

Activity/Project	Action Description	General Effects
KO Timber Sale Reforestation maintenance	Fence Maintenance or removal and Big Game Repellant application. Dwarf Mistletoe control Pruning and Girdling.	Relatively minor ground disturbance. Relatively low volume opportunities for vectoring of weed propagules.
Wildlife Improvement Maintenance	Guzzler maintenance on two guzzlers.	Relatively intense, but localized ground disturbance may be associated with dense occurrences of cheatgrass which, in turn, is available for vectoring to outlying areas by wildlife and cattle.
Cluster II Grazing allotment EA 2006.- Grazing allotment Maintenance and Improvement	Fence Repair, Fence building, Water sets, Cattle Grazing, waterline installation and maintenance	Cattle appear to be particularly effective agents of localized ground disturbance and vectoring of invasive plant species.
Aspen Project Fuels Treatments	Adjacent to planning area Machine Shrub treatment and thinning	Low to moderate local ground disturbance. Moderate to high level of opportunity for local weed vectoring (perhaps particularly for cheatgrass).
Road Maintenance	Ongoing road maintenance. Danger tree removal, roadside brushing, drainage repair, spot surfacing.	Low to high levels ground disturbance. Moderate to high probability of linear vectoring of weed propagules, both by road maintenance machinery and other vehicular traffic.
Green Dot road Closure	Administrative closure of roads Hunting season	Temporary but annually recurring reduction of opportunity for vectoring of current season's weed propagules.
Opal mine	Opal mine operations on mine claim including camping site.	Continuing ground disturbance and opportunities for vectoring locally established weeds.
Travel Management	Travel Management EIS possible signature within 2 years. Shared use roads.	Planned reduction in miles of road available for recreational use should reduce opportunities for introduction and spread of invasive plant species.
BPA power line Maintenance	Power line maintenance within right of way includes mowing of brush and seedlings and scattered tree and snag removal. Outside of the right of way individual hazard trees would also be removed. Cycle varies 3 - 5 years.	Regularly recurring, low to high levels of ground disturbance with moderate to high probability of linear vectoring of any existing weeds. No noxious weeds currently documented along power line route adjacent to project area. Cheatgrass likely to be present.

FOREST ROADS

SUMMARY

The Deadlog EA area encompasses several previous and recent planning areas. The road system within the planning area is above the minimum necessary to meet Forest objectives. The total "open road" density for this planning area is 4.77 miles per square mile.

Roads categorized as maintenance level 1 (Closed roads blocked to all traffic) would be utilized as necessary to support project needs. Danger tree reduction would be in accordance to FSM (Forest Service Manual) 7733. Upon project completion these roads would be returned to level 1 status and condition for future needs. Road closure and decommissioning is proposed within the project area.

DEADLOG ROAD CONDITIONS AND RECOMMENDATIONS

One-third (33 percent) of the open roads within the project area are proposed for closure or decommissioning. Table 67 provides a summary of the Deadlog project area Forest road system, pre- and post-analysis.

Table 67: Deadlog Road Summary

Deadlog Road Summary	
Deadlog Project Area (Acres)	16,055.000
Deadlog Project Area (Square Miles)	25.086
Arterial Roads (Miles)	10.336
Collector Roads (Miles)	11.989
Local Roads (Miles)	97.727
Closed Roads (Miles)	2.480
Total Deadlog Road Miles	120.052
Total Deadlog Open Road Miles, Pre-Analysis	117.572
Pre-Analysis Miles per Square Mile	**4.687**
Road Miles Proposed for Closure	17.421
Road Miles Proposed for Decommissioning	21.490
Total Open Road Miles, Post-Analysis	78.664
Post-Analysis Miles per Square Mile	**3.136**

- **Forest Service Collector System Roads**

Forest Service Collector Roads, 39.78 miles, were analyzed in the Forest Wide Roads Analysis. The need and degree of general maintenance to accommodate use is more extensive. Most of these roads would need routine maintenance. Road work related maintenance items along these routes shall consist of; roadside brushing, ditch cleaning, reclaiming of clearing limits for site distance, and falling danger trees along traveled routes bordering and within this project boundary. Danger trees which are felled would be removed to avoid additional fuel loading and help reduce the potential of intensifying fire effects, in addition to providing defensible space along these main travel corridors. Danger tree reduction would be in accordance to FSM (Forest Service Manual) 7733.

- **Forest Service Local Roads**

Local roads are, in general, routes that are mostly native surfaced and receive limited maintenance. Within this project there are 101.02 miles of this type of road. This type of road would receive a very limited amount of additional work to support this project. Maintenance items shall consist of that necessary to sustain this road during the life of the project. As this project nears completion it is highly recommended that these roads receive the adequate amount of maintenance to achieve a state to be self-maintaining. Construction and restoration of drainage and drainage structures (Rolling Dips, Waterbars and leadouts) are a critical element to achieve the desired effect. Other associated maintenance on these road types would include limited brushing, pre and post haul blade and shaping of roadway. Danger tree reduction would be in accordance to FSM (Forest Service Manual) 7733.

- **Road Closure and Decommissioning**

A project level roads analysis was completed to determine access needs within the project area. Table 68 summarizes proposed Forest road closure and decommissioning miles. Table 4 page 33, Table 5, page 33, and Figure 12 page 34 display proposed road closure and decommissioning. As displayed in Table 67, the open road density would be reduced from approximately 4.7 to 3.1 miles per square mile.

Table 68: Deadlog - Forest Roads Closure and Decommissioning

Activity	Road Miles
Forest Roads Proposed for Closure	17.42
Forest Roads Proposed for Decommissioning	21.48

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: Normal maintenance activities that include road blading, shaping, and drainage activities and hazard tree removal would continue. Usual Forest access would continue to be provided for both federal management activities and historical use of public activities.

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

Direct and Indirect Effects: Open road miles would be decreased through road closures and decommissioning. Approximately 17.4 miles of road would be closed and 21.5 miles of road would be decommissioned. There would be no new permanent road construction. The most economical and effective method for road inactivation that meets management objectives would be used for closure of temporary roads. Road reconstruction and maintenance activities would occur under both action alternatives. These activities would include, cutting hazard trees adjacent to identified roads and haul routes. Road reconstruction activities would restore proper drainage to the road template and improve road surface conditions where identified as deficient.

Roads that are proposed for closure, Table 4, page 33, and decommissioning, Table 5, page 33, would be closed or decommissioned following completion of vegetation treatments.

The closure and decommissioning of roads would reduce access for Forest management activities and historical public uses. Access for camping and hunting sites would be limited to non-motorized in those areas where public motorized access has been discontinued. Use of areas with historical camping sites, that are no longer accessible, would likely shift to other areas that are similar in terrain, vegetation, and previous accessibility.

Cumulative Effects: The Travel Management EIS will provide direction regarding public use of Forest roads.

RECREATION

INRODUCTION

The public uses the Deadlog planning area primarily for dispersed recreation use, such as big game hunting, camping, OHV riding, and driving for pleasure. There are no developed recreation facilities in the project area.

EXISTING CONDITION

Statistically valid use figures for dispersed recreation are unavailable since there are no fees charged, or any other methods used to track use. Dispersed campsites have not been inventoried for this project, though it is known that many dispersed hunter camps exist throughout the planning area.

Based on observation by Forest Service staff, use levels are relatively stagnant in the Deadlog project area. Dispersed campers and day use visitation is much lower in this area of the forest. Even with the population and popularity of central Oregon continuing to rise, it is unlikely there will be a noteworthy increase in the recreation use in this area. This is likely because of the location, lack of facilities, water bodies, and amount and variety of available recreation activities. The area does provide opportunities for solitude and quiet.

Long-time users of the area are generally made up of La Pine area residents. They prefer the lack of management or facilities development. They favor the freedom to choose campsites and picnic areas or they have traditional campsites or areas that they frequent at various times of the year.

Most visitors come to this area to hunt big game, but roads within the project area provide access for a variety of other activities, such as: driving for pleasure, 4-wheel driving, forest product gathering, and wildlife viewing. Maintaining open roads is a strong desire with many of the publics that frequent this area of the forest.

Dispersed camping is very popular in the project area, especially in the fall during big game hunting seasons. Most dispersed sites are located off Forest roads in the interior of the planning area, although some occur along major travel routes. Most sites are in areas of large ponderosa pine overstory. A majority of the sites are large, providing for families or group camping opportunities.

Use at some of these sites has resulted in sanitation problems, soil compaction, and a loss or degradation of vegetation. This is caused primarily by: user-created roads and trails, pit toilet development, use of vegetation for firewood and other camp use (construction of furniture, lean-tos, etc.).

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: This alternative would continue current management practices and policies. Recreation opportunities would remain relatively unchanged. No actions are proposed to close, restrict, relocate, or rehabilitate roads within the project area under this alternative. Existing campsites and roads (including user-created) would continue to be utilized and/or developed. Use and overuse of some dispersed campsites could change the condition or site character of some.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: In general, the amount of road closures being proposed reduces driving opportunities for sightseeing and other activities. There would continue to be many driving opportunities for motorists and access would continue for fire crews. Even though proposed closures would eliminate motor vehicle access to areas that were once available to the public, access would continue to be available via another open road or horseback, hiking, or biking. This would likely to result in some visitor dissatisfaction. The overall effect to the public is that there would be fewer roads to drive. Road closures would likely be disregarded by some campers and recreationists who are accustomed to few or no use restrictions, or want to continue to access areas used in the past.

Closing roads, other than temporary closures during hunting season, which provide access to dispersed campsites, would likely change the camping opportunity for some. Road closures could lead to an increase in competition for the remaining campsites or camp areas that are accessible. Most road closures are roads that are not heavily used or are not necessary for regular administrative use. Most heavily used campsites would not be impacted.

Those campers and other recreationists that frequent the affected sites on a regular basis (i.e. at least one visit per year) would likely be inconvenienced. For motor vehicle campers that would be displaced from specific sites, it is likely they would take one of the following actions:

- Utilize campsites that remain accessible.
- Develop new sites and access roads in other areas.
- Breach road closures to access campsites.
- Camp and recreate at another location other than this area.

Improvements for dispersed campsites that would be associated with closing roads would be:

- Reduced impacts (erosion, pollutants, trampling, rutting) to vegetation and soil resources by defining travel routes.

Vegetation treatments would likely have a short-term (3 to 10 years) effect to the visual quality of the treatment areas adjacent to dispersed campsites. Slash piles would be burned when optimal burning conditions arise. Post-burn visual conditions could include tree scorch and evidence of burning of shrubs. Shrub mowing would be evidenced until the shrubs regain height and vigor. Mowing and prescribed burning for maintenance would likely provide the same effect, likely with less scorch to trees.

Cumulative Effects: Table 69 summarizes the cumulative effects to the recreation resource of other activities within or near the project area.

Table 69: Cumulative Effects to the Recreation Resource for the Deadlog Project

Deadlog – Recreation – Cumulative Effects		
Activity/ Project	**Action Description**	**General Effects**
KO Timber Sale	Plantation Fence Maintenance and removal and Big Game Repellant application. Dwarf Mistletoe control activities (pruning and girdling). Past harvest and thinning.	N/A
Wildlife Improvement Maintenance	Maintenance on three wildlife guzzlers.	N/A

Deadlog – Recreation – Cumulative Effects		
Activity/ Project	**Action Description**	**General Effects**
Cluster II Grazing Allotment. Grazing allotment Maintenance and Improvement	Grazing, fence maintenance, water sets, waterline repair and reconstruction.	N/A
Aspen Project Vegetation Treatments	Within approximately 2 miles of the project boundary. Prescribed burns, mowing, and thinning of plantations – In progress	N/A
Road Maintenance	Ongoing road maintenance. Danger tree removal, roadside brushing, drainage repair, spot surfacing.	N/A
Green Dot road Closure	Administrative closure of roads during hunting season	N/A. On-going program that's been in effect and accepted for many years.
Opal mine	Located in SW portion of Quartz Mountain. Active annually. Includes camp site.	N/A
Travel Management	Travel Management EIS possible signature within 2 years. Shared use roads.	Dispersed campsites would remain accessible. Project road closures and decommissioning could affect camping opportunities.
BPA power line Maintenance	Power line maintenance every 3-5 years, including mowing brush and seedlings and scattered tree and snag removal. Removing trees that are a potential hazard to power lines..	N/A

SCENIC

INTRODUCTION

The project area is located on the southeastern flank of Newberry National Volcanic Monument. The most prominent feature with an elevation of 6,160 feet is Quartz Mountain. There are several other buttes within the project area including Dry Butte, Deadlog, Sixteen, No Name Butte, Dry, and Rogers Butte. This area is predominantly ponderosa pine with some lodgepole and dry mixed conifer. Located on the east portion of the project area are approximately 90 acres within the Scenic Views Management Area (LRMP, MA 9). These 90 acres are classified as **Medium Scenic Integrity** (formerly partial retention) in the Scenery Management System (SMS).

MANAGEMENT DIRECTION

The USDA Forest Service developed a Handbook for Scenery Management System (SMS--USDA FS 1995) to use to protect and enhance scenic resources which may be diminished by human activities, such as vegetation management, recreation and/or administrative facility development. The analysis takes into consideration the balance between Social (human) and Ecological (natural) needs within the analysis area.

The Forest Service implementing regulations currently establish a variety of Scenic Integrity Levels for Scenic Views—MA 9. These standards include:

- Natural Appearing Landscape with High Scenic Integrity Level (formerly Retention)
- Slightly Altered Landscape with Medium Scenic Integrity Level (formerly Partial Retention)
- Altered Landscape with Low Scenic Integrity Level (formerly Modification)

Foreground areas cover a viewing distance zone up to ½ mile. Middleground areas cover a distance of 0.5 to 5 miles.

Scenery Management Objectives are defined in terms of Scenic Integrity Levels which describe existing conditions and whether the landscape is visually perceived to be "complete" or not. The most complete (highest rating) for Scenic Integrity Levels means having little or no deviation from the landscape character that makes it appealing and attractive to visitors and local residents. In addition to describing existing conditions, Scenic Integrity Levels also describe the level of development allowed and ways to mitigate deviations from the area's landscape character.

Usually, the most effective way to meet Scenic Integrity Levels is to repeat visual form, line, color, texture, pattern, and scale common to the scenic values of the landscape character being viewed. For example, in natural and natural appearing landscapes, deviations such as created openings can sometimes be visually enhanced through repetition of size, shape, spacing, surface color, edge effect, and pattern of natural openings common to the existing landscape character.

LRMP – Scenic Views – Management Area 9

Objectives (LRMP, page 4-121): To the casual observer, results of activities either will not be evident or will be visually subordinate to the natural landscape. Landscapes will be enhanced by opening views to distant peaks, unique rock forms, unusual vegetation, or other features of interest. Timber harvest is permitted, but only to protect and improve the visual quality of the stands both now and in the future. Timber stands, which have remained unmanaged in the past because of their visual sensitivity, will begin receiving treatment to avoid loss of the stand to natural causes. Landscapes containing negative visual elements, such as skid roads, activity residue, or cable corridors, will be rehabilitated.

M9-4: Ponderosa pine in Foreground Scenic Views MA areas will be managed to maintain or create a visual mosaic of numerous, large diameter, yellow-barked trees with stands of younger trees offering visual diversity and a sense of depth in landscapes viewed from travel routes, recreation use areas and other sensitive viewer locations. Old growth characteristics, such as yellow, deeply fissured bark are desirable. Diversity in species, where biologically possible, is desirable. Species such as vine maple, aspen and occasional stands of fir or lodgepole pine are desirable for added visual interest. Small, natural-appearing open spaces help provide a sense of depth and are a desirable visual component in these landscapes.

In Partial Retention areas management activities may be noticeable to the casual forest visitor. However, visual changes will not be so obvious as to dominate a particular portion of a landscape. Any area that does not meet the desired visual condition because of past management activities should be reviewed by a landscape architect to determine management strategies needed to achieve the desired visual condition.

M9-5: Where there is an existing mosaic of tree sizes, size class diversity will be perpetuated by managing some of the trees within each size class. Where visual diversity is lacking, diversity will be gradually introduced to ultimately produce the desired mosaic. Although the numbers of trees will change through time, those stands that currently have a large number of large-diameter, yellow-barked trees will continue to have large numbers of the same trees. In order to accomplish this, trees may be removed where necessary to:

- Perpetuate the desired visual condition Control insect and disease problems.
- Create vista points or enhance a unique landscape feature, such as a rock outcrop or unique vegetation.
- Provide for safety along travel routes and in recreation use areas.
- Provide access for special uses, mineral activities, and administrative purposes.

M9-6: Management emphasis will focus on leaving the largest diameter trees and the healthiest crowns and forms in every stand. Visual variety will be provided by leaving occasional gnarly, old, overmature 'character trees'.

M9-7: Any proposed activity in Foregrounds will be reviewed by a landscape architect. An analysis will be developed by the landscape architect to determine:

- What treatment is necessary to achieve or retain the desired visual condition.
- If cleanup activities can realistically be completed within the specified time limits.
- Where existing pockets of dead and dying trees should be enlarged to produce the desire visual condition of small, natural-appearing open spaces.
- What measures may be necessary to meet the desired visual condition, such as winter logging, special slash treatment, etc.
- What the predicted visual condition will be following the activity.

M9-8: In Partial Retention areas, logging residue or other results of management activities will not be obvious to the casual forest visitor two years following the activity. Thinnings and other tree removal practices will be done to maintain species diversity, and to promote the health and visibility of larger old growth trees.

M9-42: The management emphasis in middleground and background will focus on maintaining or creating a continuous tree canopy while providing species and size class diversity.

M9-43: Except for routine sanitation/salvage treatments, proposed activities in middleground and background will be reviewed by a landscape architect.

M9-51: On this forest, older lodgepole pine stands normally lack visual diversity. They do not have diversity in size class, and rarely have other species growing among the older lodgepole pines. Because their crowns are relatively small, and the older trees tend to have a deteriorating appearance, management emphasis in lodgepole pine foregrounds will not be to produce large diameter, older trees. Instead, the emphasis will be on managing healthier, fuller crowned, younger trees.

Diversity in size classes, and the presence of natural-appearing openings that appear to rotate through time as younger stands grow up, will permit “depth” in these foreground landscapes. Instead of the traditional “wall” of mature lodgepole along travel routes and adjacent to recreation use areas, younger lodgepole stands will eventually replace the older mature trees to create a transitional effect. The viewer will be able to see back into the forest without having the feeling of driving through an unsightly clearcut.

Many of the mature and overmature lodgepole stands on the Forest have been heavily impacted by the ongoing mountain pine beetle epidemic. Some landscapes have been severely changed as a result of catastrophic losses due to mountain pine beetles.

M9-52: In mature stands of pure lodgepole pine, it will not be possible to meet the Retention visual quality standard during all phases of treatment.

M9-53: To produce or perpetuate the desired visual condition through time, lodgepole pine stands may require frequent treatment, Pre-commercial thinnings and other tree removal practices will be done to achieve size class and species diversity, and to promote full, healthy crowns in younger trees and to provide larger-scale diversity through a mosaic of size classes throughout a landscape.

M9-56: For scenic lodgepole pine, management emphasis will focus on achieving and maintaining a condition where trees have healthy crowns and natural forest debris is controlled.

M9-58: In Medium Scenic Integrity Foreground areas, logging residue or other results of management activities will not be obvious to the casual forest visitor two years following the activity.

M9-64: On the Forest, options to manage lodgepole stands for long periods of time are limited by the time lodgepole stands reach approximately 80 to 100 years of age. Increased susceptibility to insects and diseases normally requires a regeneration treatment to maintain these landscapes in a healthy appearance. Because the life expectancy for these trees is relatively short, more acres will be in a recently-regenerated appearance at any single point in time.

M9-86: Landscapes seen from selected travel routes and use areas will be managed to maintain or enhance their appearance.

DESIRED CONDITION

The desired condition for Ponderosa pine is to achieve and maintain visual diversity through variations of stand densities and size classes. Large, old-growth pine will remain an important constituent, with trees achieving 30 inches in diameter or larger and having deeply furrowed, yellowbark characteristics. For other species, the desired condition requires obtaining visual variety through either spatial distribution of age classes and species mixes, through density manipulation, or through a mixture of age classes within a stand.

The desired visual condition is a mosaic of even-aged stands with additional visual diversity provided by occasional groups of other tree and shrub species. Natural-appearing openings of varying sizes are desirable. Whenever biologically feasible, the re-introduction of Ponderosa pine in stands that have reverted to pure lodgepole pine is also desirable.

EXISTING CONDITION

This is considered a more remote location with few recreational amenities and fewer visitors than other parts of the Bend/Fort Rock District. It is an ideal place for those wanting to be away from crowds and any recreational development. Activities such as hunting and dispersed camping are common as well as riding of off-road motorized vehicles. Wildlife viewing and sightseeing also occur here.

Most of the views in this project area are from the road. There are some buttes offering some topographical interest although nothing very extreme, in terms of elevation changes, occur here. To those seeking solitude and connecting with nature, the views from Road 23 would be important in the Scenic Views portion located in the east portion of the project area.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: Views from the road would have no short-term impacts due to natural vegetation changes occurring over time. Any dramatic short-term changes affecting scenic views would be due to unforeseen situations caused by fire, insects, and disease. Long-term impacts would also be naturally occurring.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: The proposed vegetation treatments would have no negative impacts on scenic views from travel routes in the Scenic Views Management Area. Although treatments would most likely be visible from the roads, neutral of positive, there would be no changes that would create a distraction from the surrounding characteristic landscape of the area.

Cumulative Effects: There would be no cumulative effects to Scenic Views (M9) as a result of treatment activities. None of the actions listed in Table 12, page 55 of Chapter 3 would have a cumulative effect with proposed project activities in regards to M9.

WATER/FISHERIES RESOURCES

INTRODUCTION:

The project area is within the Devils Garden (HUC 1712000507) and Badlands (HUC 1707030506) 5th field watersheds.

MANAGEMENT DIRECTION:

INFISH: The project area is east of the owl line, and lies within the management area of the Inland Native Fish Strategy (INFISH), which amended the Deschutes National Forest Land and Resource Management Plan in 1995.

EXISTING CONDITION

There are no lakes, ponds, reservoirs, riparian areas, wetlands, perennial streams, or intermittent streams within or adjacent to the project area. There are no known ephemeral streams within or adjacent to the project area. Paulina Creek, approximately 16 miles northwest of the project area, and East Lake, approximately 13 miles northwest, are the nearest waterbodies. There are no Oregon Department of Environmental Quality 303(d) listed streams or lakes within or immediately adjacent to the project area. There are no fish populations within or immediately adjacent to, the project area.

ENVIRONMENTAL CONSEQUENCES:

There would be no direct, indirect, or cumulative effects to surface water resources, fisheries, wetlands, and riparian areas from the No Action or any of the action alternatives as these resources are not found within the project area. Evapotranspiration rates would be reduced as a result of vegetation management activities but there would be no measurable effects to groundwater. There would be no effects to Essential Fish Habitat from any alternative.

There would be no effects to any ODEQ 303(d) listed waterbodies, since there would be no effects to water resources.

RIPARIAN MANAGEMENT OBJECTIVES COMPLIANCE

Since there are no known stream systems within the project area, there would be no effects to the Riparian Management Objectives listed under INFISH.

ECONOMIC EFFICIENCY

INTRODUCTION

Although the past decade has seen a significant reduction in employment within the lumber and wood products industry, the industry is still an important contributor to the local economies. In 1999 in Crook County 1,510 people were employed in the lumber and wood products industry and in Deschutes County 4,770 people.

Over the last 10 years, an annual average of approximately 68.2 MMBF of timber has been sold from the Deschutes National Forest. In the near future, the amount of timber offered for sale is expected to be near this annual average. The Deschutes National Forest is expected to continue offering timber for sale and is expected to continue making contributions to the local economy as a result of timber harvest activities.

Forest Service Handbooks 1909.17 and 2409.18 direct the evaluation of Economic Efficiency for proposed projects. To assess economic efficiency of Alternatives 2 and 3, the anticipated timber volumes and costs were entered into TEA.ECON, a spreadsheet developed by the Forest Service to assess economic efficiency. The analysis can be used to compare alternatives, not to give an absolute number for the outputs. Numbers useful for comparing alternatives include a benefit/cost ratio, discounted benefits, discounted costs, and present net value. Effects on the local economy include estimated number of jobs created or maintained.

This analysis does not place a value on indirect benefits which may occur (such as increased future yields resulting from reduced stocking and reduced risk of stand replacing wildfire). Other amenity values, such as dispersed recreation or wildlife habitat, were included in the discussion, though the actual values were not developed. Table 70 displays some of the activities which are proposed and used in the financial efficiency analysis.

Table 70: Comparison of Activities by Alternative

Action	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3
Commercial Thin (Acres)	**0**	**7,339**	**6,660**
Logging Systems (acres)			
Ground-Based	0	6,919	6,660
Skyline	0	420	0
Biomass removal	0	0	1,321
Fuels Reduction (Acres)	**0**	**10,593**	**11,235**
MST		5,874	6,668
Piling -hand	0	2,334	1,691
Piling -grapple	0	5,061	6,114
Lop & Scatter	0	765	928
Prescriptive Burning	0	8,912	9,443
Precommercial Thinning (Acres)		**7,985**	**8,586**
Sub Soiling (Acres)	**0**	**413**	**465**
Reforestation Surveys (Acres)	**0**	**489**	**157**
Road Management (Miles)			
Temporary Road Construction	0	14.8	15.3
Road Closure	0	17.4	17.4
Road Decommissioning	0	21.5	21.5

The volume of timber removed (Table 70, page 218) in this project is the only source of positive cash flow. Timber is not the only benefit to be gained from the project. The value of the benefits of other activities has not been determined. Volumes were estimated using stand exams of representative stands by prescription. Volumes by prescription were averaged and applied to the acreages for each prescription. Volumes are merchantable volume and do not include possible biomass or non saw timber volume. The cost of cable systems analysis is covered under the heading CABLE LOGGING ANALYSIS.

Biomass removal acreages represent plantations where biomass may be removed and stands which contain a large component of trees to be removed less than seven inches. Biomass removal on these units may occur at the same time as timber harvest or later so the cost calculation is left out of the project as a whole. Analysis of biomass removal is discussed under BIOMASS ANALYSIS.

COST ANALYSIS

The cost analysis considers all costs (expenditure costs) through the stage of processing, at which the benefits are valued or environmental effects are achieved. When evaluating differences in costs (logging, transport, and other access costs of forest users) all costs do not need to be included unless differences in costs are incorporated into output values. An emphasis is made on variable costs, which differ among the alternatives being considered and affecting the decision process. Costs are assigned to each treatment or activity. These include costs of all specific inputs, and include labor supplies, equipment, fuel, and other expenditures. Forest service costs for overhead and administration are developed on the forest level and used in all projects.

Logging Costs

Logging costs to the purchaser were developed using logcost100.xls, Updated 10/08 (Rheinberger, 2008) (http://www.fs.fed.us/r6/nr/fp/FPWebPage/FP70104A/Programs.htm). It is a stump-to-truck costing program (cost per CCF, MBF, Tons). This program includes costing routines for skyline, tractor, mechanized, loader (shovel), and helicopter yarding systems. The spreadsheet is capable of estimating costs for individual harvest units and by logging system. The outputs generated the costs per hundred cubic feet (CCF) for each prescription type and logging type to remove the material. The following table shows the average cost per CCF to get timber to the road by system for each action alternative.

Table 71: Logging Cost per CCF by Logging System and Alternative (Stump to truck)

Logging System	Alternative 2 (Proposed Action)		Alternative 3	
	Cost per CCF	Volume (CCF)	Cost per CCF	Volume (CCF)
Skyline	$151.30	4,242	NA	NA
Ground- based	$88.23	57,067	$88.15	58,403
Average/Total	**$92.59**	**61,309**	**$88.15**	**58,403**

Costs incurred by the Forest Service and expected to be incurred by the purchaser of the commercial portions of this project are included in the costs for logging, Table 72.

Table 72: Forest Service and Purchaser Timber related costs

Cost Description	Alternative 2 (Proposed Action) Costs	Alternative 3 Costs
Planning NEPA	$10.45	$10.45
Sale Preparation	$10.18	$10.18
Sale Administration	$5.36	$5.36
Stump to Truck	$88.23/$151.30	$88.15
Log Haul	$28.66	$28.66/ 14.26
Road Maintenance	$8.65	$8.65
BD	$3.96	$3.96
Temp Road con/decommission	$3.60	$3.93
Discount Rate	4.0%	4.0%

Non-Logging Costs

Additional costs of activities which with the timber sale are intended to meet the resource objectives of the project. These are considered non-timber costs since they are not part of logging but are tied to the desire to manage stands and fuels to levels which meet resource objectives. These include:

- Fuels Treatments which will reduce the potential fuels loadings to levels where prescribed fire and natural fire processes can develop. These include:
  - Grapple piling and burning (on ground-based harvest units) with machinery along skid trails.
  - Hand piling and burning of slash in treated units.
  - Mechanical Shrub treatment of brush and surface fuels with mowing type machinery.
  - Ladder Fuels Reduction LFR cutting of small diameter trees.
  - Lop and scatter of LFR or precommercial thinned trees.
  - Under burning of natural and created surface fuels.
- Reforestation monitoring of overstory removal and shelterwood treatments to ensure prescription meets reforestation standards.
- Precommercial thinning of plantations and understory trees in harvest units.
- Road closure and decommissioning of roads not needed following activities.
- Subsoiling of landings, temporary roads, main skid trails and road decommissioning in units and roads designated to reduce detrimental soil conditions and increase soil productivity

The following table identifies the costs used which include overhead assessments. These are non-timber projects and activities:

Table 73: Non logging Treatment Costs

Activity	Cost	Unit of Measurement
Fuels Treatments		
Piling- Grapple	$317	Per acre
Piling- Hand	$552	Per acre
Lop & Scatter	$92	Per acre
Whip falling	$199	Per acre
LFR	$199	Per acre
MST	$166	Per acre
Underburning	$479	Per acre
Precommercial Thinning	$178	Per acre

Activity	Cost	Unit of Measurement
Road Closure	$500	Each
Sub soiling	$210	Per acre
Reforestation surveys	$21	Per acre

Economic Comparison

Table 74: Summary of economic efficiency analysis

Economic Measure	Alternative 1 (No Action)	Alternative 2	Alternative 3
Benefits			
Acres of Commercial Harvest	0	6,919 acres	6,660 acres
Volume Total (CCF) Saw Timber (CCF) Saw Timber (MBF)	 0 0	61,309 49,047 24,523	58,403 46,722 23,361
Discounted Benefits [1]	$0	***$671,314.00***	***$610,311.00***
Costs			
Environmental Analysis	$600,000.00	$640,679.00	$610,311.00
Sale Preparation	$0.00	$624,125.00	$594,542.00
Sale Administration	$0.00	$328,616.00	$294,935.00
Regeneration Surveys	$0.00	$10,269.00	$3,297.00
Discounted Timber Sale Costs	$600,000.00	***($1,582,769.00)***	***($1,502,614.00)***
Sale Area Projects			
Subsoiling	$0.00	$39,235.00	$44,175.00
Pre-commercial thinning	$0.00	$1,026,170.00	$850,128.00
Road Decommissioning	$0.00	$52,500.00	$52,500.00
Road Closure	$0.00	$8,000.00	$8,000.00
Fuels Treatments			
Underburning	$0.00	$4,268,848.00	$4,523,197.00
Lop & Scatter	$0.00	$67,160.00	$82,156.00
Mechanical Shrub Treatment	$0.00	$977,740.00	$1,109,544.00
Ladder Fuel Reduction	$0.00	$423,671.00	$756,996.00
Hand piling	$0.00	$1,263,528.00	$933,432.00
Grapple piling	$0.00	$1,615,432.00	$1,949,233.00
Sale area Improvement and Discounted Fuels Costs		***($7,239,065.00)***	***($7,619,740.00)***
Total Discounted Costs [1]	***$600,000.00***	***$8,821,834.00***	***$9,121,354.00***
Summary			
Benefit/Cost Ratio [1] without fuels treatments	0	0.42	0.42
Benefit/Cost Ratio [1] with fuels treatments	0	0.08	0.07
Present Net Value [1] without fuels treatment	0	($911,455.00)	($872,059.00)
Present Net Value [1]	($600,000.00)	($8,150,520.00)	($8,490,799.00)
Jobs maintained or created [2]	0	294	278
Estimated Employee Income [3]	0	$9,352,434.00	$8,843,458.00

[1] Assumes 4% discount rate.
[2] Calculated using figures for the Deschutes National Forest from Appendix B-5 of the FY 1997 Timber Sale Program Annual Report. Excluding firewood from the volume harvested on the Deschutes National Forest, an estimated 9.6 jobs per million board feet were maintained or created.

[3] Derived by multiplying (a) the number of jobs maintained or created by (b) $31,811, the average 1999 salary in Central Oregon for lumber and wood products jobs. Source of salary information: Oregon Covered Employment & Payrolls by County and Industry, Oregon Employment Department, and US Bureau of Labor Statistics.

The economic analysis of the project which compares economic features such as Present Net Benefits, Present Net Costs, Present Net Value and Benefit cost ratios was calculated using econ52.xls (Rheinberger, 2009) available at http://www.fs.fed.us/r6/nr/fp /FPWebPage/FP70104A/Programs.htm. The program allows evaluation of timber sale economics based on current and or future sale data.

ENVIRONMENTAL CONSEQUENCES

Alternative 1 (No Action)

Direct and Indirect Effects: This alternative would forgo any addition to the timber supply in the area. No new jobs would be added to the local economy.

Alternative 2 (Proposed Action) and Alternative 3

Direct and Indirect Effects: Timber proposed for harvest with Alternative 2 would be approximately 36 percent and Alternative 3 would be approximately 34 percent of the Forest's annual average timber sale program. This timber would be expected to be sold over the course of more than one year.

Alternative 2 would provide 294 jobs and Alternative 3 would provide 278 jobs associated with the timber wood products industry. Not included in these estimates are jobs related to over 7 million dollars in thinning and fuels treatments. Alternative 2 provides more jobs and a higher level of estimated timber related income than Alternative 3. The difference between action alternatives is less than 6 percent, when measured by jobs created or employee income. The costs of Alternative 3 are higher by three percent.

The timber benefits accrued from each alternative is similar although Alternative 3 removes less timber and has commercial harvest on fewer acres. The selling of timber would bring some money to the Forest Service although it would not pay for the whole project. The project as a whole would cost more under Alternative 3 as a result of an increase in fuels treatments acres.

The economic effects of the fuels treatments beyond the scope of the timber sold are dependent on the risk and probability of wildfire. Wildfires and management of wildfires will continue in the area. With treatments there is a higher probability that wildfires could be managed to meet management objectives with reduced suppression costs. Without treatment fires will continue to be a threat. The threat of losing habitat and timber value due to wildfire was not part of this analysis.

BIOMASS ANALYSIS

The need for energy generation and reduction in CO_2 emissions provided the issue to analyze the possibilities of biomass removal in Alternative 3. This was kept separate from the rest of the analysis in order to determine the values and costs of the specific treatments. Biomass treatment is compared with the treatments needed to meet the fuels objectives. Biomass removal would require mechanical harvesting, removal to a landing, processing into chips and hauling the chips to a generation facility and subsoiling 15 units for a total of 73 acres (Deadlog Soils Report). Depending on the amount of material removed from the site, there may or may not be a need to further treat the fuels following treatment. The assumption in this analysis is that there is no further treatment of activity fuels. Both the biomass removal and fuels treatment would treat current natural fuels following thinning. At this time the nearest facility that utilizes biomass is Warm Springs. Prineville is not as far but a facility has not yet been built. LaPine is presently assessing the feasibility of a biomass facility.

Economic efficiency analysis for the removal of Biomass used the following assumptions:
- average diameter removed 7 inches dbh, ponderosa pine only removed,
- 303 trees per acre removed,
- 2.9 cubic feet of material per tree (Delany, 2007)
- 1 CCF is equivalent to 1.5 Bone Dry Tons (BDT) (Delany, 2007),
- electricity generation should be equivalent to 1BDT = 1 mega watt hour (mWh),
- electricity avoidance cost (peak) is $0.048/kilowatt hour (kWh)(Bilek, 2005).
- Total electricity potential generation is 17,412 mWh (11,608 CCF * 1.5 BDT/CCF * 1 mWh/BDT).
- Averaging the subsoiling cost of $210 on 73 acres over the whole of the biomass removal was rounded to $12 per acre.

Table 75: Biomass removal and Fuels treatment cost Comparison

Biomass Removal	Cost per Hundred Cubic Feet (CCF)	Total CCF	Cost per Acre	Total Cost per Acre
Stump to Truck Process	$61.57	11,608	$541.00	$541.00
Sub Soiling	N/A	N/A	$12.00	$12.00
Site to Prineville	$552.00	N/A	$125.00	$677.00
Site to Warm Springs	$18.48	N/A	$162.00	$715.00
Fuels Treatments				
Precommercial thinning	N/A	N/A	$175.00	$175.00
Hand Piling & Burning	N/A	N/A	$552.00	$552.00
Total Fuels Treatment	N/A	N/A	$727.00	$727.00

Table 76: Biomass to Electricity Computation.

Biomass Removal	Cost per Thousand Cubic Feet	Total CCF	Cost per Acre	Total Acres	Total BDT & mWh	Total Biomass removal Cost	Avoided Cost of Electricity @ $.048/kWh
Site to Warm Springs	$80.05	11,608	$715.00	1,321	17,412	$928,663.00	$835,776.00
Site to Prineville	$75.83	11,608	$677.00	1,321	17,412	$879,786.00	$835,776.00

This analysis shows that the cost of fuels treatments may be more than the cost to deliver chips to Warm Springs or Prineville. Equipment operations are efficient with the removal of biomass since the move in costs is shared with the logging operation. The biomass costs were calculated for stands with no timber removed. Estimates for the total amount of biomass removed are low since the calculations do not include the needles and branches. Branches and needles would nearly double the volume removed. The largest difference between fuels treatments and biomass removal tends to be in the method of fuels consumption. Piles burnt in fuels treatments would not have emission limitations. The consumption in an energy generation plant would have higher temperatures and fewer emissions. In biomass conversion, electricity is produced where with fuels only treatments only the removal of fuels is accomplished. The value of electricity is provided to show the available opportunity. The comparison of Biomass removal to the value of electricity in Table 76 does not estimate the actual cost of producing electricity at a plant just the value of electricity from the Public Utility Regulatory Policies Act of 1978.

CABLE LOGGING ANALYSIS

The economic efficiency of removing the timber on slopes greater than 30 per cent slope with cable logging was included in the overall comparison of alternatives. Here it will be separated out to identify the cost and benefit.

Alternative 2 proposes commercial thinning to reduce stand density and fuels on 420 acres with slopes greater than 30%. Cable system equipment that is currently available is in the Willamette Valley. Costs would be incurred to move in, set up and hand fall the timber. Ground based logging systems are locally available. The differences in the overall costs of cutting and removing timber would increase with cable logging. The calculated cost, “Stump to Truck” cost, for the cable system is $151.30 per CCF while the stump to truck cost of ground based systems is $88.23. The issue, at this time, is the low value of timber in slow economic times. The ponderosa pine index timber value averaged on the Deschutes is $180.00 per CCF, with the value reported from local mills at $117.00 per CCF (Vickie Dunaway, 2009, personal communication). Transportation to the nearest mill from the project area is would cost at least $29.00 per CCF. To log and transport timber using a cable system would cost more than the timber is worth. This is without adding in more costs incurred by the logger which include required road maintenance, brush disposal, temporary road construction and removal. Total costs for logging using a cable system is estimated at approximately $200.00 per CCF.

A large part of being effective in the Deadlog project is to remove large amounts of timber to reduce overall stand density on a landscape level, including on slopes over 30 %. Because of costs associated with cable logging, cable logging would reduce the overall viability of finishing the projects. Decreasing the profitability for or the number of logging entities that would provide bids to those with the equipment could possibly make the project infeasible for commercial removal of large wood fiber.

CIVIL RIGHTS AND ENVIRONMENTAL JUSTICE

Civil Rights legislation and Executive Order 12898 (Environmental Justice) direct an analysis of the proposed alternatives as they relate to specific subsets of the American population. The subsets of the general population include ethnic minorities, disabled people, and low-income groups.

Environmental Justice is defined as the pursuit of equal justice and protection under the law for all environmental statutes and regulations, without discrimination based on race, ethnicity, or socioeconomic status. Minority and low-income populations groups, living in counties that surround the project area, work in diverse occupations. Some minorities, low-income residents, and Native Americans may rely on forest products or related forest activities for their livelihood. This is especially true for those individuals that most likely reside in the rural communities adjacent to National Forest Lands.

Alternative 1 (No Action)

Direct and Indirect Effects**:** This alternative would not provide jobs that would improve the local economic situation as described under the heading “Economic Efficiency Analysis.” In the event of a large scale wildfire, local firefighting groups could be employed for suppression and post-suppression activities.

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

Direct and Indirect Effects**:** There would be no discernable impacts among the alternative in the effects on Native Americans, women, other minorities, or the Civil Rights of any American citizen.

Opportunities for employment of minority and low-income workers may occur through the various activities, such as thinning and hand piling of small diameter material. The action alternatives developed for this project have the potential to bring in workers from the outside to perform thinning and related activities.

The primary services needed by the workers would be food and shelter. Local businesses that can supply food (grocery stores and restaurants) and other services would capture the majority of the financial output of the workers in the area. It is not likely that businesses would need to increase their employment, either by temporarily adding employees, or giving present employees more hours.

Resources gathered for subsistence or of cultural importance, such as edible plants or animals, or materials for shelter, are not likely affected by any federal action proposed within the fire area. Road decommissioning would reduce the opportunity for motorized access for traditional hunting and camping opportunities. Even though areas that have been used for dispersed camping along proposed road closures and decommissioning would no longer be utilized, many areas would continue to be accessible.

The Proposed Action does not appear to have a disproportionately high or adverse effect on minority or low-income populations. Scoping did not reveal any issues or concerns associated with the principles of Environmental Justice. No mitigation measures to offset or improve adverse affects to these populations have been identified. All interested and affected parties will continue to be involved with the public involvement and decision process.

OTHER DISCLOSURES

SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA requires consideration of the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Maintaining the productivity of the land is a complex, long-term objective. The action alternatives meet the purpose and need to protect the long-term objective of the project area through the use of specific Forest plan Standards and Guidelines, mitigation measures, and BMPs. Long-term productivity could change as a result of the various management activities proposed in the alternatives. Timber management activities would have a direct, indirect, and cumulative effect on the economic, social, and biological environment. Those effects are disclosed in Chapter 3 of this analysis.

Soil is a key factor in ecosystem productivity. This resource would be protected in Alternative 2 and Alternative 3 to avoid damage that could take many decades to rectify. Sustained growth of trees, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Long-term productivity would not be impaired by the application of short-term management practices. The action alternatives would improve soil productivity in specific areas where soil restoration treatments (subsoiling) are implemented on soils committed to roads and logging facilities.

All alternatives would provide wildlife habitat that is necessary to contribute to the maintenance of viable, well-distributed populations of existing native and non-native vertebrate species. The abundance and diversity of wildlife species depends on the quality, quantity, and distribution of habitat, whether for breeding, feeding, or resting. Management Indicator Species are used to represent the habitat requirements of all fish and wildlife species found within the project area. By managing habitat of indicator species, the other species associated with the same habitat would also benefit.

The no action alternative would likely continue to provide slower tree growth rates, affecting the long-term productivity, for both resources, such as wildlife, and economics, of timber resources. The action alternatives would likely provide an environment that would protect trees and enhance associated growth rates, attaining late and old structure more quickly and providing structural diversity for wildlife. Although the length of time and success rates could vary and be dependent upon natural processes, trees would be regenerated to provide more desirable wildlife habitat.

UNAVOIDABLE ADVERSE EFFECTS

Several expected adverse effects, including some that are minimal and/or short term, were identified during the analysis. Resource protection measures were identified and considered for each of these as a means to lessen or eliminate such effects on specific resources. Refer to Resource Protection Measures in Chapter 2. Resources that have been determined to have potential adverse effects (resulting from any of the alternatives) are documented within the appropriate Environmental Consequences sections of each resource in Chapter 3.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of "... any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. No significant irreversible or irretrievable commitment of resources would occur under Alternative 2 (Proposed Action) or Alternative 3.

- **Irreversible:** Those resources that have been lost forever, such as the extinction of a species or the removal of mined ore. The proposed activities would result in a commitment of rock for road reconstruction from local rock pits.

The action alternatives are not expected to create any impacts that would cause irreversible damage to soil productivity. There is low risk for mechanical disturbances to cause soil mass failures (landslides) due to the inherent stability of dominant landtypes and the lack of seasonally wet soils on steep slopes. Careful planning and the application of Best Management Practices and project design elements would be used to prevent irreversible losses of the soil resource.

- **Irretrievable:** Those resources that are lost for a period of time, such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

The proposed activities would result in few direct and indirect commitments of resources; these would be related primarily to thinning operations. A temporary, short-term loss of the shrub component would also be lost

There would be an irretrievable loss of firm wood fiber over the long-term under Alternative 1 (No Action), as existing dead lodgepole pine deteriorates in value and is unable to be utilized for commercial firm wood fiber.

The development and use of temporary roads and logging facilities is considered an irretrievable loss of soil productivity until their functions have been served and disturbed sites are returned back to a productive capacity. Both action alternatives include soil restoration activities (subsoiling) that would improve the hydrologic function and productivity on detrimentally disturbed soils. There would be no irretrievable losses of soil productivity associated with these reclamation treatments.

PRIME FARMLANDS, RANGELANDS, FORESTLANDS

The Secretary of Agriculture issued memorandum 1827 which is intended to protect prime farm lands and rangelands. The project area does not contain any prime farmlands or rangelands. Prime forestland is not applicable to lands within the National Forest System. National Forest System lands would be managed with consideration of the impacts on adjacent private lands. Prime forestlands on adjacent private lands would benefit indirectly from a decreased risk of impacts from wildfire. There would be no direct, indirect, or cumulative adverse effects to these resources and thus are in compliance with the Farmland Protection Act and Departmental Regulation 9500-3, "Land Use Policy".

HUMAN HEALTH AND SAFETY

No significant adverse effects to public health or safety have been identified. The effects of implementation of the alternatives are well known, not highly controversial, and do not involve any unique or unknown risks. Although State air quality standards would be met or exceeded, some risk remains for forest workers.

An elevated wildfire risk would remain a concern along public escape routes. Fine airborne particulate matter could increase the incidence of respiratory problems during wildfires. Proposed activities would improve human health and safety by: 1) the reduction of the risk of entrapment from wildfire and 2) the reduction of the risk of increased airborne particulates from wildfire (refer to Fire and Fuels discussion).

EXECUTIVE ORDERS 11988 (FLOODPLAIN MANAGEMENT) AND 11990 (PROTECTION OF WETLANDS)

Executive Orders 11988 and 11990 direct Federal agencies to avoid, to the extent possible, both short-term and long-term adverse impacts associated with the modifications of floodplains and wetlands. All alternatives have no specific actions that adversely affect wetlands and floodplains. Proposed activities are compliant with the orders and USDA Departmental Regulation 9500-3. There are no floodplains or wetlands within the project area. Refer to discussions related to this topic in the soils, fisheries, and hydrology resource sections in Chapter 3 for more information.

COMPATIBILITY WITH STATE AND LOCAL LAWS

Implementation of all alternatives would be consistent with State and local laws, land use, and environmental policies. Action alternatives follow State of Oregon requirements in accordance with the Clean Water Act for protection of waters. There are no lakes or perennial streams within the project area. The nearest body of water is East Lake within the Newberry National Volcanic Monument, approximately 15 miles to the northwest of the project area.

INVENTORIED ROADLESS AREAS AND WILDERNESS

The project area does not contain any Inventoried Roadless Areas or Wilderness. Activities would not directly or indirectly affect any of the resources or values of those areas. The nearest IRA is in the Newberry National Volcanic Monument, the North and South Paulina IRA, approximately 13 miles to the Northwest of the project area.

FOREST PLAN AMENDMENT

INTRODUCTION

The purpose and need of this project is to: restore or maintain fire-dependent ecosystems and maintain the forest in a healthy condition. Treatments would promote and sustain late and old structured forest stands, reduce susceptibility to bark beetles and dwarf mistletoe infestation, and reduce fuel loading. Alternative 2 (Proposed Action) would involve active management on approximately 10,752 acres and Alternative 3 on approximately 11,281 acres. Activities would include thinning, mechanical shrub treatment (MST – shrub mowing), slash piling, and underburning.

PROPOSED AMENDMENT AND RATIONALE

This proposed non-significant Forest Plan Amendment would waive Standard and Guide WL-54, which requires that 30 percent of the National Forest System land within summer range of big game within each Implementation Unit (IU) be in hiding cover. Generally, this would result in 70 percent of each implementation unit existing either as a hiding area or within 600 feet of a hiding area. The calculation of cover excludes 50-80 year old ponderosa pine (aka black-bark pine) within each implementation unit as well as Deer Habitat (MA-7), which is addressed with a different standard and guideline.

Preliminary analysis determined that the cover standard WL-54 would not be met within the implementation units (Table 77) because the three implementation units currently do not meet big game hiding cover standards. The proposed thinning and underburning would further reduce the hiding cover ratio. Thinning would target densely stocked stands that, as expected, provide the hiding cover. The existing proportion of hiding cover within the Deadlog planning area is approximately 11 percent. Some mitigation through managing open road density and retaining 10 percent of units untreated is also proposed in the EIS.

Table 77: Deadlog Implementation Unit (IU) Hiding Cover Assessment outside of Black-bark Pine, Deer Habitat (MA-7), and Non-National Forest Service Land

Implementation Unit	Analysis Area Acres	Hiding Cover Acres within Analysis Area	% Cover within Analysis Area
IU #62	10,602	1,920	18%
IU #63	6,919	759	10%
IU #69	3,037	425	13%

Related Standards and Guidelines: The open road density for the implementation units and the project area is above the objective of 2.5 miles per square mile. However, an amendment of the WL-53 is not requested because a further analysis (as described in WL-53 and TS-14) will show that LRMP wildlife objectives will be met for the project when considering: the existing green dot system; proposed road closures to mitigate opening the forest through thinning; and thinning will not change amount of stage 6 LOS. Also, the project area includes a very small piece of MA-7 (Deer Habitat) where cover is to be provided at 40 percent of the Management Area. Because there will be no harvest of trees within this Management Area under the Deadlog project, and it is a small fraction of the larger management area, there will be no effect to cover and no LRMP amendment is being requested.

SIGNIFICANCE

It is assumed that the proposed change in big game hiding cover will not significantly change the forest-wide impacts disclosed in the Deschutes National Forest Plan Environmental Impact Statement. FSM 1926.51 describes non-significant amendments as:

1. Actions that do not significantly alter the multiple-use goals and objectives for long-term land and resource management;
2. Adjustments of management area boundaries or management prescriptions resulting from further on-site analysis when the adjustments do not cause significant changes in the multiple-use goals and objectives for long-term land and resource management;
3. Minor changes in standards and guidelines; and/or
4. Opportunities for additional projects or activities that would contribute to achievement of the management prescriptions.

The Forest Plan's goals and objectives for the applicable Management Areas for this area are:

- The goal for General Forest (MA-8) is to emphasize timber production while providing forage production, visual quality, wildlife habitat, and recreational opportunities for public use and enjoyment. The amendment would not have an impact on this goal and it does provide for activities that contribute to meeting the General Forest objectives including controlling stocking levels; maintaining satisfactory growth rates; protecting stands from insects, disease, and damage.
- The goal for Scenic Views (MA-9) is to provide Forest visitors with high quality scenery that represents that natural character of Central Oregon. The proposed amendment would not have any impact to the goals or objectives of Scenic Views.
- The goal for Old Growth (MA-15) is to provide naturally evolved old growth forest ecosystems and the case of the Deadlog area, for old-growth ponderosa pine. The amendment would allow activities to proceed in the OGMA that help to achieve these objectives. For example, thinning in structure stage 5 (dense multi-layer stands) will start over 3,000 acres towards structure stage 7 (single-story with large trees).

The proposed amendment would allow thinning and burning activities that would promote restoration and maintenance of this dry ponderosa pine fire-dependent ecosystem. This would allow the area to be more sustainable, resilient, and resistant to wide spread wildfire and beetle infestation. The EIS will show beneficial effects for other species that depend more on open habitats and large ponderosa pine trees associated with frequent, low-intensity fire, such as white-headed woodpecker.

Because this amendment does not significantly alter goals and objectives, is a minor change in a standard considering the size of the landscape, and provides an opportunity for contributing to achievement of the long-term goals and objectives, it meets the definition of a non-significant amendment.

LONG-TERM CLIMATE CHANGES

Existing Condition

Although El Niño/Southern Oscillation and the Pacific Decadal Oscillation comprise the primary factors for climate variability in the Pacific Northwest (Climate Impacts Group 2006[1]), the influence from global climate change is a growing concern. According to the Climate Impacts Group, based out of the University of Washington, climate modeling for the Pacific Northwest predicts a future rate of warming of approximately 0.5 degrees Fahrenheit per decade for the Pacific Northwest through at least 2050, relative to the 1970-1999 average temperature. Temperatures are projected to increase across all seasons, although most models project the largest temperature increases in summer (June-August), and the average temperatures could increase beyond the year-to-year variability observed in the Pacific Northwest during the 20th century as early as the 2020s.

Direct and Indirect Effects:

This project is designed with the intent of keeping portions of all of the current species and structures on this landscape. Whether and how increasing temperatures resulting from global climate change would alter predicted forest response to the proposed commercial thinning under any of the action alternatives would depend on specific site conditions in relation to temperature and soil moisture availability on tree growth. If temperature were to increase while precipitation changes minimally, as predicted by the Climate Impacts Group, tree evapotransporation would increase nonlinearly, leading to more frequent drought stress (Climate Impacts Group 2004). A moderate density commercial thinning could decrease competition for water during the summer while limiting additional evaporation from the soil and transpiration from the understory in the summer. Such thinning could also maximize the duration of snowpack in spring by having an open enough canopy that more snow accumulates in the ground rather than on the forest canopy, yet, is still shaded from melting by the sun in the spring. The resulting increased available moisture, in turn, could reduce the risk of dead or drought-stressed trees created by increasing temperatures and changes in precipitation caused by climate change and that would be susceptible to fire and disease in the near-term. Late-successional and old-growth forests are generally thought to be more resilient to climate change. This project would not reduce stands classified as LOS or designated as Old Growth. Further, prescriptions are designed in a way that would promote these conditions and, if not increase, would be neutral to forest habitat connectivity, allowing species to reach new locations as climate change alters existing habitat (Climate Action Group 2004a).

The range of species within the analysis area over the past few hundred years appears to have been similar to today, based on the variety of species of the older trees. While there is much discussion among scientists about global climate change, the reality for management of existing forests is that they are a result of the past and present climatic influences (Shugart, et al, 2003). The current climate limits what can be done with forest trees at this point in time. To be able to respond to the influences of global climate changes, it is best to maintain the full range of native species now present on this

[1] Intergovernmental Panel on Climate Change (IPCC). Their reports (2007) provide the authoritative scientific basis for subsequent Forest Service analysis of the phenomenon. Information specific to the Forest Service can be found in the latest Synthesis and Assessment Product 4.4.1

analysis area. Regardless of the climatic changes, a full suite of species remaining on the analysis area ensures adaptability for a wide range of climatic conditions.

Shugart et al (2003) state that the ecological responses to climate change is extremely complicated and understanding how ecological systems will respond to climate change remains a challenge. Hence, we do not know the direction, effects, and magnitude of the climatic changes of the future as they pertain to this analysis area, and establishing species adapted to a climate differing from the present would be potentially very costly in time and resources. Therefore, the most prudent approach in the context of this project would appear to be to “keep all of the pieces” (Leopold, 1949).

Since the proposed management actions in this project would leave the treated stands fully stocked after implementation (fully capable of utilizing the available moisture, nutrients, and growing space on the treated sites), vegetation would continue normal respiration processes and effects to atmospheric CO_2 levels would be expected to be inestimable on a regional, national, or global scale.

LITERATURE CONSIDERED FROM SCOPING COMMENTS

During scoping, commenters suggested that the following references be reviewed and utilized during analysis. Following is a discussion that briefly summarizes the reference content and a brief discussion explaining why the reference was not further considered for use in the analysis.

- **Reed F Noss, Jerry F Franklin, William L. Baker, Tania Schoennagel, and Peter B Moyle. 2006. Managing fire-prone forests in the western United States. (Frontiers in Ecology) Front Ecol Environ 2006; 4(9): 481-487**

This is a general overview of managing fire landscapes, fire and post fire activities and ecological processes. This paper reviews other papers dealing with restoration of forests in western wildlands. For dry western forests which originally had frequent fire this paper recommends restoring this condition and process where alterations in ecosystem structure, function or composition have deviated. This restoration would allow fire and other processes to play characteristic roles.

The Deadlog project did not use this paper because of its general approach to management but the general ideas are used. Restoring open stands where they once were and reintroducing fire so wildfire can resume its original role.

- **Talbert & Marshall. 2005 Plantation Productivity in the Douglas-fir Region Under Intensive Silvicultural Practices: Results from Research and Operations. Journal of Forestry. March 2005. PP 65-70**

This paper synthesizes research in productivity and economic comparisons of the west coast Douglas-fir region to the other wood producing countries. The growth study referenced in the article compared different thinning regimes and densities to identify if differences in volume production in Douglas-fir plantations would occur with different densities. It found that thinning can reduce the overall volume production of Douglas-fir sites. Suppression induced mortality was not more than the gross volume loss from thinning. The overall basis of the Talbert and Marshall paper is that to be competitive in the wood fiber world market, the west coast Douglas-fir growers need to improve on site productivity through intensive management though with reduced costs and improved product.

This paper was not used due to the fact that it was a west side plantation thinning exercise in coastal Douglas-fir plantations. The thinning regimes were a test of growth and volume estimations for different thinning densities and to identify weather volume would be the same in all thinnings which left stands stocked. The Deadlog project is in low precipitation areas where competition or suppression mortality is not the loss expected. Losses expected are due to density and insect interactions and potential wild fire impacts due to an increase in fuel loading. Timber volume production in plantations in Deadlog may be a concern however survival of plantations from drought induced stress and insect mortality is a larger issue. Moving stands towards large diameter condition which will benefit wildlife and be more resistant to fire mortality are the larger goals.

- **Noss, Reed: The Ecological Effects of roads:**

This paper chronicles the effects of all road types. The information is gleaned from numerous reports ranging across many different habitats and types of fauna. For effects on animal habitats, references range from African Elephants, Mohave rodents, and wolf responses to roads. The areas include Florida, Africa, Michigan and many more states. Road types causing effects include a variety of roads, including interstate highways through dirt roads. The mitigations presented are focused mostly on highways though they include roads found on public land. On public lands closing roads are recommended especially for temporary roads and landings used for timber sales. Seasonal restrictions were also identified as a method desired to reduce road disturbance if road closures could not occur.

This paper makes recommendations in road use and closure. This is similar to processes in place with management activities with temporary roads and landings being subsoiled and roads which are excess to management needs being closed.

- **www.sciencedaily.com/releases/2001/10/011030230203.htm**

This is a general overview of insects and effects in western forests stands. The implication is the condition of stands is the problem. Insects are just taking advantage of stands that are in a stressed condition and the insect outbreaks may actually be moving stands to a more sustainable condition.

This reference was not used because of its general approach to insect outbreaks and tree mortality. However indications that insect outbreaks and risk of stand loss is mostly due to stand condition is realized in the Deadlog project. The treatments in Deadlog try to indirectly affect insect impacts through stand management and not by trying to control insects directly.

- **Insect Ecology – An Ecosystem Approach. ed Timothy Schowalter Academic Press. 2000**

This is a textbook on insect ecology and forest management. Highlighted for the application here is the effects of current forest practices and the impacts of insects populations. Generally dense stands which were historically open with fire as the main mortality agent are now having insect mortality as the main agent. This is due to stocking levels which favor bark beetle success in colonizing trees and causing mortality.

This book was not used though the general ideas are used in the design of the Deadlog project design. This is removing less adapted trees of dry sites (lodgepole pine a) and reducing density of stands which were historically lower stocked density of intolerant tree species (ponderosa pine)

- **Schowalter TD, Jay Withgott, 2001, Rethinking Insects: What would an ecosystem approach look like?. 2001 Conservation Biology in Practice 2(4): 11-16**

This paper is a generalized approach to insect interactions in forests. The main emphasis is the premise that past management has set up insect outbreaks and impacts. It does also generalize the ecosystem services insects provide. The main emphasis the paper brings forward in more than one place is the identification of native insects and outbreaks as not a problem in itself but a problem with the management or stand condition on the landscape.

This paper was not used because of its generalities and their being more specific papers on the influence and stand conditions which mountain and western pine beetle form outbreaks. However the ideas from this paper are relevant in the sense that dense stands were not historically common in the ponderosa pine types and are currently in need of management to make them less susceptible to beetle outbreaks.

- **Tiedemann, A.R., J.O.Klemmedson, Evelyn L. Bull, Solution of forest health problems with prescribed Fire: Are forest productivity and wildlife at risk?, Forest Ecology and Management 127 (2000) 1 = 183**

This paper is an overview of the concerns using prescribed fire as a tool to over large landscapes in the Blue Mountains. The main focus is the conversion of current stands dominated by grand and Douglas fir to ponderosa pine. Three threads are dealt with in this paper. One is whether or not the conversion is the right thing to do. Another is the effect of burning with short intervals on site productivity and the third is the effects of the change and fire on wildlife.

This paper was not used since it s focused on conversion of areas which were ponderosa pine dominated in the past but are not currently. The Deadlog Project is not converting stands just enhancing the ponderosa pine present. However many of the concerns presented in the paper are considered in the Deadlog project including burning when duff moisture will not be totally consumed (spring burning), burning with techniques to maintain snags and large down wood and using identified burning intervals specific to the area. Other recommendations including using mechanical methods for reducing fuels is preferred. This is used in the Deadlog project in many stands though not all. .

- **Spies, T.A. 2006. Maintaining old-growth forests. In: Haynes, R.W.; Borman, B.T.; Lee, D.C; Martin, J.R., tech. eds. 2006. Northwest Forest Plan – the first 10 years (1994-2003): synthesis of monitoring and research results. USDA Forest Service Gen. Tech. Rep. PNW-GTR-651. 292 p.**

Spies addresses in this chapter of the synthesis the following questions regarding old-growth forests: 1) what was expected, 2) what are the status and trends and what differences were found between expectations and observations from effectiveness monitoring, and 3) are the plan's assumptions and approaches still valid.

The chapter includes a section addressing the role of silviculture in restoring ecological diversity and accelerating old-growth development in plantations. According to Spies, "results thus far show that thinning plantations is important to restoring structural and compositional diversity on federal lands." He indicates the goals of thinning include diversifying young stands now and accelerating the development of old-growth characteristics in the future. He states it's believed that thinning for biodiversity goals should seek to promote spatial heterogeneity in stands, rather than uniform spacing and density. He states caution needs to be exercised in applying the same spatial pattern of thinning in all areas and at all spatial scales, since scientific research on this practice is only in the early stages.

Spies states the effects of thinning on development of old-growth characteristics in plantations are only partially understood. It is recognized growth of trees into larger diameter classes will increase as stand density declines. If thinning is too heavy, however, it could effect development of old-growth characteristics by: 1) reducing the number of larger trees later in succession to levels lower than what is observed in current old-growth stands, 2) creating a dense layer of regeneration, and 3) reducing the potential for future snag recruitment. Spies states "thinning should allow for future mortality in the canopy trees."

One of the assumptions and approaches evaluated in this chapter was the treatment of the matrix for both ecological values and commodity production. Spies states the ecological value of leaving large live trees as individuals and groups as a way of supporting older forest species in areas managed for timber production has been supported by habitat studies of individual species. Spies states "no new scientific evidence has emerged that the standards and guidelines for the matrix, which allowed cutting of old trees, would not meet the ecological and viability goals of the Plan."

Consideration: This paper was not used, though it validates the purpose and need for the project and promotes treatments similar to those proposed with the action alternatives. This paper adds no additional concepts to consider in designing fuel treatments outside of late-successional reserves.

While the paper suggests thinning in plantations should allow for future mortality in canopy trees, it offers no specific density levels appropriate for local site conditions. This paper covers the area within the Northwest Forest Plan boundary, located approximately 30 miles to the west of the project area.

- **Curtis, Robert O, David Marshall, John Bell. 1997, Logs: a pioneering Examples of Silvicultural Research in Coastal Douglas-fir. Journal of Forestry 95(7):19-25**

This paper is relates intensive management techniques in high productivity stands in coastal Douglas fir. The study compared stand volume net and gross from different thinning regimes. The thinning levels varied but were conducted intensively following every ten feet of growth. The comment mentioned in scoping about thinning and bonus volume has to do with thinning at a point where waiting for volume to accumulate is not capturing more volume than what would be lost to suppression based mortality. The volume measured was the total stand level of volume not board foot volume.

This paper was not used due to the fact that it was a west side plantation thinning exercise in coastal Douglas-fir plantations. The thinning regimes were a test of growth and volume estimations for different thinning densities and to identify weather volume would be the same in all thinnings which left stands stocked. The Deadlog project is in low precipitation areas where competition or suppression mortality is not the loss expected. Losses expected are due to density and insect interactions. Timber volume production in plantations in Deadlog may be a concern however survival of plantations from drought induced stress and insect mortality is a larger issue. Moving stands towards large diameter condition which will benefit wildlife and be more resistant to fire mortality are the larger goals.

CHAPTER 4

CONSULTATION AND COORDINATION

CHAPTER 4 - CONSULTATION AND COORDINATION

PUBLIC NOTIFICATION

Initial Scoping

Ms. Susan Jane Brown
Mr. Josh Laughlin - Cascadia Wildlands Project
Ms. Karen Coulter - Blue Mountains Biodiversity Project
Ms. Chandra LaGue - Oregon Wild
Mr. Tim Lillebo - Oregon Wild
Ms. Marilyn Miller - Sierra Club - Juniper Group
Mr. Scott Silver - Wild Wilderness
Ms. Libby Johnson - Bonneville Power Administration
Mr. Ken Wienke - Boise Cascade
Mr. John Morgan - Ochoco Lumber
Mr. Flip Houston - Scott Logging Inc.
Ms. Kate Ramsayer - The Bulletin
Mr. Pat Schatz - Mickey Finn Guide Service
Mr. Craig Vaage - Bigfoot Guide Service
Mr. David Nissen - Wanderlust Tours
Mr. Jerry Reid - Emerald Trail Riders Association
Mr. Tom Street - Tom's World of Wheels
Mr. Ed Duffy - Deschutes County 4-Wheelers
Mr. Rick Bozarth - Bozarth's Offroad Service Specialties
Ms. Joani Dufourd - RecConnect LLC
Ms. Joni Mogstad - Blue Ribbon Coalition
Ms. Peggy Spieger - Oregon State Snowmobile Association
Mr. Mark Dunaway - Pine Mountain Observatory
Mr. Darwin Thurston - Midstate Electric Cooperative, Inc.
Mr. James Reeves - Century Telephone
Ms. Patti Gentiluomo - Environmental Manager - Sunriver
Mr. Bruce Cunningham - Moon Country Snowmobilers
Ms. Lynne Breese - Eastern Oregon Forest Protection Association
Mr. Dan Kruse - Cascadia Wildlands Project
Mr. David Lexow - Motorcycle Riders Association
Northwest Environmental Defense Center
Sunriver Owners Association - Public Affairs Committee Chair
Mr. Charlie Larson - Oregon Grotto
Mr. Dennis Glasby - Willamette Valley Grotto
Mr. David Lexow
Motorcycle Riders Association
Mr. Steven J. McNulty - Gas Transmission NW Corp.
Dr. Steve Fitzgerald - Oregon State Universtity Extension Service
Alex Robertson - Prineville BLM
Ms. Kathleen Cushman - Bureau of Reclamation
Mr. Glen Ardt - Oregon Department of Fish and Wildlife
Mr. Stuart Otto - Oregon Dept. of Forestry
Ms Letha Sanderson - Oregon Parks and Recreation Department
Mr. Gene Keane - Warm Springs Forest Products

Mr. Dean Adams - Tribal Chairman - Burns Paiute Tribe
Ms. Wanda Johnson - Burns Paiute Tribe
Mr. Amos Firstraised - Burns Paiute Tribe

Mr. Ron Suppah - Tribal Chairman - Confederated Tribes of the Warm Springs
Mr. Clay Penhollow - Confederated Tribes of the Warm Springs
Mr. Robert Brunoe - Confederated Tribes of the Warm Springs
Ms. Sally Bird - Confederated Tribes of the Warm Springs
Mr. Lonny Macy - Confederated Tribes of the Warm Springs
Mr. Scott Turo - Confederated Tribes of the Warm Springs
Ms. Brigette M. Whipple - Confederated Tribes of the Warm Springs

Mr. Allen Foreman . Chairman, Tribal Council - The Klamth Tribes
Mr. Will Hatcher - The Klamath Tribes

Mr. and Mrs. Donald Kerr
Mr. Andrew H. Ulven
Mr. Scott Walley
Mr. Tim Hester
Mr. Don Rooper
Mr. & Mrs. Jon Pyland
Ms. Charla Q. Ranch
Mr. Dean Richardson
Mr. Robert Waer
Mr. Ed Graham
Ms. Patricia Moore
Mr. and Mrs. Ronald Hart
Mr. Keith Cloudas
Mr. Vic Russell
Mr. John Zachem
Mr. Ken Copeland
Mr. and Mrs. Frank Pennock
Mr. and Mrs. John Emerson
Mr. Edward Kerber
Mr. Wes Pyne
Mr. Jim Anderson
Mr. Jim Anderson
Mr. Earl Nichols
Ms. Loren Smith
Mr. Chris Kerber
Mr. Jerry Powell
Mr. Rod Bjorvik
Ms Sandra Swanlund
Ms. Winona Wright
Wildfire
Mr. David Pitts
Mr. & Mrs. Scott O'Neill
Ms. June Ramey
Mr. Mark Davis
Mr. Robert Speik
Mr. E. Clark Matschek
Mr. William Tye
Mr. Irwin Holzman
Mr. & Mrs. Keith Nash
Mr. Stephen Roth
Mr. and Mrs. Kenneth Holmes
Wade Nelson
Dick Nelson
Joanna Nelson
Mr. & Mrs. John Pindar
Ms. Kathryn J. Nachand
David and Janette Roth
Mr. & Mrs. Dennis Krakow
Mr. Ray Hatton
Mr. Leonard Houston
Mr. Arlie Holm
Mr. & Mrs. David Scharfenberg
Mr. Franklin Engel
John Kreuger - Quartz Mountain Grazing Group
Mr. Larry McGlocklin
Mr. C. Norman Winningstad
Mr. Lawrence Huntley
Mr. Scott Odgers
Mr. Paul Hammerquist
John Peila
Mr. Jon Cain
Mr. George Law
Mr. Larry Ulrich
Mr. Billy Toman
Mr. Stan Summers
Mr. Randy J. Zustiak
Mr. Gordon Baker
Mr. Robert Mullong
Dennis Holt
Robert Loveland
Walter Hogan
Mr. Dyarle Sharkey
Kenneth Burbank
Mr. Wade N. Foss

PUBLIC PARTICIPATION

During the initial scoping, a number of comments and questions were received. Responses varied from those who wanted more clarification to specific suggestions for project implementation. Comments were used to help develop the planning issues and an additional action alternative.

Those who responded regarding the proposed action are listed below:

Joanna Nelson
Asante Riverwind, Sierra Club
Elizabeth O'Connell
Perry Chocktoot, Klamath Tribes
Chandra LeGue, Oregon Wild
Theo Mbabaliye, US Environmental Protection Agency

Following scoping, various field trips and meetings were held with the public that had expressed interest in this project during the scoping period. Those that were involved with these activities are listed below:

March 17, 2008 – Meeting with Perry Chocktoot of the Klamath Tribes
June 26, 2008 – Meeting with Amy Waltz of the Fire Learning Network
July 9, 2008 – Field Trip with the Fire Learning Network
September 5, 2008 – Field Trip with Glen Ardt of Oregon Department of Fish and Wildlife
October 24, 2008 – Field Trip with the Fire Learning Network
November 12, 2008 – Attended Fire Learning Network meeting

PREPARERS / INTERDISCIPLINARY TEAM

Steve Bigby

Position:	Bend/Ft. Rock RD, District Roads Manager
Education:	Oregon Institute of Technology
Experience:	20 years professional experience
Contribution:	Roads Analysis

Terry Craig

Position:	Sisters RD, Soils Scientist
Education:	BA, Chemistry and Biology, Chico State University (1985), MS, Soil Science, University of California Davis (2005)
Experience	20 years professional experience
Contribution:	Interdisciplinary Team Leader

Rick Dewey

Position:	Forest Supervisors Office, Botanist
Education:	BS, Zoology, San Diego State University (1969); BS, Natural Resources, Humboldt State University (1975); MA, Biology, Humboldt State University (1979); PhD, Botany, Texas A&M University (1986).
Experience:	20 years professional experience
Contribution:	Botany Analysis

John Erwert

Position:	Bend/Ft. Rock RD, Fuels Specialist
Education:	Technical Fire Management, Colorado State University (2003)
Experience:	30 years professional experience
Contribution:	Fuels Analysis

David Frantz

Position:	Bend/Ft. Rock RD, Environmental Specialist
Education:	BS, Forest Management, Northern Arizona University (1974); MS, Forest Entomology, Northern Arizona University (1988)
Experience:	19 years professional experience
Contribution:	Writer/Editor

Leslie M. Hickerson

Position:	Crescent RD, Archaeologist
Education:	BS, Anthropology, Oregon State University (1976); MA Anthropology, University of Arizona (1989)
Experience:	23 years professional experience
Contribution:	Heritage Project Input for Cultural Resources

Rod Jorgensen

Position:	Bend/Ft. Rock RD, District Soils Scientist
Education:	BS, Soil Science, California State Polytechnic University, Pomona (1977)
Experience:	31 years professional experience
Contribution:	Soils analysis

Jason Loomis

Position:	Bend/Ft. Rock RD, Fuels Specialist
Education:	AAS, Fire Science, Chemeketa Community College, Technical Fire Management, Colorado State University (2006)
Experience:	14 years professional experience
Contribution:	Fuels FLAMAP Analysis

Jim Lowrie

Position:	Bend/Ft. Rock RD, Wildlife Biologist, District Program Lead
Education:	BS, Wildlife Science, Oregon State University (1975).
Experience:	31 years professional experience
Contribution:	Wildlife analysis

Janine McFarland

Position:	Bend/Ft. Rock RD, Archaeologist, District Program Lead
Education:	BA, Anthropology, Oregon State University (1984); MA, Interdisciplinary Studies (Anthropology, History, Geography), Oregon State University, (1989)
Experience:	24 years professional experience
Contribution:	Heritage Project Input for Cultural Resources

Les Moscoso

Position:	Bend/Ft. Rock RD, Recreation Specialist
Education:	BS, Outdoor Recreation management, Colorado State University (1988)
Experience:	18 years professional experience
Contribution:	Recreation analysis

Beth Peer

Position:	Bend/Ft. Rock RD, NEPA Coordinator
Education:	BS, Anthropology, University of Oregon (1990)
Experience:	18 years professional experience
Contribution:	NEPA oversight

Peter V. Powers

Position:	Bend/Ft. Rock RD, Silviculture Forester
Education:	BS, Forestry, Washington State University (1979)
Experience:	22 years professional experience
Contribution:	Vegetation (Trees) analysis

Don Sargent

Position:	Bend/Ft. Rock RD, Range Technician, District Program Manager
Education:	BS, Forest Resource Management, Humboldt State University (1980)
Experience:	16 years professional experience
Contribution:	Range analysis

Aaron Smith

Position:	Forest Supervisors Office, Plant Pathology
Education:	BS, Biology, University of Oregon (2003); MS, Plant Pathology, Oregon State University (2007)
Experience:	3 years professional experience
Contribution:	Tree disease analysis

GLOSSARY OF TERMS

- A -

ACCESS – Usually refers to a road or trail route over which a public agency claims a right-of-way for public use; a way of approach.

ACTIVITY – An action, measure or treatment undertaken that directly or indirectly produces, enhances, or maintains forest and rangeland outputs, or achieves administrative or environmental quality objectives. An activity can generate multiple outputs.

ACTIVITY FUELS – Fuels generated or altered by a management activity.

ADMINISTRATIVE UNIT – An area under the administration of one line officer, such as a District Ranger, Forest Supervisor, or Regional Forester.

ADMINISTRATIVE RECORD – The official project record file.

AFFECTED ENVIRONMENT – The natural and physical environment and the relationship of people to that environment that will or may be changed by proposed actions.

AGE CLASS -An interval, usually 10 to 20 years, into which the age ranges of vegetation are divided for classification or use.

AIRSHED - A geographic area that, because of topography, meteorology, and climate, shares the same air.

ALLOCATION - See Land Use allocation or Resource allocation.

ALLOTMENT - See Range allotment.

ALL TERRAIN VEHICLE (ATV) – A vehicle characterized by its ability to negotiate most kinds of terrain, by virtue of traction devices such as wide tracks, large, low-pressure rubber tires and/or four-wheel drive.

ALTERNATIVE – One of several policies, plans, or projects proposed for decision-making.

AMENITY – An object, feature, quality, or experience that gives pleasure or is pleasing to the mind or senses. The terms “amenity values” or “amenity resources” are typically used in land management planning to describe those resources for which monetary values are not or cannot be established (such as clean air and water, or scenic quality).

ANALYSIS AREA – The basic land unit of analysis that is used to allocate and schedule management prescriptions.

ARTERIAL ROAD - Primary traffic route serving a large area and providing travel efficiency for many activities. Arterial roads are non-project roads, usually built with Agency funds.

ARTIFACT - An object made or modified by humans.

- B -

BARK BEETLE – An insect that bores through the bark of forest trees to eat the inner bark and lay its eggs.

BASAL AREA - The area of the cross-section of a tree stem near the base, generally at breast height and inclusive of bark.

BENEFIT - The value of the expected outputs.

BEST MANAGEMENT PRACTICES (BMP) - A practice or combination of practices that is the most effective and practical means (including technological, economic, and institutional considerations) of preventing or reducing negative environmental impacts that may result from resource management activities. For example, Best Management Practices are used to reduce the amount of pollution generated by non-point sources to a level compatible with water quality goals.

BIG GAME - Large mammals hunted for sport. On the Deschutes National Forest these include animals such as deer and elk.

BIG GAME SUMMER RANGE - A range, usually at higher elevation, used by deer and elk during the summer. Summer ranges are usually much more extensive than winter ranges.

BIG GAME WINTER RANGE - A range, usually at lower elevation, used by migratory deer and elk during the winter months; usually more clearly defined and smaller than summer ranges.

BIOLOGICAL DIVERSITY – The number and abundance of species found within a common environment. This includes the variety of genes, species, ecosystems, and the ecological processes that connect everything in a common environment. The variety of life and its processes within communities and ecosystems.

BIOLOGICAL EVALUATION (BE) – Describes and displays the effects to Proposed, Endangered, Threatened, and Sensitive (PETS) flora and fauna species.

BOARD FOOT (BF) - The amount of wood equivalent to a piece of wood one foot by one foot by one inch thick.

BROWSE - Twigs, leaves, and young shoots of trees and shrubs on which animals feed; in particular, those shrubs that are used by big game animals for food.

BUREAU OF LAND MANAGEMENT (BLM) - An agency within the Department of the Interior, with land management responsibility for the Public Domain lands.

- C -

CABLE LOGGING – Refers to methods used to skid or pull logs to a central landing or collection area by a cable connected to a remote power source.

CANOPY – The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

CANOPY CLOSURE – The progressive reduction of space between crowns as they spread laterally, increasing canopy cover.

CANOPY COVER – The percentage of a fixed area covered by crowns of plants delimited by a vertical projection of the outermost perimeter of the spread of the foliage.

CAVITY - The hollow excavated in trees by birds or other natural phenomena, used for roosting and reproduction by many birds and mammals.

CHARACTERISTIC LANDSCAPE - In reference to the U.S.D.A. Forest Service visual management system; the overall impression created by a landscape's unique combination of visual features (land, vegetation, water, structures), as seen in terms of form, line, color, and texture; synonymous with "visual landscape character."

CLOSURE - An administrative order restricting either location, timing, or type of use in a specific area.

COARSE WOODY MATERIAL (CWM) – Dead and down material greater than 10 inches DBH at the small end.

CODE OF FEDERAL REGULATIONS (CFR) - A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the federal government.

COLLECTOR ROADS - Roads constructed to serve two or more elements but which do not fit into the other two categories (arterial or local). These roads serve smaller land areas, are usually connected to a Forest arterial or public highway, and are operated for constant service. They collect traffic from Forest roads or terminal facilities.

COMMERCIAL HARVEST – The removal of commercial wood fiber through commercial thinning and regeneration cuts (small clearcuts that leave all trees greater than or equal to 21 inches dbh).

COMMERCIAL THINNING - Any type of tree thinning that produces merchantable material at least equal in value to the direct costs of harvesting.

COMMODITIES – Transportable resources with commercial value; all resource products that are articles of commerce.

COMMUNITY STABILITY - A community's capacity to handle change without major hardships or disruptions to component groups or institutions. Measurement of community stability requires identification of the type and rate of proposed change and an assessment of the community's capacity to accommodate that level of change.

COMPACTION – The packing together of soil particles by forces exerted at the soil surface, resulting in increased soil density.

COMPETING VEGETATION – Vegetation that seeks and uses the limited common resources (space, light, water, and nutrients) of a forest site needed by preferred trees for survival and growth.

CONDITION CLASS - 1) Timber: a grouping of timber strata into size-age-stocking classes for Forest planning. **2)** Range: one of a series of arbitrary categories used to classify range conditions, usually expressed as excellent, good, fair, or poor.

CORRIDOR - A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries.

COST EFFECTIVENESS - Achieving specified outputs or objectives under given conditions for the least cost.

COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) - An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

COVER/FORAGE RATIO - The mixture of cover and forage areas on a unit of land, expressed as a ratio. The optimum cover/forage mix for deer on summer range is 60:40.

CRITICAL HABITAT – That portion of a wild animal's habitat that is critical for the continued survival of the species. Areas designated for the survival and recovery of federally listed threatened or endangered species.

CROWN – The part of a tree, or other woody plant, bearing live branches and foliage.

CROWN HEIGHT - In a standing tree, the vertical distance from ground level to the base of the crown, measured either to the lowest live branch whorl, or to the lowest live branch (excluding shoots arising spontaneously from buds on the stem of a woody plant), or to a point halfway between.

CUBIC FOOT (CF) - The amount of timber equivalent to a piece of wood one foot by one foot by one foot.

CULTURAL RESOURCE - The remains of sites, structures, or objects used by humans in the past-historic or prehistoric.

CUMULATIVE EFFECTS OR IMPACTS - Cumulative effect or impact is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

CUMULATIVE EFFECTS AREA (CEA) – The portion of a study area on which the effects from implementing project activities are expected to occur (and may occur outside the project analysis area).

- D -

DATA – Any recorded measurements, facts, evidence, or observations reduced to written, graphical, tabular, or computer form. The term implies reliability, and therefore provides an explanation of source, type, precision and accuracy.

DecAID – An advisory tool that has been developed to replace the biological potential models for species that utilize dead and partially dead trees and down wood. It is an internet-based summary, synthesis, and integration of published scientific literature, research data, wildlife databases, forest inventory databases, and expert judgment and experience. It offers a way of estimating or evaluating levels of dead wood habitat that provide for a wide array of species and ecological processes. The DecAID Repository is located on the Internet at http://www.fs.fed.us/wildecology/decaid/decaid_background/decaid_home.htm.

DECOMMISSION – Activity that results in the stabilization and restoration of unneeded roads to a more natural state.

DEER WINTER RANGE – See BIG GAME WINTER RANGE.

DEPENDENT COMMUNITIES – Communities whose social, economic, or political life would change in important respects if market or non-market outputs from the National Forests were substantially decreased.

DESIRED CONDITION – A description of the desired human dimension, production, and physical/biological characteristics to be achieved on an area.

DEVELOPED RECREATION – Recreation that requires facilities that, in turn, result in concentrated use of an area. Examples of developed recreation areas are campgrounds and ski areas; facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, ski lifts, and buildings.

DEVELOPED RECREATION SITE – Relatively small, distinctly defined areas where facilities are provided for concentrated public use; e.g. campgrounds, picnic areas, swimming areas, and downhill ski areas.

DIAMETER AT BREAST HEIGHT (dbh) – The diameter of a tree measured 4 feet 6 inches above the ground.

DISPERSED RECREATION – A general term referring to recreation use outside developed recreation sites; this includes activities such as scenic driving, hiking, backpacking, hunting, fishing, snowmobiling, horseback riding, cross-country skiing, and recreation in primitive environments.

DISTANCE ZONE – One of three categories used in the Visual Management System to divide a view into near and far components. The three categories are: **(1)** foreground, **(2)** middleground, and **(3)** background.

DISTURBANCE (Ecosystem) – Refers to events (either natural or human caused) that alter the structure, composition, or function of terrestrial or aquatic habitants.

DIVERSITY – The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

DOMINANT – Trees with crowns extending above the general level of the canopy and receiving full light from above and partly from the side; taller than the average trees in the stand with crowns well developed.

DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) – The draft statement of environmental effects that is required for major federal actions under Section 102 of the National Environmental Policy Act, and released to the public and other agencies for comment and review.

DUFF – Organic matter in various stages of decomposition on the floor of the forest.

- E -

EARLY FOREST SUCCESSION - The early stage or condition of a plant community that occurs during its development from bare ground to climax.

ECONOMIC EFFICIENCY ANALYSIS - An analytical method in which discounted benefits are compared with discounted costs.

ECOSYSTEM - An interacting system of organisms considered together with their environment; for example, marsh, watershed, and lake ecosystems.

ECO-TYPE – Groupings of soil and potential vegetation. Areas that have similar site potentials and are expected to have similar responses to treatments.

EFFECTS - Environmental changes resulting from a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Effects and impacts as used in this EIS are synonymous. Effects include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic quality, historic, cultural, economic, social, or healthy effects, whether direct, indirect, or cumulative. Effects may also include those resulting from actions that may have both beneficial and detrimental effects, even if on balance the agency believes that the effects will be beneficial.

ENDANGERED SPECIES - Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

ENHANCEMENT - See VISUAL QUALITY OBJECTIVE.

ENVIRONMENTAL ASSESSMENT (EA) - The concise public document required by the regulations for implementing the procedural requirements of the National Environmental Policy Act.

ENVIRONMENTAL IMPACT STATEMENT (EIS) - A statement of the environmental effects of a proposed action and alternatives to it**.** It is required for major federal actions under Section 102 of the National Environmental Policy Act (NEPA), and released to the public and other agencies for comment and review. It is a formal document that must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) guidelines, and directives of the agency responsible for the project proposal.

ENVIRONMENTAL JUSTICE - The pursuit of equal justice and equal protection under the law for all environmental statutes and regulations, without discrimination based on race, ethnicity, or socioeconomic status.

ENVIRONMENTAL PROTECTION AGENCY (EPA) - An agency of the Executive Branch of the Federal Government which has the responsibility for environmental matters of national concern.

EPHEMERAL DRAW - A drainage-way that conveys surface water for short periods of time in direct response to snowmelt or rainfall runoff.

EQUIVALENT CLEARCUT AREA - Watershed index of snowmelt and evapotranspiration rates relative to baseline condition where tree stands are considered fully canopied.

EROSION - (1) The wearing away of the land surface by running water, wind, ice, or other geologic agents, including such processes as gravitation creep; or **(2)** detachment and movement of soil or rock fragments by water, wind, ice, or gravity. The following terms are used to describe different types of erosion:

> Accelerated erosion **-** Erosion which is much more rapid than natural erosion, with the increase in erosion rate resulting primarily from the influence of human activities, or, in some cases, of other events that expose mineral soil surfaces, such as wildfire.
>
> Gully erosion **-** The erosion process whereby water accumulates in narrow channels, and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 4 inches to as much as 75 to 100 feet.
>
> Rill erosion **-** An erosion process in which numerous small channels less than 4 inches deep and 6 inches wide are formed.
>
> Sheet erosion **-** The removal of a fairly uniform layer of soil from the land surface by runoff water.

EXISTING CONDITION – A description of present-day human dimensions, production, physical/biological characteristics of an area.

EXTREME FIRE BEHAVIOR – "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong convection column. Predictability is difficult because such fire often exercise some degree of influence on their environment and behave erratically, sometimes dangerously.

- F -

FINAL ENVIRONMENTAL IMPACT STATEMENT - The final version of the statement of environmental effects required for major federal actions under section 102 of the National Environmental Policy Act. It is a revision of the draft environmental impact statement to include public and agency responses to the draft.

FIRE INTENSITY – The nature of a fire in terms of its rate of energy release. These are physical descriptions of the fires, rather than ecological effects. "Fire <u>intensity</u> is a term that is used to describe the rate at which a fire produces thermal energy. Fire intensity is influenced by the amount of fuel available for burning, local weather conditions before and at the time of the fire, and the topography of the burning site. The limiting factor in fire intensity is the amount of energy stored in the fuel. As a consequence, the greater the fuel loading, the more intensely a fire is likely to burn" (DeBano et al 1998 p. 56-57.).

FIRE MANAGEMENT - All activities required for protection of resources from fire and for the use of fire to meet land management goals and objectives.

FIRE FREQUENCY - Refers to the number of fires in a specified time an area.

FIRE SEVERITY or BURN SEVERITY - Refers to the degree which a site has been altered or the successional process disrupted by fire. Fire severity is a product of fire time and intensity (DeBano et al., 1998).
Severity also describes the fire-caused damage to the soil. The severity ratings are based on the following standards (BAER Handbook, FSH 2509.13):

- High severity – More than 40 percent of the area exhibits soil features likely to significantly increase runoff and erosion (such as., absence of duff layer, hydrophobic soils, soil discoloration).
- Moderate severity – Less than 40 percent of the area exhibits high severity indicators. Duff layers may be absent or mostly absent.
- Low severity – Duff layers are burned but intact. Unburned areas are intermingled with lightly burned areas.

FIXED COSTS - Costs incurred that are not expected to change significantly with the production of outputs, or over the range of alternatives. They are not tied to specific management activities and are usually a small component of the overall budget.

FORAGE - All browse and non-woody plants that are available to livestock or game animals and used for grazing or harvested for feeding.

FORB - Any herb other than grass.

FOREGROUND - A term used in visual management to describe the portions of a view between the observer and up to 1/4 to 1/2 mile distant.

FOREST HEALTH – A measure of the robustness of forest ecosystems. Aspects of forest health include biological diversity; soil, air, and water productivity; natural disturbances; and the capacity of the forest to provide a sustaining flow of goods and services for people.

FOREST LAND - Land at least 10 percent occupied by forest trees or formerly having had such tree cover and not currently developed for non-forest use. Lands developed for non-forest use include areas for crops, improved pasture, residential, or administrative areas, improved roads of any width, and adjoining road clearings and powerline clearings of any width.

FOREST SERVICE HANDBOOK (FSH) - For Forest Service use, directives that provide detailed instructions on how to proceed with a specialized phase of a program or activity.

FOREST SERVICE MANUAL (FSM) - A system of manuals that provides direction for Forest Service activities.

FOREST SYSTEM ROADS - Roads that are part of the Forest development transportation system, which includes all existing and planned roads as well as other special and terminal facilities designated as Forest development transportation facilities. See ARTERIAL ROADS, COLLECTOR ROADS, and LOCAL ROADS.

FRAGMENTATION – Breaking up of a continuous area into progressively smaller patches of increasing degrees of isolation.

FUEL BREAK - A zone in which fuel quantity has been reduced or altered to provide a position for suppression forces to make a stand against wildfire. Fuel breaks are designated or constructed before the outbreak of a fire. Fuel breaks may consist of one or a combination of the following: natural barriers, constructed fuel breaks, constructed barriers.

FUEL MANAGEMENT - The practice of planning and executing the treatment or control of living or dead vegetative material in accordance with fire management direction.

FUEL TREATMENT - The rearrangement or disposal of natural or activity fuels (generated by management activity, such as slash left from logging) to reduce fire hazard. Fuels are defined as both living and dead vegetative materials consumable by fire (See Fire and Fuels, Chapter 3, for a definition of various fuel treatment methods).

FUELS - Combustible wildland vegetative materials. While usually applied to above-ground living and dead surface vegetation, this definition also includes roots and organic soils such as peat.

- G -

GEOGRAPHIC INFORMATION SYSTEMS (GIS) – Computer software that provides database and spatial analytic capabilities.

GEOMORPHOLOGY - The science that deals with land and submarine relief features of the earth's surface and seeks a genetic interpretation of them, using the principles of physiography in its descriptive aspects and dynamic and structural geology in its explanatory phases.

GOAL - A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be completed. Goal statements form the principal basis from which objectives are developed.

GOODS AND SERVICES - The various outputs, including on-site uses, produced from forest and rangeland resources.

GOSHAWK FORAGING AREA – Areas where prey are searched for and captured by goshawks. Desired size of foraging areas is approximately 5400 acres (not including nest stand and post fledgling area).

GOSHAWK NEST AREA – The nest tree and stand surrounding the nest that contains prey handling areas, perches and roosts. Often referred to as the nest stand, usually approximately 30 acres in area.

GRASS/FORB - An early forest successional stage where grasses and forbs are the dominant vegetation.

GREEN TREE REPLACEMENT (GTR) – Trees retained, or managed through time, to provide snags or CWM habitat at some point in the future.

GROUND FUELS – All combustible materials below the surface litter layer. These fuels may be partially decomposed, such as forest soil organic layers (duff), dead mosses and lichen layers, punky wood, and deep organic layers (peat), or may be living plant material, such as tree and shrub roots.

GROUND-BASED HARVESTING SYSTEMS – Logging systems that employ ground-based equipment such as feller-bunchers, skidders, and forwarders.

GROUP SELECTION CUTTING - See UNEVEN-AGED SILVICULTURAL SYSTEMS.

GROWING SEASON - That part of the year when temperature and moisture are favorable for vegetation growth.

GUIDELINE - An indication or outline of policy or conduct; i.e. any issuance that assists in determining the course of direction to be taken in any planned action to accomplish a specific objective.

GUZZLER - A device for collecting and storing precipitation for use by wildlife or livestock. Consists of an impenetrable water collection area, a storage facility, and a trough from which animals may drink.

- H -

HABITAT - The place where a plant or animal naturally or normally lives or grows.

HABITAT DIVERSITY - The distribution and abundance of different plant and animal communities and species within a specific area.

HABITAT TYPE – An aggregation of all land areas potentially capable of producing similar climax plant communities.

HAND PILING – The use of personnel to manually gather accumulated fuels (usually smaller fuels such as woodcutting slash or small thinning slash) and place it in a pile to be burned or retained for wildlife.

HAZARD – Any real or potential condition that can cause injury, illness, or death of personnel, or damage to or loss of equipment or property.

HIDING COVER - Vegetation that will hide 90 percent of a deer from the view of a human at a distance of 200 feet or less. The distance at which the animal is essentially hidden is called a “sight distance.”

HISTORIC RANGE OF VARIABILITY (HRV) – The historical pattern and abundance of structural stages within watersheds, using pre-settlement (1800-1900) conditions as a reference point.

HISTORIC SITE - Site associated with the history, tradition, or cultural heritage of national, state, or local interest, and of enough significance to merit preservation or restoration.

- I -

ID TEAM - See INTERDISCIPLINARY TEAM.

IMPACTS - See EFFECTS**.**

INCREMENT – The increase in diameter, basal area, height, volume, quality or value of individual trees or stands during a given period.

INDICATOR SPECIES - See MANAGEMENT INDICATOR SPECIES**.**

INDIRECT OUTPUTS -Outputs caused by an action, but which are later in time or farther removed in distance, although still reasonably foreseeable. See EFFECTS.

INTEGRATED PEST MANAGEMENT - A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated population on various resource values, alternative regulation tactics and strategies, and benefit/cost estimates of those alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pest-host system, and consist of a combination of tactics such as timber stand improvement plus selective use of pesticides.

INTENSIVE MANAGEMENT (INTENSIVE FOREST MANAGEMENT) - A high investment level of timber management that includes use of precommercial thinnings, commercial thinnings, genetically improved stock, and control of competing vegetation.

INTERDISCIPLINARY TEAM (ID TEAM) - A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem.

INTERMEDIATE CUTTING - Any removal of trees from a stand between the time of its formation and the regeneration cut. Most commonly applied intermediate cuttings are release, thinning, improvement, and salvage.

INTERMITTENT STREAMS - A stream which flows only at certain times of the year when it receives water from some surface source, such as melting snow in mountainous areas.

INVENTORY DATA AND INFORMATION COLLECTION - The process of obtaining, storing, and using current inventory data appropriate for planning and managing the Forest.

IRRETRIEVABLE - Applies to losses of production, harvest, or commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

IRREVERSIBLE - Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

ISSUE - A point, matter, or question of public discussion or interest to be addressed or decided through the planning process. See also PUBLIC ISSUE.

- L -

LADDER FUELS – Fuels that provide vertical continuity between the surface fuels and crown fuels in a forest stand, thus contributing to the ease of torching and crowning.

LAND MANAGEMENT - The intentional process of planning, organizing, programming, coordinating, directing, and controlling land use actions.

LANDING - Any place where round timber is assembled for further transport, commonly with a change of method.

LANDSCAPE LEVEL – A watershed, or series of interacting watersheds or other natural biophysical (ecological) units, within the larger Land and Resource Management Planning areas. This term is used for conservation planning and is not associated with visual landscape management and viewscape management.

LAND USE ALLOCATION - The commitment of a given area of land or a resource to one or more specific uses, for example, to campgrounds or wilderness.

LATE FOREST SUCCESSION – A stage of forest succession where the majority of trees are mature or over-mature.

LEAVE-TOP-ATTACHED-YARDING (LTA) – All trees meeting Utilization Standards which are 60 feet in length or longer are required to have tops (and limbs) attached to the last log while being yarded to the landing. Portions of live trees which break during felling or yarding, and are greater than 8 feet in length shall be yarded to the landing.

LOGGING RESIDUES - See SLASH.

LOPPING AND SCATTERING – Lopping the slash created after felling and spreading it more or less evenly over the ground.

LATE AND OLD STRUCTURE (LOS) – Late and old structural stages are defined by the Eastside Screens as multi-strata stands with large trees and single strata stands with large trees.

- M -

MANAGEMENT AREA - Tracts of land grouped into one category having a particular management emphasis.

MANAGEMENT CONCERN - An issue, problem, or condition that influences the range of management practices identified by the Forest Service in the planning process.

MANAGEMENT DIRECTION - A statement of multiple use and other goals and objectives, and the associated management prescriptions, and standards and guidelines for attaining them.

MANAGEMENT EMPHASIS - That portion of a management scheme that receives the most stress or is of the greatest significance or importance. It may be the resources being produced, or it may be the way in which they are produced.

MANAGEMENT INDICATOR SPECIES – A species selected because its welfare is presumed to be an indicator of the welfare of other species using the same habitat. A species whose condition can be used to assess the impacts of management actions on a particular area.

MANAGEMENT PRACTICE – A specific activity, measure, course of action, or treatment.

MANAGEMENT PRESCRIPTION – The management practices and intensity selected and scheduled for application on a specific area to attain multiple use and other goals and objectives.

MANAGEMENT REQUIREMENT (MR) – Minimum standards for resource protection, vegetation manipulation, silvicultural practices, even-aged management, riparian areas, soil and water diversity that are to be met to accomplish National Forest System goals and objectives.

MASS MOVEMENT – A general term for any of the variety of processes by which large masses of earth material are moved downslope by gravitational forces - either slowly or quickly.

MATURE TIMBER – Trees that have attained full development, particularly height, and are in full seed production.

MEAN ANNUAL INCREMENT OF GROWTH – The total volume of a tree or stand of trees up to a given age divided by that age.

MECHANICAL PILING – The use of mechanized equipment to gather accumulated fuels, usually activity fuels created by thinning, harvest or woodcutting and places it in a pile configuration to be either utilized, burned or left for wildlife habitat.

MECHANICAL SHRUB TREATMENT (MST) – Use of mechanized equipment to mow, cut, chop, grind or otherwise reduce shrub or ground fuel vertical structure. Equipment and attachments would be chosen based on soils (compaction and displacement potential), terrain, other resource concerns, cost and availability.

MIDDLEGROUND – A term used in visual management to describe the portions of a view extending from the foreground zone out to 3 to 5 miles from the observer.

MINERAL MATERLALS - Deposits such as sand, stone, gravel, and clay.

MINERAL SOIL - Weathered rock materials, usually containing less than 20 percent organic matter.

MITIGATION MEASURES - Actions to avoid, minimize, reduce, eliminate, or rectify adverse impacts of management practices.

MODEL - A representation of reality used to describe, analyze, or understand a particular concept. A “model” may be a relatively simple qualitative description of a system or organization, or a highly abstract set of mathematical equations.

MODIFICATION - See VISUAL QUALITY OBJECTIVE**.**

MONITORING AND EVALUATION - The periodic evaluation of LRMP management practices on a sample basis to determine how well objectives have been met.

MORTALITY - In wildlife management, the loss in a population from any cause, including hunter kill, poaching, predation, accident, and disease. In forestry, trees in a stand that die of natural causes.

MOUNTAIN PINE BEETLE - A tiny black insect, ranging in size from 1/8 to 3/4 inch, which bores its way into a tree's cambium and cuts off its supply of nutrients, thus killing the tree.

MULTIPLE USE - The management of all the various renewable surface resources of the National Forest System so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some lands will be used for less than all of the resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land and with consideration being given to the relative values of the various resources; and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

- N -

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) OF 1969 - An Act to declare a National policy that will encourage productive and enjoyable harmony between humankind and the environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality.

NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN - A Plan which " . . . shall provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long-term net public benefits in an environmentally sound manner."

NATIONAL FOREST MANAGEMENT ACT (NFMA) - A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act, requiring the preparation of Regional Guides and Forest Plans and the preparation of regulations to guide that development.

NATIONAL FOREST SYSTEM (NFS) - A nationally significant system of federally owned units of forest, range, and related land consisting of National Forest, Purchase Units, National Grasslands, and other lands, waters, and interest in lands which are administered by the Forest Service or designated for administration through the Forest Service.

NATIONAL FOREST SYSTEM (NFS) LANDS – National Forests, National Grasslands, or Purchase Units and other federal lands, that have been designated by Executive Order or statute as lands under the management of the Forest Service, including experimental areas and Bankhead-Jones Title 111 lands.

NATIONAL REGISTER OF HISTORIC PLACES - A listing (maintained by the U.S. National Park Service) of areas that have been designated as being of historical significance. The Register includes places of local and state significance as well as those of value to the Nation.

NATURAL BARRIER - A natural feature that restricts livestock or wildlife movements, such as a dense stand of trees or a cliff.

NATURAL DISTURBANCE REGIMES – The historic patterns (frequency and extent) of fire, insects, wind, landslides and other natural processes in an area.

NATURAL REGENERATION - Reforestation of a site by natural seeding from the surrounding trees. Natural regeneration may or may not be preceded by site preparation.

NET PUBLIC BENEFITS - An expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs), whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of net public benefits to be derived from management of units of the National Forest System is consistent with the principles of multiple use and sustained yield.

NON-FOREST LAND - Lands that never have had or that are incapable of having 10 percent or more of the area occupied by forest trees; or lands previously having such cover and currently developed for non-forest use.

NON-GAME SPECIES – Animal species that are not hunted, fished, or trapped.

NOXIOUS WEEDS – Undesirable plant species that are unwholesome to the range or to animals. The Forest Service Manual describes a noxious weed as a plant that is aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier of host of serious insects or disease, and being native or new to, or not common to the United States or parts thereof (USDA, Forest Service, 1995c).

- O -

OBJECTIVE – A concise, time-specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.

OFF-HIGHWAY VEHICLE (OHV) – Vehicle such as motorcycles, all-terrain vehicles, four-wheel drive vehicles, and snowmobiles, synonymous with Off-road vehicle (ORV).

OLD-GROWTH ATTRIBUTES – Structural features and other characteristics of old-growth forests, including: large trees for the species and site; wide variation in tree sizes and spacing; accumulations of large dead standing and fallen trees; multiple canopy layers; canopy gaps and understory patchiness; elements of decay such as broken or deformed tops or trunks and root decay; and the presence of species characteristic of old growth.

OLD-GROWTH HABITAT – Habitat for certain wildlife that is characterized by overmature coniferous forest stands with large snags and decaying logs.

OPPORTUNITY – A statement of general actions, measure, or treatments that addresses a public issue or management concern in a favorable way.

OUTPUTS – The goods, services, products, and concerns that are measurable and capable of being used to determine the effectiveness of programs and activities in meeting objectives. Goods, end products, or services that are purchased, consumed, or utilized directly by people. A broad term for describing any result, product, or service that a process or activity actually produces.

OVERSTORY – That portion of the trees, in a forest or in a stand of more than one story, forming the upper or uppermost canopy.

- P -

PARTIAL RETENTION – See VISUAL QUALITY OBJECTIVE.

PARTICULATES – Small particles suspended in the air and generally considered pollutants. See TOTAL SUSPENDED PARTICULATES.

PERENNIAL STREAM – A stream that flows year round.

PERMITTEE – Any person or business formally allowed to graze livestock on the land of another person or business (e.g.; on state or federal land).

PERSONAL USE – Normally used to describe the type of permit issued for removal of wood products (firewood, post, poles, and Christmas trees) from National Forest Land when the product is for home use and not to be resold for profit.

PLANNED IGNITION - A fire started deliberately, and controlled to accomplish a resource management objective

PLANNING AREA - The contiguous area within defined boundaries that is determined to be logical for analysis of the existing condition and proposed activities.

PLANNING CRITERIA - Criteria prepared to guide the planning process. Criteria applied to collection and use of inventory data and information, analysis of the management situation, and the design, formulation, and evaluation of alternatives.

PLANNING RECORDS - The body of information documenting the decisions and activities that result from the process of developing an EIS, Forest Plan, or significant amendment (also referred to as the Project Record).

PLANT ASSOCIATION GROUP (PAG) – Combine plant associations by climax species, site potential, and temperature and moisture similarities.

POLE/SAPLING – A Forest successional stage in which trees between five and nine inches in diameter are the dominant vegetation. See also SIZE CLASS.

POLE TIMBER - Trees of at least five inches in diameter at breast height, but smaller than the minimum utilization standard for sawtimber. See also SIZE CLASS.

POLICY - A definite course or method of action selected by a governmental agency, institution, group, or individual from among alternatives and, in the light of given conditions, to guide and usually determine present and future decisions. A specified decision or set of decisions designed to carry out such a chosen course of action.

POST-FLEDGLING AREA (PFA) – The area of concentrated use by the goshawk family after the young leave their nest. The desired area is approximately 420 acres.

PRACTICES - Those management activities that are proposed or expected to occur.

PRECOMMERCIAL THINNING - The practice of removing some of the trees less than marketable size from a stand so that the remaining trees will grow faster.

PREHISTORIC SITE - An area that contains important evidence and remains of the life and activities of early societies that did not record their history.

PRESCRIBED FIRE - A fire burning under specified conditions that will accomplish certain planned objectives.

PRESCRIPTION - A written direction for various Forest management activities, such as tree harvest and fuels reduction activities.

PRESERVATION - A visual quality objective that allows only for ecological changes.

PROGRAM - When spelled with a capital, the Renewable Resource Program required by the RPA. In the general sense, sets of activities or projects with specific objectives, defined in terms of specific results and responsibilities for accomplishment.

PROGRAMMATIC MEMORANDUM OF AGREEMENT - An agreement between the U.S.D.A. Forest Service, Pacific Northwest Region, the Oregon State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation on the management of two types of cultural resource sites found on the Forest: Depression-era administrative structures and prehistoric lithic scatters.

PROJECT RECORD - The body of information documenting the decisions and activities that result from the process of developing an EIS, Forest Plan, or significant amendment (also referred to as the Planning Record).

PROJECTS - Work schedules prescribed for a project area to accomplish management prescriptions. Projects can be for operation, maintenance, and protection (OMP), or for investment purposes. OMP projects are for ongoing work and are generally considered one year at a time. Investments can be of multi-year duration. A project is organized for managerial convenience, and is described by location, activities, outputs, effects, work force, dollars, time, and responsibility for execution.

PUBLIC ACCESS – Refer to Access

PUBLIC ISSUE - A subject or question of widespread public interest relating to management of the National Forest System.

PUBLIC PARTICIPATION - Meetings, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities designed and held to obtain comments from the public about Forest Service planning.

- R -

RAPTORS – Predatory birds such as falcons, hawks, eagles, and owls.

RANGER DISTRICT – A sub-unit of a National Forest for management and administration purposes.

RECORD OF DECISION - A document separate from but associated with an Environmental Impact Statement which states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not.

REGENERATION - The renewal of a tree crop, whether by natural or artificial means. Also, the young crop itself**,** which is commonly referred to as reproduction.

REGULATIONS - Generally refers to the Code of Federal Regulations, Title 36, Chapter II, which covers management of the Forest Service.

REHABILITATION - Action taken to restore, protect, or enhance site productivity, water quality, or other resource values over a period of time.

RELEASE CUTTING – Removal of competing vegetation to allow a desired tree species to grow.

RESIDUAL STAND - The trees remaining standing after some activity such as selection cutting.

RESOURCE - Anything which is beneficial or useful, be it animal, vegetable, mineral, a location, a labor force, a view, an experience, etc. Resources, in the context of land use planning, thus vary from such commodities as timber and minerals to such amenities as scenery, scenic viewpoints, or recreation opportunities.

RESOURCE MANAGEMENT PLAN - A Plan developed prior to the LRMP that outlined the activities and projects for a particular resource element independently of considerations for other resources. Such Plans are superseded by the LRMP.

RESOURCE PLANNLNG ACT (RPA) - The Forest and Rangeland Renewable Resources Planning Act of 1974**.** Also refers to the National Assessment and Recommended Program developed to fulfill the requirements of the act.

RESPONSIBLE OFFICIAL - The Forest Service employee who has been delegated the authority to carry out a specific planning action.

RETENTION - See VISUAL QUALITY OBJECTIVE.

RIPARIAN - Pertaining to areas of land directly influenced by water. Riparian areas usually have visible vegetative or physical characteristics reflecting this water influence. Stream sides, lake borders, or marshes are typical riparian areas.

RIPARIAN AREA - Geographically delineated areas, with distinctive resource values and characteristics, that are comprised of aquatic and riparian ecosystems.

ROADED NATURAL (RN) - A classification of the Recreation Opportunity Spectrum that characterizes a predominately natural environment with evidence of moderate permanent alterations and resource utilization. Evidence of the sights and sounds of people is moderate, but in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from the sights and sounds of people.

RURAL - A Recreation Opportunity Spectrum classification for areas characterized by a substantially modified natural environment. Sights and sounds of people are evident. Renewable resource modification and utilization practices enhance specific recreation activities or provide soil and vegetative cover protection.

- S -

SALE PREPARATION COSTS - Costs associated with preparing a timber harvest on Forest Service lands for sale to the public; usually include all administrative costs for developing sale layout, writing an Environmental Assessment and selling the timber sale.

SCARIFIED - Land in which the topsoil has been broken up or loosened in preparation for regenerating by direct seeding or natural seedfall. Also refers to ripping or loosening road surfaces to a specified depth for obliteration or "putting a road to bed."

SCOPING PROCESS -A part of the National Environmental Policy Act (NEPA) process; early and open activities used to determine the scope and significance of the issues, and the range of actions, alternatives, and impacts to be considered in an Environmental Impact Statement.

SECOND GROWTH – Forest growth that has become established following some interference, such as cutting, serious fire, or insect attack, with the previous Forest crop.

SEDIMENT – Earth material transported, suspended, or deposited by water.

SEEDLINGS AND SAPLINGS – Live trees less than five inches in diameter at breast height. See also SIZE CLASS.

SENSITIVE SPECIES – Plant or animal species that are susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on an official State list, or that are recognized by the Regional Forester as needing special management to prevent placement on Federal or State lists.

SERAL – A biotic community which is a developmental, transitory stage in an ecological succession.

SILVICULTURAL EXAMINATION – The process used to gather the detailed in-place field data needed to determine management opportunities and direction for the forest resource within a small subdivision of a Forest area, such as a stand. Also, Stand Exam.

SIVICULTURAL SYSTEM – A management process whereby Forests are tended, harvested, and replaced, resulting in a Forest of distinctive form. Systems are classified according to: 1) the method of carrying out the fellings that remove the mature crop and provide for regeneration, and 2) the type of forest thereby produced.

SILVICULTURE – The art and science of controlling the established, composition, and growth of forests.

SITE INDEX – A numerical evaluation of the quality of land for plant productivity, based on the height of dominant trees in a stand at an arbitrarily chosen age.

SITE PREPARATION – An activity (such as prescribed burning, disking, and tilling) performed on a reforestation area, before introduction of reforestation, to ensure adequate survival and growth of the future crop.

SITE PRODUCTIVITY – Production capability of specific areas of land.

SIZE CLASS – For the purposes of Forest planning, size class refers to the intervals of tree stem diameter used for classification of timber in the LRMP database.

Seedling/sapling = less than five-inch diameter
Pole/sapling or pole timber = five-inch to nine-inch diameter
Sawtimber = greater than nine-inch diameter

SKIDDING – A general term for hauling loads by sliding, not on wheels, as developed originally from stump to roadside, deck, skidway, or other landing.

SLASH – The residue left on the ground after tree felling and tending, and/or accumulating there as a result of storm, fire, girdling, or poisoning. It includes unutilized logs, uprooted stumps, broken or uprooted stems, the heavier branchwood, etc.

SMALL GAME – Birds and small mammals normally hunted or trapped.

SNAG – A standing dead tree.

SOCIO-ECONOMIC – Pertaining to, or signifying the combination or interaction of social and economic factors.

SOIL – The portion of the earth's surface consisting of disintegrated rock and humus.

SOIL PRODUCTIVITY – The capacity of a soil to produce a specific crop such as fiber or forage under defined levels of management. Productivity is generally dependent on available soil moisture and nutrients, and length of growing season.

SOIL RESOURCE INVENTORY - See SOIL SURVEYS**.**

SOIL SURVEYS - Systematic examinations of soils in the field and in laboratories, their description and classification; the mapping of kinds of soil; the interpretation according to their adaptability for various crops, grasses, and trees, their behavior under use or treatment for plant production or for other purposes, and their productivity under different management systems.

SOIL TEXTURE - The relative proportions of the various soil separates in a soil, described by the classes of soil texture. Twelve basic soil texture classes are recognized, such as "loam." The textural classes may be modified by the addition of suitable adjectives when coarse fragments are present in substantial amounts; for example, "stony loam."

STAND (TREE STAND, TIMBER STAND) - An aggregation of trees or other vegetation occupying a specific area and sufficiently uniform in species composition, age arrangement, and condition as to be distinguishable from the forest or other vegetation or land cover on adjoining areas.

STAND COMPOSITION – The proportion of each tree species in a stand expressed as a percentage of either the total number, basal area or volume of all tree species in the stand.

STAND DENSITY – A relative measure of the amount of stocking on a forest area. Often described in terms of stems per acre, basal area, or stand density index.

STAND DENSITY INDEX (SDI) – The number of trees per acre that a stand would have at a quadratic mean diameter of 10 inches. $SDI=(trees/acre)*(Dq/10)^{1.66}$ where Dq is the quadratic mean diameter for the stand or portion thereof. (See SDImax)

STAND DIVERSITY - Any attribute that makes one timber stand biologically or physically different from other stands. This difference can be measured by, but not limited to: different age classes; species; densities; or non-tree floristic composition.

STAND EXAMINATION SURVEYS - Procedures to collect data on Forest stands.

STAND STRUCTURE – The distribution of trees in a stand, which can be described by species, vertical or horizontal spatial patterns, size of trees or tree parts, age, or a combination of these.

STANDARD - A statement that describes a condition when a job is done properly. Standards show how well something should be done, rather than what should be done.

STANDARDS AND GUIDELINES - Principles specifying conditions or levels of environmental quality to be achieved.

SUITABILITY - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

SUITABLE FOREST LAND - Land to be managed for timber production on a regulated basis.

SUPPRESSED VEGETATION – Trees or shrubs with crowns receiving no direct light either from above or from the sides, and that will not respond to release. Usually crowns are entirely below the general level of the canopy.

SUPPRESSION - The process of extinguishing or confining fire.

SURFACE FUELS - Loose surface litter on the soil surface, normally consisting of fallen leaves or needles, twigs, bark, cones, and small branches that have not yet decayed enough to lose their identity; also grasses, forbs, low and medium shrubs, tree seedlings, heavier branchwood, downed logs, and stumps interspersed with or partially replacing the litter.

SUSTAINABILTY - The ability of forested systems to withstand or resist rapid and widespread structural change due to fire, insects, and disease.

- T -

TEMPORARY ROAD - Roads authorized by contract, permit, lease, other written authorization, or emergency operation not intended to be a part of the forest transportation system and not necessary for long term resource management (36CFR 212.1).

THERMAL COVER - Cover used by animals to ameliorate effects of weather; for deer, a stand of coniferous trees 5 feet or taller with an average crown closure of 75 percent or more, or a pole-size or larger stand with 60 percent or more closure.

THINNING - A felling made in an immature stand primarily to maintain or accelerate diameter increment and also to improve the average form of the remaining trees without permanently breaking the canopy. An intermediate cutting.

THREATENED AND ENDANGERED (T&E) SPECIES - See THREATENED; see ENDANGERED

THREATENED SPECIES - Those plant or animal species likely to become endangered species throughout all or a significant portion of their range within the foreseeable future. See also ENDANGERED SPECIES.

TIERING - Refers to the coverage of general matters in broader environmental impact statements (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as Regional or Forest program statements, or ultimately, site-specific statements) incorporating, by reference, the general discussions and concentrating solely on the issues specific to the statement subsequently prepared.

TIMBER PRODUCTION - The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts, or other round sections for industrial or consumer use. For purposes of Forest planning, the term "timber production" does not include production of fuelwood or harvest of unsuitable lands.

TIMBER STAND IMPROVEMENT (TSI) - Measures such as thinning, pruning, release cutting, prescribed fire, girdling, weeding, or poisoning of unwanted trees aimed at improving the growing condition of the remaining trees.

TOPOGRAPHY - The configuration of a surface including its relief, elevation, and the position of its natural and human-created features

TOTAL SUSPENDED PARTICULATES (TSP) - Any finely divided material (solid or liquid) that is airborne with an aerodynamic diameter smaller than a few hundred micrometers.

TRACTOR LOGGING - Any logging method that uses a tractor as the motive power for transporting logs from the stumps to a collecting point, whether by dragging or carrying the logs.

TRADE-OFF -The combination of benefits and costs that are gained and lost in switching between alternative courses of action. Trade-offs include only those portions of benefits and costs that are not common to all alternative courses of action under consideration.

TREATMENTS – Any planned manipulation of plant materials. Prescribed burning, thinning, logging, lopping are all examples of vegetation treatments.

- U -

UNCLASSIFIED ROAD - Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travelways, and off road vehicle tracks that have not been designated and managed as a trail; and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization (36 CFR 212.1).

UNDERBURNING (UB) – Use of prescribed fire under a stand of trees to decrease or remove accumulated ground fuels during periods of spring like moisture to reduce risk of wildfire

UNDERSTORY - The trees and other woody species growing under a more-or-less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

UNPLANNED IGNITION - A fire started at random by either natural or human causes, or a deliberate incendiary fire.

UNROADED AREA - Any area, without the presence of a classified road, of a size and configuration sufficient to protect the inherent characteristics associated with its roadless condition. Unroaded areas do not overlap with inventoried roadless areas.

UPPER DENSITY LIMITS - The density level at which a suppressed class of trees begins to develop.

UPPER MANAGEMENT ZONES – Refer to Upper Density Limits

- V -

VARIABLE COSTS - Costs that vary according to the activity or output level. They may be expressed as a cost per acre or cost per unit of output.

VEGETATIVE MANAGEMENT - Activities designed primarily to promote the health of the crop forest cover for multiple-use purposes.

VIABLE POPULATIONS - That number of individuals of a species sufficient to ensure the long-term existence of the species in natural self-sustaining populations adequately distributed throughout the planning area.

VISUAL RESOURCE - The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

- W -

WATERSHED - The entire land area that contributes water to a drainage system or stream.

WETLANDS - Areas that are inundated by surface or ground water often enough to support, and usually do support, primarily plants and animals that require saturated or seasonally saturated soil conditions for growth and reproduction.

WHOLE-TREE-YARD (WTY) – All trees meeting utilization standards less than 60 feet in length are required to be whole tree yarded to the landing. Portions of live trees which break during felling or yarding, and are greater than 8 feet in length shall be yarded to the landing.

WILDERNESS - Areas designated by congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation. Wildernesses are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or a primitive and unconfined type of recreation; are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition, and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest.

WILDFIRE - Any wildland fire that is not a prescribed fire. See also PRESCRIBED FIRE.

WILDLIFE – All non-domesticated mammals, birds, reptiles, and amphibians living within a natural environment, and include both game species and non-game species. Animals, or their progeny, which one were domesticated but escaped captivity and are running wild (i.e., feral animals), such as horses, burros, and hogs, are not considered wildlife.

WILDLIFE HABITAT DIVERSITY – The distribution and abundance of different plant and animal communities and species within a specified area.

WINTER RANGE HABITAT UNIT (WRHU) – Areas in the biological winter range of mule deer ranging from 15,000 to 20,000 acres.

WOOD FIBER PRODUCTION - The growing, tending, harvesting, and regeneration of harvestable trees.

- X, Y, Z -

YARDING - Hauling timber from the stump to a collection point.

YARDING TOPS ATTACHED – This refers to hauling the tops and limbs left attached to the last log of each tree as it is yarded to the landing for processing and is done to reduce accumulations of logging fuels within the harvest unit.

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APPENDICES

APPENDIX A

APPENDIX A: PROPOSED UNITS AND ACTIVITIES

The silviculture prescriptions are described in DEIS Chapter 2, pages 12-14.

Table 78: Alternative 2 (Proposed Action) Proposed Activities

Unit	Acres	Harvest Treatments	Silviculture Prescriptions	Pile Type	Fuels Treatments	Timber Stand Improvement Treatments
1	9	NT	20	HP	UB/LFR/LFR/LOP/UB	SPC
2	28	HTH	2	MP	LFR/PILE/BURN/UB	NT
3	100	HTH	2		LOP/UB	SPC
4	71	HTH	2		UB	NT
5	33	HTH	1		UB	NT
6	20	HTH	2		MST/LFR/LOP/UB	NT
7	27	HTH	2		LOP/UB	SPC
8	34	HTH	1		PILE/BURN/UB	NT
9	104	HTH	2	MP	LFR/PILE/BURN/UB	NT
10	13	HTH	2	MP	PILE/BURN/UB	SPC
11	18	HTH	5	MP	LFR/PILE/BURN/UB	NT
12	24	HTH	2	MP	PILE/BURN/UB	SPC
13	11	HTH	2	MP	LFR/PILE/BURN/UB	NT
14	94	HTH	2	MP	LFR/PILE/BURN/UB	NT
15	40	HTH	3	MP	MST/PILE/BURN	SPC
16	39	HTH	4	MP	PILE/BURN/MST/UB	SPC
17	22	HTH	2		MST/UB	NT
18	37	HTH	5	MP	PILE/BURN/UB	WHIP
19	53	HTH	2	MP	LFR/PILE/BURN/UB	NT
20	58	HTH	1		UB	NT
21	38	HTH	1	MP	LFR/PILE/BURN/UB	NT
22	88	HTH	1	MP	MST/LFR/PILE/BURN/UB	NT
23	62	HTH	5	MP	MST/PILE/BURN/UB	SPC
24	32	HTH	2	MP	MST/LFR/LOP/UB	NT
25	11	HTH	2		UB	NT
26	40	HTH	2		PILE/BURN/UB	NT
27	64	HTH	5	MP	MST/PILE/BURN/UB	SPC
28	17	HSH	7		LOP	WHIP
29	51	HTH	4	MP	LFR/PILE/BURN/UB	NT
30	61	HTH	2	MP	MST/LFR/LOP/UB	NT
31	24	HTH	1	MP	LFR/PILE/BURN/UB	NT
32	26	HTH	2	MP	LFR/PILE/BURN/UB	NT
33	16	HTH	1	MP	MST/PILE/BURN/UB	WHIP
34	31	NT	20		UB	NT
35	19	HTH	4	MP	PILE/BURN/UB	SPC
36	49	NT	20		LOP/UB	SPC
37	58	HTH	5	MP	PILE/BURN/UB	SPC
38	129	HTH	5	MP	PILE/BURN/UB	SPC
39	93	HTH	5	MP	MST/PILE/BURN/UB	SPC
40	15	HTH	2	MP	MST/PILE/BURN/UB	SPC

Unit	Acres	Harvest Treatments	Silviculture Prescriptions	Pile Type	Fuels Treatments	Timber Stand Improvement Treatments
41	254	HTH	5	MP	MST/PILE/BURN/UB	SPC
42	51	HTH	5	MP	MST/PILE/BURN/UB	SPC
43	65	HTH	2	MP	PILE/BURN/UB	SPC
44	43	HTH	2	MP	MST/PILE/BURN/UB	SPC
45	58	HTH	2		MST/UB	NT
46	95	HTH	2	MP	PILE/BURN/UB	SPC
47	90	HTH	3	MP	PILE/BURN	SPC
48	140	HTH	3	MP	PILE/BURN	SPC
49	57	HTH	2	MP	PILE/BURN/UB	SPC
50	11	HTH	2	MP	PILE/BURN/UB	SPC
51	21	HTH	2	MP	LFR/PILE/BURN/UB	NT
52	55	HTH	2	MP	PILE/BURN/UB	SPC
53	60	HTH	5	MP	MST/PILE/BURN/UB	WHIP
54	56	HTH	5	MP	PILE/BURN/UB	SPC
55	63	HTH	2	MP	LFR/PILE/BURN/UB	NT
56	45	HTH	5	MP	PILE/BURN/UB	SPC
57	55	HTH	2		PILE/BURN/UB	SPC
58	23	HTH	5	MP	PILE/BURN/UB	SPC
59	37	HTH	2	MP	PILE/BURN/UB	SPC
60	70	HTH	5		PILE/BURN/UB	SPC
61	62	HTH	5	MP	PILE/BURN/UB	WHIP
62	47	HTH	1		MST/UB	NT
63	96	HTH	5	MP	MST/UB/PILE/BURN	ABSPC
64	52	NT	20	HP	UB/LFR/LFR/LOP/UB	ABSPC
65	48	HTH	2		UB	NT
66	28	HTH	2		UB	NT
68	17	HTH	2	MP	PILE/BURN/UB	WHIP
69	114	HTH	5	MP	MST/PILE/BURN/UB	SPC
70	33	HTH	5	MP	PILE/BURN/UB	SPC
71	39	HTH	5	MP	LFR/PILE/BURN/UB	NT
72	54	HTH	2	MP	PILE/BURN/UB	SPC
73	19	HTH	1		LFR/LOP/UB	NT
74	19	HTH	1		PILE/BURN/UB	NT
75	41	HTH	2		UB	NT
76	12	HTH	2		UB	NT
77	46	HTH	2		MST/UB	NT
78	54	HTH	5	MP	MST/PILE/BURN/UB	SPC
79	20	HTH	5	MP	MST/PILE/BURN/UB	SPC
80	39	HTH	2	MP	MST/PILE/BURN/UB	SPC
81	28	HTH	4	MP	MST/PILE/BURN/UB	SPC
82	27	HSH	7	MP	PILE/BURN	WHIP
83	16	HSH	7	MP	PILE/BURN	WHIP
84	23	HSH	7		LOP	WHIP
85	37	HSH	7		LOP	WHIP
86	10	HSH	7		LOP	WHIP
87	30	HSH	7		NT	NT

Unit	Acres	Harvest Treatments	Silviculture Prescriptions	Pile Type	Fuels Treatments	Timber Stand Improvement Treatments
88	13	HSH	7		LOP	WHIP
89	21	HSH	7		LOP	WHIP
90	5	HTH	1	MP	PILE/BURN/UB	SPC
91	83	HSH	7		LOP	SPC
92	20	HTH	1		MST/UB	NT
93	17	HTH	1	MP	PILE/BURN/UB	SPC
94	31	HTH	5	MP	PILE/BURN/UB	SPC
95	13	HTH	5	MP	PILE/BURN/UB	SPC
97	16	HTH	1		NT	NT
98	16	HTH	3		UB	NT
99	42	HTH	3		UB	NT
100	30	HTH	1	MP	MST/PILE/BURN/UB	SPC
101	44	HTH	2	MP	MST/PILE/BURN/UB	SPC
102	23	HOR	6	MP	PILE/BURN	SPC
103	35	HTH	3		LOP	SPC
106	20	HTH	2	MP	MST/PILE/BURN/UB	SPC
107	32	HTH	2	MP	LFR/PILE/BURN/UB	NT
108	20	HTH	1	MP	PILE/BURN/UB	WHIP
109	23	HSH	7	MP	PILE/BURN	WHIP
110	20	HTH	2		MST/UB	NT
112	7	HSH	7	MP	PILE/BURN	WHIP
113	25	NT	20		MST/UB	NT
115	29	NT	20		MST/UB	NT
116	11	NT	20	HP	LFR/MST/PILE/BURN/UB	NT
117	50	HTH	2		MST/UB	PRUNE
119	29	NT	20	HP	LFR/MST/PILE/BURN/UB	SPC
121	33	HTH	5	MP	MST/LFR/PILE/BURN/UB	NT
122	33	NT	20	HP	MST/PILE/BURN/UB	SPC
123	14	NT	20		UB	NT
124	31	NT	20		UB	NT
125	18	NT	20		UB	NT
126	67	HTH	2		PILE/BURN/UB	NT
128	49	HTH	2		UB	NT
129	57	HTH	2		UB	NT
130	134	HOR	6	MP	PILE/BURN	SPC
131	26	HTH	2	MP	MST/PILE/BURN/UB	SPC
132	84	HTH	5		UB	NT
133	19	HTH	2	MP	MST/LFR/PILE/BURN/UB	NT
134	25	NT	20		MST/LFR/LOP/UB	NT
135	51	NT	20	HP	PILE/BURN	SPC
136	46	HTH	2		UB	NT
137	21	HTH	2		NT	NT
138	23	HTH	2		UB	NT
139	134	HTH	2		UB	SPC
140	36	HTH	2	HP	PILE/BURN	SPC
141	68	HTH	2	HP	PILE/BURN	SPC

Unit	Acres	Harvest Treatments	Silviculture Prescriptions	Pile Type	Fuels Treatments	Timber Stand Improvement Treatments
143	35	HTH	1	MP	MST/UB/PILE/BURN	ABSPC
144	92	HTH	1		UB	NT
145	198	NT	20	HP	MST/UB/PILE/BURN	ABSPC
146	112	NT	20	HP	MST/PILE/BURN	SPC
147	400	HTH	5	MP	MST/PILE/BURN/UB	SPC
148	65	NT	20	HP	MST/LFR/PILE/BURN/UB	SPC
149	235	NT	20	HP	MST/LFR/PILE/BURN/	SPC
150	228	NT	20		MST/UB	NT
151	35	NT	20	HP	MST/PILE/BURN	SPC
152	65	NT	20	HP	PILE/BURN	SPC
153	192	NT	20		MST/UB	NT
154	199	NT	20		MST/UB	NT
155	404	NT	20	HP	MST/UB/LFR/PILE/BURN	NT
156	167	HTH	5	MP	MST/UB/PILE/BURN	ABSPC
159	32	NT	20	HP	MST/LFR/PILE/BURN	SPC
160	120	NT	20	HP	MST/LFR/PILE/BURN	SPC
161	153	HTH	4	MP	MST/PILE/BURN/UB	ABSPC
163	56	NT	20		MST/UB	NT
164	57	NT	20		MST/UB	NT
165	46	HTH	1		MST/UB	SPC
166	48	NT	20	HP	LFR/PILE/BURN/UB	SPC
167	92	NT	20	HP	MST/LFR/PILE/BURN/UB	SPC
168	26	NT	20	HP	MST/LFR/PILE/BURN/UB	SPC
169	60	NT	20		MST/UB	NT
170	58	NT	20	HP	LFR/PILE/BURN	NT
171	129	HTH	3	MP	PILE/BURN	SPC
172	13	NT	20		LFR/LOP/UB	NT
173	22	NT	20		MST/UB	NT
174	25	HSH	7	MP	PILE/BURN	WHIP
175	30	NT	20	HP	MST/LFR/PILE/BURN	SPC
176	43	NT	20	HP	MST/LFR/PILE/BURN	SPC
177	27	NT	20	HP	MST/LFR/PILE/BURN	SPC
179	109	NT	20		MST/UB	NT
180	45	NT	20		MST/UB	SPC
181	24	NT	20	HP	MST/UB/LFR/PILE/BURN	SPC
182	20	NT	20	HP	UB/LFR/PILE/BURN	SPC
183	31	NT	20	HP	MST/UB/LFR/PILE/BURN	SPC
184	7	NT	20	HP	UB/LFR/PILE/BURN	SPC
186	22	NT	20	HP	UB/LFR/PILE/BURN	SPC
189	371	HTH	4	MP	MST/UB/PILE/BURN	ABSPC
190	68	HTH	3	MP	PILE/BURN/UB	SPC
191	13	HTH	3	MP	PILE/BURN/UB	SPC
192	72	NT	20	HP	MST/LFR/PILE/BURN/UB	NT
193	36	NT	20	HP	MST/LFR/PILE/BURN/UB	NT
195	111	NT	20	HP	LFR/PILE/BURN/UB	NT
196	64	HTH	5	MP	PILE/BURN/UB	WHIP

Unit	Acres	Harvest Treatments	Silviculture Prescriptions	Pile Type	Fuels Treatments	Timber Stand Improvement Treatments
197	5	NT	20		UB	NT
198	25	NT	20		UB	NT
199	84	NT	20		MST/UB	NT
200	62	NT	20		MST/UB	NT
201	115	NT	20		MST/UB	NT
202	87	NT	20	HP	MST/LFR/PILE/BURN/UB	NT
206	15	NT	20		MST/UB	NT
207	9	NT	20		MST/UB/LFR/LFR/LOP/UB	SPC
219	16	NT	20		UB	NT
221	28	NT	20		UB	NT
235	9	NT	20		MST/UB/LFR/LFR/LOP/UB	NT
239	14	NT	20		MST/UB/LFR/LFR/LOP/UB	SPC
246	7	NT	20		MST/UB/LFR/LFR/LOP/UB	NT
252	8	NT	20		UB/LFR/LFR/LOP/UB	SPC
257	11	NT	20		UB	NT
263	5	NT	20		MST/UB/LFR/LFR/LOP/UB	SPC
269	32	NT	20		MST/UB/LFR/LFR/LOP/UB	SPC
300	9	NT			NT	NT
301	19	NT			NT	NT
302	105	NT			NT	NT
303	145	NT			NT	NT
304	160	NT			NT	NT
305	83	NT			NT	NT
306	8	NT			NT	NT

Table 79: Alternative 3 Proposed Activities

Unit	Acres	Harvest Treatments	Silviculture Prescriptions	Pile Type	Fuels Treatments	Timber Stand Improvement Treatments
1	9	NT	20		UB/LFR/LFR/LOP/UB	NT
2	28	HTH	2	MP	LFR/PILE/BURN/UB	NT
3	100	HTH	2		LOP/UB	SPC
4	71	HTH	2		UB	NT
5	33	HTH	1		UB	NT
6	20	HTH	2		MST/LFR/LOP/UB	NT
7	27	HTH	2		LOP/UB	SPC
8	34	HTH/HSV	1		PILE/BURN/UB	NT
9	104	HTH	2	MP	LFR/PILE/BURN/UB	NT
10	13	HTH	2	MP	PILE/BURN/UB	SPC
11	18	HTH	5	MP	LFR/PILE/BURN/UB	NT
12	24	HTH	2	MP	PILE/BURN/UB	SPC
13	11	HTH	2	MP	LFR/PILE/BURN/UB	NT
14	94	HTH	2	MP	LFR/PILE/BURN/UB	NT
15	40	HTH	3	MP	MST/PILE/BURN	SPC
16	39	HTH/HSV	4	MP	PILE/BURN/MST/UB	SPC
17	22	HTH	2		MST/UB	NT
18	37	HTH	5	MP	PILE/BURN/UB	WHIP
19	53	HTH	2	MP	LFR/PILE/BURN/UB	NT
20	58	HTH	1		UB	NT
21	38	HTH	1	MP	LFR/PILE/BURN/UB	NT
22	88	HTH	1	MP	MST/LFR/PILE/BURN/UB	NT
23	62	HTH	5	MP	MST/PILE/BURN/UB	SPC
24	32	HTH	2		MST/LFR/LOP/UB	NT
25	11	HTH	2		UB	NT
26	40	HTH	2	MP	PILE/BURN/UB	WHIP
27	64	HTH	5	MP	MST/PILE/BURN/UB	SPC
28	17	HTH	8		LOP	WHIP
29	51	HTH	4	MP	LFR/PILE/BURN/UB	NT
30	61	HTH	2		MST/LFR/LOP/UB	NT
31	24	HTH	1	MP	LFR/PILE/BURN/UB	NT
32	26	HTH	2	MP	LFR/PILE/BURN/UB	NT
33	16	HTH	1	MP	MST/PILE/BURN/UB	WHIP
34	31	NT	20		UB	NT
35	19	HTH	4	MP	PILE/BURN/UB	SPC
36	49	NT	20		LFR/LOP/UB	SPC
37	58	HTH	5	MP	PILE/BURN/UB	SPC
38	129	HTH/HSV	5	MP	PILE/BURN/UB	SPC
39	93	HTH	5	MP	MST/PILE/BURN/UB	SPC
40	15	HTH	2	MP	MST/PILE/BURN/UB	SPC
41	254	HTH	5	MP	MST/PILE/BURN/UB	SPC
42	51	HTH	5	MP	MST/PILE/BURN/UB	SPC
43	65	HTH	2	MP	PILE/BURN/UB	SPC

Unit	Acres	Harvest Treatments	Silviculture Prescriptions	Pile Type	Fuels Treatments	Timber Stand Improvement Treatments
44	43	HTH	2	MP	MST/PILE/BURN/UB	SPC
45	58	HTH	2		MST/UB	NT
46	95	HTH	2	MP	PILE/BURN/UB	SPC
47	90	HTH/HSV	3	MP	PILE/BURN	SPC
48	140	HTH/HSV	3	MP	PILE/BURN	SPC
49	57	HTH	2	MP	PILE/BURN/UB	SPC
50	11	HTH/HSV	2	MP	PILE/BURN/UB	SPC
51	21	HTH	2	MP	LFR/PILE/BURN/UB	NT
52	55	HTH	2	MP	PILE/BURN/UB	SPC
53	60	HTH	5	MP	MST/PILE/BURN/UB	WHIP
54	56	HTH/BIOMASS	10	MP	PILE/BURN/UB	SPC
55	63	HTH	2	MP	LFR/PILE/BURN/UB	NT
56	45	HTH	5	MP	PILE/BURN/UB	SPC
57	55	HTH	2	MP	PILE/BURN/UB	SPC
58	23	HTH	5	MP	PILE/BURN/UB	SPC
59	37	HTHBIOMASS	2	MP	PILE/BURN/UB	SPC
60	70	HTH/HSV	5	MP	PILE/BURN/UB	SPC
61	62	HTH	5	MP	PILE/BURN/UB	WHIP
62	47	HTH	1		MST/UB	NT
63	96	HTH/BIOMASS	5	MP	MST/UB/PILE/BURN	ABSPC
64	52	NT	20		UB/LFR/LFR/LOP/UB	NT
65	48	HTH	2		UB	NT
66	28	HTH	2		UB	NT
68	17	HTH	2	MP	PILE/BURN/UB	WHIP
69	114	HTH	5	MP	MST/PILE/BURN/UB	SPC
70	33	HTH/BIOMASS	10	MP	PILE/BURN/UB	SPC
71	39	HTH	5	MP	LFR/PILE/BURN/UB	NT
72	54	HTH/BIOMASS	10	MP	PILE/BURN/UB	SPC
73	19	HTH	1		LFR/LOP/UB	NT
74	19	HTH/HSV	1		PILE/BURN/UB	NT
75	41	HTH	2		UB	NT
76	12	HTH	2		UB	NT
77	46	HTH	2	MP	MST/PILE/BURN/UB	SPC
78	54	HTH/BIOMASS	10	MP	MST/PILE/BURN/UB	SPC
79	20	HTH/BIOMASS	10	MP	MST/PILE/BURN/UB	SPC
80	39	HTH	2	MP	MST/PILE/BURN/UB	SPC
81	28	HTH/BIOMASS	10	MP	MST/PILE/BURN/UB	SPC
82	27	HTH	8	MP	PILE/BURN	WHIP
83	16	HTH	8	MP	PILE/BURN	WHIP
84	23	HTH	8		LOP	WHIP
85	37	HTH	8		LOP	WHIP
86	10	HTH	8		LOP	WHIP
87	30	HTH	8		NT	NT
88	13	HTH	8		LOP	WHIP
89	21	HTH	8		LOP	WHIP
90	5	HTH/HSV	1	MP	PILE/BURN/UB	SPC

Unit	Acres	Harvest Treatments	Silviculture Prescriptions	Pile Type	Fuels Treatments	Timber Stand Improvement Treatments
91	83	HTH	8		LOP	SPC
92	20	HTH	1		MST/UB	NT
93	17	HTH	1	MP	PILE/BURN/UB	SPC
94	31	HTH/BIOMASS	10	MP	PILE/BURN/UB	SPC
95	13	HTH/BIOMASS	10	MP	PILE/BURN/UB	SPC
97	16	HTH	1		NT	NT
98	16	HTH	3		UB	NT
99	42	HTH	3		UB	NT
100	30	HTH	1	MP	MST/PILE/BURN/UB	SPC
101	44	HTH	2	MP	MST/PILE/BURN/UB	SPC
102	23	HOR	6	MP	PILE/BURN	SPC
103	35	HTH	3		LOP	SPC
106	20	HTH	2	MP	MST/PILE/BURN/UB	SPC
107	32	HTH	2	MP	LFR/PILE/BURN/UB	NT
108	20	HTH	1	MP	PILE/BURN/UB	WHIP
109	23	HTH/HSV	8	MP	PILE/BURN	WHIP
110	20	HTH	2		MST/UB	NT
112	7	HTH/HSV	8	MP	PILE/BURN	WHIP
113	25	NT	20		MST/UB	NT
115	29	NT	20		MST/UB	NT
116	11	NT	20	HP	LFR/MST/PILE/BURN/UB	NT
117	50	HTH	2		MST/UB	PRUNE
119	29	NT	20	HP	LFR/MST/PILE/BURN/UB	NT
121	33	HTH	5	MP	MST/LFR/PILE/BURN/UB	NT
122	33	NT	20	HP	MST/LFR/PILE/BURN/UB	SPC
123	14	NT	20		UB	NT
124	31	NT	20		UB	NT
125	18	NT	20		UB	NT
126	67	HTH	2	MP	PILE/BURN/UB	NT
128	49	HTH	2		UB	NT
129	57	HTH	2		UB	NT
130	134	HOR	6	MP	PILE/BURN	SPC
131	26	HTH	2	MP	MST/PILE/BURN/UB	SPC
132	84	HTH	5		LOP/UB	ABSPC
133	19	HTH	2	MP	MST/LFR/PILE/BURN/UB	NT
134	25	HTH	1		MST/LFR/LOP/UB	NT
135	51	BIOMASS	9	MP	LFR/PILE/BURN	NT
136	46	NT	20	HP	LFR/PILE/BURN/MST/UB	NT
137	21	NT	20	HP	LFR/PILE/BURN/MST/UB	NT
138	23	NT	20	HP	LFR/PILE/BURN/MST	NT
139	134	NT	20		UB	NT
140	36	NT	20	HP	MST/LFR/PILE/BURN/UB	NT
141	68	NT	20	HP	LFR/PILE/BURN	NT
143	35	HTH	1	MP	MST/UB/PILE/BURN	ABSPC
144	92	NT	20	HP	LFR/PILE/BURN/UB	SPC
145	198	NT	20	HP	MST/LFR/PILE/BURN/UB	ABSPC

Unit	Acres	Harvest Treatments	Silviculture Prescriptions	Pile Type	Fuels Treatments	Timber Stand Improvement Treatments
146	112	BIOMASS	9	MP	MST/LFR/PILE/BURN	NT
147	400	HTH	5	MP	MST/PILE/BURN/UB	SPC
148	65	NT	20	HP	MST/LFR/PILE/BURN/UB	NT
149	235	BIOMASS	9	MP	MST/LFR/PILE/BURN	NT
150	228	NT	20		MST/UB	NT
151	35	BIOMASS	9	MP	MST/LFR/PILE/BURN	NT
152	65	BIOMASS	9	MP	LFR/PILE/BURN	NT
153	192	NT	20		MST/UB	NT
154	199	NT	20		MST/UB	NT
155	404	NT	20	HP	MST/UB/LFR/PILE/BURN	NT
156	167	HTH	5	MP	MST/UB/PILE/BURN	ABSPC
159	32	BIOMASS	9	MP	MST/LFR/PILE/BURN	NT
160	120	BIOMASS	9	MP	MST/LFR/PILE/BURN	NT
161	153	HTH	4	MP	MST/PILE/BURN/UB	ABSPC
163	56	NT	20		MST/UB	NT
164	57	NT	20		MST/UB	NT
165	46	HTH	1		MST/LOP/UB	SPC
166	48	NT	20	HP	LFR/PILE/BURN/UB	NT
167	92	NT	20	HP	MST/LFR/PILE/BURN/UB	NT
168	26	NT	20	HP	MST/LFR/PILE/BURN/UB	NT
169	60	NT	20		MST/UB	NT
170	58	NT	20	HP	LFR/PILE/BURN	NT
171	129	HTH	3	MP	PILE/BURN	SPC
172	13	NT	20		LFR/LOP/UB	NT
173	22	NT	20		MST/UB	NT
174	25	HTH/HSV	8	MP	PILE/BURN	WHIP
175	30	BIOMASS	9	MP	MST/LFR/PILE/BURN	NT
176	43	BIOMASS	9	MP	MST/LFR/PILE/BURN	NT
177	27	BIOMASS	9	MP	MST/LFR/PILE/BURN	NT
179	109	NT	20		MST/UB	NT
180	45	BIOMASS	9	MP	MST/LFR/PILE/BURN/UB	NT
181	24	BIOMASS	9	MP	MST/UB/LFR/PILE/BURN	NT
182	20	BIOMASS	9	MP	UB/LFR/PILE/BURN	NT
183	31	BIOMASS	9	MP	MST/UB/LFR/PILE/BURN	NT
184	7	BIOMASS	9	MP	UB/LFR/PILE/BURN	NT
186	22	BIOMASS	9	MP	UB/LFR/PILE/BURN	NT
189	371	HTH	4	MP	MST/UB/PILE/BURN	ABSPC
190	68	HTH	3	MP	PILE/BURN/UB	SPC
191	13	HTH	3	MP	PILE/BURN/UB	SPC
192	72	HTH	20	MP	MST/LFR/PILE/BURN/UB	NT
193	36	HTH	1	MP	MST/LFR/PILE/BURN/UB	NT
195	111	NT	20	HP	LFR/PILE/BURN/UB	NT
196	64	HTH	5	MP	PILE/BURN/UB	WHIP
197	5	NT	20		UB	NT
198	25	NT	20		UB	NT
199	84	NT	20		MST/UB	NT

Unit	Acres	Harvest Treatments	Silviculture Prescriptions	Pile Type	Fuels Treatments	Timber Stand Improvement Treatments
200	62	NT	20		MST/UB	NT
201	115	NT	20		MST/UB	NT
202	87	NT	20	HP	MST/LFR/PILE/BURN/UB	NT
206	15	NT	20		MST/UB	NT
207	9	NT	20		MST/UB/LFR/LFR/LOP/UB	NT
219	16	NT	20		UB	NT
221	28	NT	20		UB	NT
235	9	NT	20		MST/UB/LFR/LFR/LOP/UB	NT
239	14	NT	20		MST/UB/LFR/LFR/LOP/UB	NT
246	7	NT	20		MST/UB/LFR/LFR/LOP/UB	NT
252	8	NT	20		UB/LFR/LFR/LOP/UB	NT
257	11	NT	20		UB	NT
263	5	NT	20		MST/UB/LFR/LFR/LOP/UB	NT
269	32	NT	20		MST/UB/LFR/LFR/LOP/UB	NT
300	9	HTH	2		MST/UB	NT
301	19	HTH	2		MST/UB	NT
302	105	NT	20		MST/UB	NT
303	145	NT	20		MST/UB	NT
304	160	NT	20	HP	MST/LFR/PILE/BURN/UB	NT
305	83	NT	20	HP	MST/LFR/PILE/BURN/UB	NT
306	8	NT	20		UB	NT

APPENDIX B

SOILS

APPENDIX B: SOILS

Appendix B displays quantitative, unit-specific information that shows the predicted amounts of detrimental soil conditions before and after implementation of project activities proposed under both action alternatives. The detailed information in Appendix A is summarized in Table 3-1 of the Soil Specialist Report.

The acres and percentages of existing soil impacts are shown in Column 4. The cumulative increases in detrimental soil conditions following mechanical harvest are shown in Column 5. The net changes following soil mitigation (subsoiling treatments) are shown in Column 6. The subsoil acres are determined by multiplying the estimated percentage (after restoration) by the unit acres (Column 3) and subtracting this amount from the disturbed acres in Column 5. Surface area calculations of designated areas such as roads, main skid trails, and log landings determine how much area needs to be subsoiled within individual activity areas of known size.

Table 80: Appendix B - Alternative 2: Estimates of Detrimental Soil Conditions Following Mechanical Harvest and Soil Restoration Treatments by Activity Areas.

EIS Unit Number	Proposed Activity Regen Cuts: HOR, HSH Thin/Biomass: HTH, BIO, HTH/HSV	Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Conditions After Harvest		Estimated Detrimental Soil Conditions After Restoration	
			Disturbed Acres	% of Unit	Disturbed Acres	% of Unit	Subsoil Acres	% of Unit
2	HTH	29	1.8	6 %	3.8	13 %	0.0	13 %
3	HTH	101	29.8	30 %	37.4	37 %	9.1	28 %
4	HTH	71	18.3	26 %	23.4	33 %	6.4	24 %
5	HTH	33	7.8	24 %	10.2	31 %	3.6	20 %
6	HTH	20	5.2	26 %	6.6	33 %	2.6	20 %
7	HTH	27	6.8	25 %	8.6	32 %	3.2	20 %
8	HTH	34	8.3	24 %	10.5	31 %	3.7	20 %
9	HTH	104	30.0	29 %	37.4	36 %	9.3	27 %
10	HTH	13	2.8	22 %	3.8	29 %	1.2	20 %
11	HTH	18	4.5	25 %	5.8	32 %	2.2	20 %
12	HTH	24	6.8	28 %	8.4	35 %	2.4	25 %
13	HTH	11	2.9	26 %	3.6	33 %	1.0	24 %
14	HTH	94	28.7	31 %	35.7	38 %	9.4	28 %
15	HTH	40	6.6	17 %	9.6	24 %	1.6	20 %
16	HTH	39	11.5	30 %	14.4	37 %	3.5	28 %
17	HTH	22	6.0	27 %	7.5	34 %	2.0	25 %
18	HTH	37	9.5	26 %	12.2	33 %	3.3	24 %
19	HTH	53	14.4	27 %	17.8	34 %	4.4	25 %
20	HTH	58	17.6	30 %	21.5	37 %	5.3	28 %
21	HTH	38	6.7	18 %	10.3	27 %	2.7	20 %
22	HTH	33	0.0	0 %	4.3	13 %	0.0	13 %
23	HTH	88	1.4	2 %	9.2	15 %	0.2	10 %
24	HTH	32	8.5	27 %	10.9	34 %	2.9	25 %
25	HTH	11	2.6	25 %	3.5	32 %	1.3	20 %
26	HTH	40	8.3	21 %	11.7	29 %	3.7	20 %
27	HTH	64	9.8	15 %	16.2	25 %	3.4	20 %
28	HSH	17	0.3	1 %	2.4	14 %	0.0	14 %

EIS Unit Number	Proposed Activity Regen Cuts: HOR, HSH Thin/Biomass: HTH, BIO, HTH/HSV	Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Conditions After Harvest		Estimated Detrimental Soil Conditions After Restoration	
			Disturbed Acres	% of Unit	Disturbed Acres	% of Unit	Subsoil Acres	% of Unit
29	HTH	51	1.4	3 %	7.7	15 %	0.0	15 %
30	HTH	62	16.6	27 %	21.2	34 %	5.7	25 %
31	HTH	24	5.4	23 %	7.3	30 %	2.5	20 %
32	HTH	26	2.5	10 %	5.3	20 %	0.0	20 %
33	HTH	16	0.3	2 %	2.4	15 %	0.0	15 %
34	HTH	31	6.8	22 %	9.0	29 %	2.8	20 %
35	HTH	19	0.2	1 %	2.7	14 %	0.0	14 %
36	HTH	52	13.5	26 %	17.3	33 %	4.8	24 %
37	HTH	58	12.8	22 %	16.8	29 %	5.2	20 %
38	HTH	129	30.5	24 %	40.0	31 %	11.6	22 %
39	HTH	93	21.8	23 %	27.9	30 %	9.3	20 %
40	HTH	15	4.4	29 %	5.4	36 %	1.6	25 %
41	HTH	254	63.3	25 %	81.3	32 %	17.8	25 %
42	HTH	51	9.7	19 %	13.3	26 %	3.6	19 %
43	HTH	65	18.6	29 %	23.4	36 %	5.8	27 %
44	HTH	43	13.1	30 %	15.9	37 %	3.9	28 %
45	HTH	58	17.1	30 %	21.5	37 %	5.3	28 %
46	HTH	96	0.7	1 %	13.0	14 %	0.0	14 %
47	HTH	90	0.9	1 %	12.4	14 %	0.0	14 %
48	HTH	140	3.7	2 %	21.8	16 %	0.6	15 %
49	HTH	57	16.7	29 %	20.5	36 %	5.1	27 %
50	HTH	11	3.9	36 %	4.7	43 %	1.4	30 %
51	HTH	21	5.6	27 %	7.1	34 %	1.8	25 %
52	HTH	55	16.2	30 %	20.4	37 %	5.0	28 %
53	HTH	60	17.8	30 %	22.2	37 %	5.4	28 %
54	HTH	56	8.6	15 %	12.3	22 %	1.1	20 %
55	HTH	63	19.8	31 %	23.9	38 %	6.3	28 %
56	HTH	45	14.6	32 %	17.6	39 %	4.1	30 %
57	HTH	55	12.5	23 %	17.2	31 %	6.2	20 %
58	HTH	23	5.7	25 %	7.6	33 %	3.0	20 %
59	HTH	37	0.9	2 %	5.5	15 %	0.0	15 %
60	HTH	70	1.1	2 %	10.0	14 %	0.0	14 %
61	HTH	62	0.8	1 %	8.7	14 %	0.3	14 %
62	HTH	47	1.0	2 %	7.1	15 %	0.0	15 %
63	HTH	96	11.7	12 %	22.2	23 %	3.0	20 %
65	HTH	48	14.0	29 %	17.5	36 %	4.5	27 %
66	HTH	28	8.1	29 %	10.1	36 %	3.1	25 %
68	HTH	17	4.1	24 %	5.5	32 %	2.1	20 %
69	HTH	114	33.4	29 %	42.0	37 %	11.2	27 %
70	HTH	33	1.2	4 %	5.6	17 %	0.0	17 %
71	HTH	39	0.3	1 %	5.5	14 %	0.0	14 %
72	HTH	54	1.1	2 %	8.0	15 %	0.0	15 %
73	HTH	19	5.1	27 %	6.6	35 %	1.8	25 %

EIS Unit Number	Proposed Activity Regen Cuts: HOR, HSH Thin/Biomass: HTH, BIO, HTH/HSV	Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Conditions After Harvest		Estimated Detrimental Soil Conditions After Restoration	
			Disturbed Acres	% of Unit	Disturbed Acres	% of Unit	Subsoil Acres	% of Unit
74	HTH	19	0.5	3 %	3.0	16 %	0.5	13 %
75	HTH	41	12.1	30 %	15.2	37 %	3.7	28 %
76	HTH	12	3.2	27 %	4.1	34 %	1.3	23 %
77	HTH	46	11.6	25 %	15.6	34 %	5.0	23 %
78	HTH	54	11.5	21 %	15.1	28 %	4.3	20 %
79	HTH	20	0.0	0 %	2.6	13 %	0.0	13 %
80	HTH	39	11.3	29 %	14.0	36 %	3.5	27 %
81	HTH	28	4.9	16 %	7.8	28 %	2.2	20 %
82	HSH	27	0.6	2 %	3.0	11 %	0.0	11 %
83	HSH	16	0.2	1 %	1.9	12 %	0.0	12 %
84	HSH	23	0.0	0 %	3.0	13 %	0.0	13 %
85	HSH	37	0.0	0 %	4.8	13 %	0.0	13 %
86	HSH	10	0.0	0 %	1.3	13 %	0.0	13 %
87	HSH	30	1.8	6 %	4.3	14 %	0.0	14 %
88	HSH	13	0.7	5 %	2.2	17 %	0.0	17 %
89	HSH	21	0.0	0 %	2.7	13 %	0.0	13 %
90	HTH	5	0.0	0 %	0.7	13 %	0.0	13 %
91	HSH	83	0.5	1 %	11.6	14 %	0.0	14 %
92	HTH	20	0.3	2 %	3.0	15 %	0.0	15 %
93	HTH	17	0.3	2 %	2.6	15 %	0.0	15 %
94	HTH	31	0.3	1 %	4.3	14 %	0.0	14 %
95	HTH	13	0.6	2 %	2.2	15 %	0.0	15 %
97	HTH	16	0.5	9 %	2.0	12 %	0.0	12 %
98	HTH	16	3.6	23 %	4.8	30 %	1.6	20 %
99	HTH	42	4.8	11 %	8.8	21 %	2.5	15 %
100	HTH	30	1.7	6 %	5.5	18 %	0.0	18 %
101	HTH	44	12.9	29 %	15.8	36 %	3.9	27 %
102	HOR	23	4.0	17 %	5.5	24 %	4.6	4 %
103	HTH	35	0.0	0 %	4.6	13 %	0.0	13 %
106	HTH	20	5.8	29 %	7.2	36 %	2.2	25 %
107	HTH	32	10.1	32 %	12.5	39 %	3.2	29 %
108	HTH	20	5.8	29 %	7.2	36 %	2.2	25 %
109	HTH	23	6.6	29 %	8.3	36 %	2.3	26 %
110	HTH	20	5.2	26 %	6.7	34 %	2.1	23 %
112	HTH	7	2.1	30 %	2.6	37 %	1.0	23 %
117	HTH	50	0.0	0 %	6.5	13 %	0.0	13 %
121	HTH	33	0.2	1 %	4.6	14 %	0.0	14 %
126	HTH	67	19.0	28 %	23.5	35 %	6.7	25 %
128	HTH	49	6.5	13 %	10.4	21 %	0.6	20 %
129	HTH	57	11.3	20 %	15.4	27 %	4.0	20 %
130	HOR	134	21.5	16 %	30.8	23 %	17.4	10 %
131	HTH	26	7.7	30 %	9.6	37 %	2.3	28 %
132	HTH	84	21.5	26 %	27.5	33 %	7.3	24 %

EIS Unit Number	Proposed Activity Regen Cuts: HOR, HSH Thin/Biomass: HTH, BIO, HTH/HSV	Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Conditions After Harvest		Estimated Detrimental Soil Conditions After Restoration	
			Disturbed Acres	% of Unit	Disturbed Acres	% of Unit	Subsoil Acres	% of Unit
133	HTH	19	6.1	32 %	7.4	39 %	2.1	28 %
136	HTH	46	10.9	24 %	13.3	29 %	4.1	20 %
137	HTH	21	5.5	26 %	6.5	31 %	2.3	20 %
138	HTH	23	6.9	30 %	8.1	35 %	1.9	27 %
139	HTH	134	37.1	28 %	44.2	33 %	9.4	26 %
140	HTH	36	9.6	27 %	11.5	32 %	2.5	25 %
141	HTH	68	18.0	27 %	18.4	32 %	1.4	25 %
143	HTH	35	8.5	24 %	11.1	32 %	3.4	22 %
144	HTH	92	17.4	19 %	22.1	24 %	8.3	15 %
147	HTH	400	60.6	15 %	100.2	25 %	20.2	20 %
156	HTH	167	27.1	16 %	43.1	26 %	9.7	20 %
161	HTH	153	8.6	6 %	27.4	18 %	0.2	18 %
165	HTH	46	13.1	29 %	16.6	36 %	4.2	27 %
171	HTH	129	39.1	30 %	47.7	37 %	9.0	30 %
174	HSH	25	0.0	0 %	3.3	13 %	0.0	13 %
189	HTH	371	14.7	4 %	58.5	16 %	0.0	16 %
190	HTH	68	20.4	30 %	25.2	37 %	8.2	25 %
191	HTH	13	3.3	25 %	4.2	32 %	1.6	20 %
196	HTH	64	15.9	25 %	20.5	32 %	5.8	23 %

Table 81: Appendix B - Alternative 3 - Estimates of Detrimental Soil Conditions Following Mechanical Harvest and Soil Restoration Treatments by Activity Areas

EIS Unit Number	Proposed Activity Regen Cuts: HOR, HSH Thin/Biomass: HTH, BIO, HTH/HSV	Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Conditions After Harvest		Estimated Detrimental Soil Conditions After Restoration	
			Disturbed Acres	% of Unit	Disturbed Acres	% of Unit	Subsoil Acres	% of Unit
2	HTH	29	1.8	6 %	3.8	13 %	0.0	13 %
3	HTH	101	29.8	30 %	37.4	37 %	9.1	28 %
4	HTH	71	18.3	26 %	23.4	33 %	6.4	24 %
5	HTH	33	7.8	24 %	10.2	31 %	3.6	20 %
6	HTH	20	5.2	26 %	6.6	33 %	2.6	20 %
7	HTH	27	6.8	25 %	8.6	32 %	3.2	20 %
8	HTH/HSV	34	8.3	24 %	10.5	31 %	3.7	20 %
9	HTH	104	30.0	29 %	37.4	36 %	9.3	27 %
10	HTH	13	2.8	22 %	3.8	29 %	1.2	20 %
11	HTH	18	4.5	25 %	5.8	32 %	2.2	20 %
12	HTH	24	6.8	28 %	8.4	35 %	2.4	25 %
13	HTH	11	2.9	26 %	3.6	33 %	1.0	24 %
14	HTH	94	28.7	31 %	35.7	38 %	9.4	28 %
15	HTH	40	6.6	17 %	9.6	24 %	1.6	20 %
16	HTH/HSV	39	11.5	30 %	14.4	37 %	3.5	28 %
17	HTH	22	6.0	27 %	7.5	34 %	2.0	25 %
18	HTH	37	9.5	26 %	12.2	33 %	3.3	24 %
19	HTH	53	14.4	27 %	17.8	34 %	4.4	25 %
20	HTH	58	17.6	30 %	21.5	37 %	5.3	28 %
21	HTH	38	6.7	18 %	10.3	27 %	2.7	20 %
22	HTH	33	0.0	0 %	4.3	13 %	0.0	13 %
23	HTH	88	1.4	2 %	9.2	15 %	0.2	10 %
24	HTH	32	8.5	27 %	10.9	34 %	2.9	25 %
25	HTH	11	2.6	25 %	3.5	32 %	1.3	20 %
26	HTH	40	8.3	21 %	11.7	29 %	3.7	20 %
27	HTH	64	9.8	15 %	16.2	25 %	3.4	20 %
28	HTH	17	0.3	1 %	2.4	14 %	0.0	14 %
29	HTH	51	1.4	3 %	7.7	15 %	0.0	15 %
30	HTH	62	16.6	27 %	21.2	34 %	5.7	25 %
31	HTH	24	5.4	23 %	7.3	30 %	2.5	20 %
32	HTH	26	2.5	10 %	5.3	20 %	0.0	20 %
33	HTH	16	0.3	2 %	2.4	15 %	0.0	15 %
34	HTH	31	6.8	22 %	9.0	29 %	2.8	20 %
35	HTH	19	0.2	1 %	2.7	14 %	0.0	14 %
36	HTH	52	13.5	26 %	17.3	33 %	4.8	24 %
37	HTH	58	12.8	22 %	16.8	29 %	5.2	20 %
38	HTH/HSV	129	30.5	24 %	40.0	31 %	11.6	22 %
39	HTH	93	21.8	23 %	27.9	30 %	9.3	20 %
40	HTH	15	4.4	29 %	5.4	36 %	1.6	25 %

EIS Unit Number	Proposed Activity Regen Cuts: HOR, HSH Thin/Biomass: HTH, BIO, HTH/HSV	Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Conditions After Harvest		Estimated Detrimental Soil Conditions After Restoration	
			Disturbed Acres	% of Unit	Disturbed Acres	% of Unit	Subsoil Acres	% of Unit
41	HTH	254	63.3	25 %	81.3	32 %	17.8	25 %
42	HTH	51	9.7	19 %	13.3	26 %	3.6	19 %
43	HTH	65	18.6	29 %	23.4	36 %	5.8	27 %
44	HTH	43	13.1	30 %	15.9	37 %	3.9	28 %
45	HTH	58	17.1	30 %	21.5	37 %	5.3	28 %
46	HTH	96	0.7	1 %	13.0	14 %	0.0	14 %
47	HTH/HSV	90	0.9	1 %	12.4	14 %	0.0	14 %
48	HTH/HSV	140	3.7	2 %	21.8	16 %	0.6	15 %
49	HTH	57	16.7	29 %	20.5	36 %	5.1	27 %
50	HTH/HSV	11	3.9	36 %	4.7	43 %	1.4	30 %
51	HTH	21	5.6	27 %	7.1	34 %	1.8	25 %
52	HTH	55	16.2	30 %	20.4	37 %	5.0	28 %
53	HTH	60	17.8	30 %	22.2	37 %	5.4	28 %
54	HTH	56	8.6	15 %	12.3	22 %	1.1	20 %
55	HTH	63	19.8	31 %	23.9	38 %	6.3	28 %
56	HTH	45	14.6	32 %	17.6	39 %	4.1	30 %
57	HTH	55	12.5	23 %	17.2	31 %	6.2	20 %
58	HTH	23	5.7	25 %	7.6	33 %	3.0	20 %
59	HTH/BIO	37	0.9	2 %	5.5	15 %	0.0	15 %
60	HTH	70	1.1	2 %	10.0	14 %	0.0	14 %
61	HTH	62	0.8	1 %	8.7	14 %	0.3	14 %
62	HTH	47	1.0	2 %	7.1	15 %	0.0	15 %
63	HTH/BIO	96	11.7	12 %	22.2	23 %	3.0	20 %
65	HTH	48	14.0	29 %	17.5	36 %	4.5	27 %
66	HTH	28	8.1	29 %	10.1	36 %	3.1	25 %
68	HTH	17	4.1	24 %	5.5	32 %	2.1	20 %
69	HTH	114	33.4	29 %	42.0	37 %	11.2	27 %
70	HTH/BIO	33	1.2	4 %	5.6	17 %	0.0	17 %
71	HTH	39	0.3	1 %	5.5	14 %	0.0	14 %
72	HTH/BIO	54	1.1	2 %	8.0	15 %	0.0	15 %
73	HTH	19	5.1	27 %	6.6	35 %	1.8	25 %
74	HTH/HSV	19	0.5	3 %	3.0	16 %	0.5	13 %
75	HTH	41	12.1	30 %	15.2	37 %	3.7	28 %
76	HTH	12	3.2	27 %	4.1	34 %	1.3	23 %
77	HTH	46	11.6	25 %	15.6	34 %	5.0	23 %
78	HTH/BIO	54	11.5	21 %	15.1	28 %	4.3	20 %
79	HTH/BIO	20	0.0	0 %	2.6	13 %	0.0	13 %
80	HTH	39	11.3	29 %	14.0	36 %	3.5	27 %
81	HTH/BIO	28	4.9	16 %	7.8	28 %	2.2	20 %
82	HTH	27	0.6	2 %	3.0	11 %	0.0	11 %
83	HTH	16	0.2	1 %	1.9	12 %	0.0	12 %
84	HTH	23	0.0	0 %	3.0	13 %	0.0	13 %
85	HTH	37	0.0	0 %	4.8	13 %	0.0	13 %

EIS Unit Number	Proposed Activity Regen Cuts: HOR, HSH Thin/Biomass: HTH, BIO, HTH/HSV	Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Conditions After Harvest		Estimated Detrimental Soil Conditions After Restoration	
			Disturbed Acres	% of Unit	Disturbed Acres	% of Unit	Subsoil Acres	% of Unit
86	HTH	10	0.0	0 %	1.3	13 %	0.0	13 %
87	HTH	30	1.8	6 %	4.3	14 %	0.0	14 %
88	HTH	13	0.7	5 %	2.2	17 %	0.0	17 %
89	HTH	21	0.0	0 %	2.7	13 %	0.0	13 %
90	HTH/HSV	5	0.0	0 %	0.7	13 %	0.0	13 %
91	HTH	83	0.5	1 %	11.6	14 %	0.0	14 %
92	HTH	20	0.3	2 %	3.0	15 %	0.0	15 %
93	HTH	17	0.3	2 %	2.6	15 %	0.0	15 %
94	HTH/BIO	31	0.3	1 %	4.3	14 %	0.0	14 %
95	HTH/BIO	13	0.6	2 %	2.2	15 %	0.0	15 %
97	HTH	16	0.5	9 %	2.0	12 %	0.0	12 %
98	HTH	16	3.6	23 %	4.8	30 %	1.6	20 %
99	HTH	42	4.8	11 %	8.8	21 %	2.5	15 %
100	HTH	29	1.7	6 %	5.5	18 %	0.0	18 %
101	HTH	44	12.9	29 %	15.8	36 %	3.9	27 %
102	HOR	22	4.0	17 %	5.5	24 %	4.6	4 %
103	HTH	35	0.0	0 %	4.6	13 %	0.0	13 %
106	HTH	20	5.8	29 %	7.2	36 %	2.2	25 %
107	HTH	32	10.1	32 %	12.5	39 %	3.2	29 %
108	HTH	20	5.8	29 %	7.2	36 %	2.2	25 %
109	HTH/HSV	24	6.6	29 %	8.3	36 %	2.3	26 %
110	HTH	20	5.2	26 %	6.7	34 %	2.1	23 %
112	HTH/HSV	7	2.1	30 %	2.6	37 %	1.0	23 %
117	HTH	50	0.0	0 %	6.5	13 %	0.0	13 %
121	HTH	33	0.2	1 %	4.6	14 %	0.0	14 %
126	HTH	67	19.0	28 %	23.5	35 %	6.7	25 %
128	HTH	49	6.5	13 %	10.4	21 %	0.6	20 %
129	HTH	57	11.3	20 %	15.4	27 %	4.0	20 %
130	HOR	134	21.5	16 %	30.8	23 %	17.4	10 %
131	HTH	26	7.7	30 %	9.6	37 %	2.3	28 %
132	HTH	84	21.5	26 %	27.5	33 %	7.3	24 %
133	HTH	19	6.1	32 %	7.4	39 %	2.1	28 %
134	HTH	25	4.9	20 %	7.0	28 %	2.0	20 %
135	BIO	51	0.2	< 1 %	6.6	13 %	0.0	13 %
143	HTH	35	8.5	24 %	11.1	32 %	3.4	22 %
146	BIO	111	33.6	30 %	41.1	37 %	10.0	28 %
147	HTH	400	60.6	15 %	100.2	25 %	20.2	28 %
149	BIO	235	68.3	29 %	84.6	36 %	16.4	29 %
151	BIO	35	8.7	26 %	11.5	33 %	3.4	23 %
152	BIO	65	17.3	27 %	22.3	34 %	6.7	24 %
156	HTH	167	27.1	16 %	43.1	26 %	9.7	20 %
159	BIO	32	9.4	29 %	11.8	37 %	3.2	27 %
160	BIO	120	28.0	23 %	37.8	31 %	13.8	20 %

EIS Unit Number	Proposed Activity Regen Cuts: HOR, HSH Thin/Biomass: HTH, BIO, HTH/HSV	Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Conditions After Harvest		Estimated Detrimental Soil Conditions After Restoration	
			Disturbed Acres	% of Unit	Disturbed Acres	% of Unit	Subsoil Acres	% of Unit
161	HTH	153	8.6	6 %	27.4	18 %	0.2	18 %
165	HTH	46	13.1	29 %	16.6	36 %	4.2	27 %
171	HTH	129	39.1	30 %	47.7	37 %	9.0	30 %
174	HTH	25	0.0	0 %	3.3	13 %	0.0	13 %
175	BIO	30	8.1	27 %	10.4	35 %	2.9	25 %
176	BIO	43	6.4	15 %	9.7	23 %	1.1	20 %
177	BIO	27	7.3	27 %	9.4	35 %	2.6	25 %
180	BIO	45	8.1	18 %	11.4	25 %	2.4	20 %
181	BIO	24	6.6	28 %	8.4	35 %	2.4	25 %
182	BIO	20	5.2	26 %	6.7	34 %	1.9	24 %
183	BIO	31	9.0	29 %	11.2	36 %	2.8	27 %
184	BIO	7	2.0	29 %	2.5	36 %	1.0	21 %
186	BIO	22	6.4	29 %	7.9	36 %	2.2	26 %
189	HTH	371	14.7	4 %	58.5	16 %	0.0	16 %
190	HTH	68	20.4	30 %	25.2	37 %	8.2	25 %
191	HTH	13	3.3	25 %	4.2	32 %	1.6	20 %
192	HTH	72	3.5	5 %	12.1	17 %	0.0	17 %
193	HTH	36	9.6	27 %	12.2	34 %	3.2	25 %
196	HTH	64	15.9	25 %	20.5	32 %	5.8	23 %
300	HTH	9	0.0	0 %	1.2	13 %	0.0	13 %
301	HTH	19	0.0	0 %	2.5	13 %	0.0	13 %

APPENDIX C

FIRE AND FUELS

APPENDIX C: FIRE AND FUELS

Table 82: Alternative 2 (Proposed Action) Fuels Treatments by Unit Number and Total Acres

Alternative 2 (Proposed Action)		
Treatment	**Unit #**	**Acres**
Ladder Fuel Reduction And Precommercial Thinning	1, 2, 3, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 21, 22, 23, 24, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 63, 64, 68, 69, 70, 71, 72 73, 78, 79, 80, 81, 82, 83, 84, 85, 86, 88, 89, 90, 91, 93, 94, 95, 100, 101, 102, 103, 106, 107, 108, 109, 112, 116, 119, 121, 122, 130, 131, 133, 134, 135, 140, 141, 143, 145, 146, 147, 148, 149, 151, 152, 155, 156, 159, 160, 161, 165, 166, 167, 168, 170, 171, 172, 174, 175, 176, 177, 180, 181, 182, 183, 184, 186, 189, 190, 191, 192, 193, 195, 196, 202, 207, 235, 239, 246, 252, 263, 269	7,985
Handpiling	1, 64, 116, 119, 122, 135, 140, 141, 145, 146, 148, 149, 151, 152, 155 159, 160, 166, 167, 168, 170, 175, 176, 177, 180, 181, 182, 183, 184, 186, 192, 193, 195, 202	2,334
Machine Piling	2, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 21, 22, 23, 26, 27, 29, 31, 32 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 57, 58, 59, 60, 61, 63, 68, 69, 70, 71, 72, 74, 78, 79, 80, 81, 82, 83, 90 93, 94, 95, 100, 101, 102, 106, 107, 108, 109, 112, 121, 126, 130, 131 133, 143, 147, 156, 161, 171, 174, 189, 190, 191, 196	5,061
Lop and Scatter	1, 3, 6, 7, 24, 28, 30, 33, 35, 36, 64, 73, 84, 85, 86, 88, 89, 91, 103, 134, 172, 207, 235, 239, 246, 252, 263, 269	765
Mechanical Shrub Treatment	6, 15, 16, 17, 22, 23, 24, 27, 30, 39, 40, 41, 42, 44, 45, 53, 62, 63, 69, 77, 78, 79, 80, 81, 92, 100, 101, 106, 110, 113, 115, 116, 117, 119, 121, 122, 131, 133, 134, 143, 145, 147, 148, 149, 150, 153, 154, 155, 156, 159, 160, 161, 163, 164, 165, 167, 168, 169, 173, 175, 176, 177, 179, 180, 181, 183, 189, 192, 193, 199, 200, 201, 202, 206, 207, 235, 239, 246, 263, 269	5,874
Pile Burn	1, 2, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 21, 22, 23, 26, 27, 29, 31, 32, 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55 56, 57, 58, 59, 60, 61, 63, 64, 68, 69, 70, 71, 72, 74, 78, 79, 80, 81, 82 83, 90, 93, 94, 95, 100, 101, 102, 106, 107, 108, 109, 112, 116, 119, 121, 122, 126, 130, 131, 133, 135, 140, 141, 143, 145, 146, 147, 148, 149, 151, 152, 155, 156, 159, 160, 161, 166, 167, 168, 170, 171, 174, 175, 176, 177, 180, 181, 182, 183, 184, 186, 189, 190, 191, 192, 193, 195, 196, 202	7,395
Underburn	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43 44, 45, 46, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 90, 92, 93 94, 95, 98, 99, 100, 101, 106, 107, 108, 110, 113, 115, 116, 117, 119, 121, 122, 123, 124, 125, 126, 128, 129, 131, 132, 133, 134, 136, 138, 139, 143, 144, 145, 147, 148, 150, 153, 154, 155, 156, 159, 161, 163, 164, 165, 166, 167, 168, 169, 172, 173, 179, 180, 181, 182, 183, 184, 186, 189, 190, 191, 192, 193, 195, 196, 197, 198, 199, 200, 201, 202, 206, 207, 219, 221, 235, 239, 246, 252, 257, 263, 269,	8,912

Fuel treatments for each unit and summarized acreages for Alternative 3 are displayed in the following table.

Table 83: Alternative 3 Fuels Treatments by Unit Number and Total Acres

Alternative 3		
Treatment	**Unit #**	**Acres**
Ladder Fuel Reduction And Precommercial Thinning	1, 2, 3, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 63, 64, 68, 69, 71, 72, 73, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 88, 89, 90, 91, 93, 94, 95, 100, 101, 102, 103, 106, 107, 108, 109, 112, 116, 119, 121, 122, 130, 131, 132, 133, 134, 135, 136, 137, 138, 140, 141, 143, 144, 145, 146, 147, 148, 149, 151, 152,155, 156, 159, 160, 161, 165, 166, 167, 168, 170, 171, 172, 174, 175, 176, 177, 180, 181, 182, 183, 184, 186, 189, 190, 191, 192, 193, 195, 196, 202, 207, 235, 239, 246, 252, 263, 269, 304, 305	8,586
Handpiling	116, 119, 122, 136, 137, 140, 141, 144, 145, 148,155, 166, 167, 168, 170, 195, 202, 304, 305	1,691
Machine Piling	2, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 21, 22, 23, 26, 27, 29, 31, 32 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 57, 58, 59, 60, 61, 63, 68, 69, 70, 71, 72, 74, 77, 78, 79, 80, 81, 82, 83 90, 93, 94, 95, 100, 101, 102, 106, 107, 108, 109, 112, 121, 126, 130, 131, 133, 135, 143, 146, 147, 149, 151, 152, 156, 159, 160, 161, 171, 174, 175, 176, 177, 180, 181, 182, 183, 184, 186, 189, 190, 191, 192, 193,196	6,114
Lop and Scatter	1, 3, 6, 7, 24, 28, 30, 33, 35, 36, 64, 73, 84, 85, 86, 88, 89, 91, 103, 122, 132, 134, 165, 172, 207, 235, 239, 246, 252, 263, 269	928
Mechanical Shrub Treatment	6, 15, 16, 17, 22, 23, 24, 27, 30, 39, 40, 41, 42, 44, 45, 53, 62, 63, 69, 77, 78, 79, 80, 81, 92, 100, 101, 106, 110, 113, 115, 116, 117, 119, 121, 122, 131, 133, 134, 136, 137, 138, 140, 143, 145, 146, 147, 148, 149, 150, 151, 153, 154, 155, 156, 159, 160, 161, 163, 164, 165, 167, 168, 169, 173, 175, 176, 177, 179, 180, 181, 183, 189, 192, 193, 199, 200, 201, 202, 206, 207, 235, 239, 246, 263, 269, 300, 301, 302, 303, 304, 305	6,668
Pile Burn	2, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 21, 22, 23, 26, 27, 29, 31, 32 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 57, 58, 59, 60, 61, 63, 68, 69, 70, 71, 72, 74, 77, 78, 79, 80, 81, 82, 83 90, 93, 94, 95, 100, 101, 102, 106, 107, 108, 109, 112, 116, 119, 121, 122, 126, 130, 131, 133, 135, 136, 137, 138, 140, 141, 143, 144, 145, 146, 147, 148, 149, 151, 152, 155, 156, 159, 160, 161, 166, 167, 168, 170, 171, 174, 175, 176, 177, 180, 181, 182, 183, 184, 186, 189, 190, 191, 192, 193, 195, 196, 202, 304, 305	7,805
Underburn	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43 44, 45, 46, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64 65, 66, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 90, 92, 93 94, 95, 98, 99, 100, 101, 106, 107, 108, 110, 113, 115, 116, 117, 119, 121, 122, 123, 124, 125, 126, 128, 129, 131, 132, 133, 134, 136, 137, 139, 140, 143, 144, 145, 147, 148, 150, 153, 154, 155, 156, 161, 163, 164, 165, 166, 167, 168, 169, 172, 173, 179, 180, 181, 182, 183, 184, 186, 189, 190, 191, 192, 193, 195, 196, 197, 198, 199, 200, 201, 202, 206, 207, 219, 221, 235, 239, 246, 252, 257, 263, 269, 300, 301, 302, 303, 304, 305, 306	9,443

Figure 23: Alternative 1 (No Action) – Wildfire Crown Fire Potential without Treatment

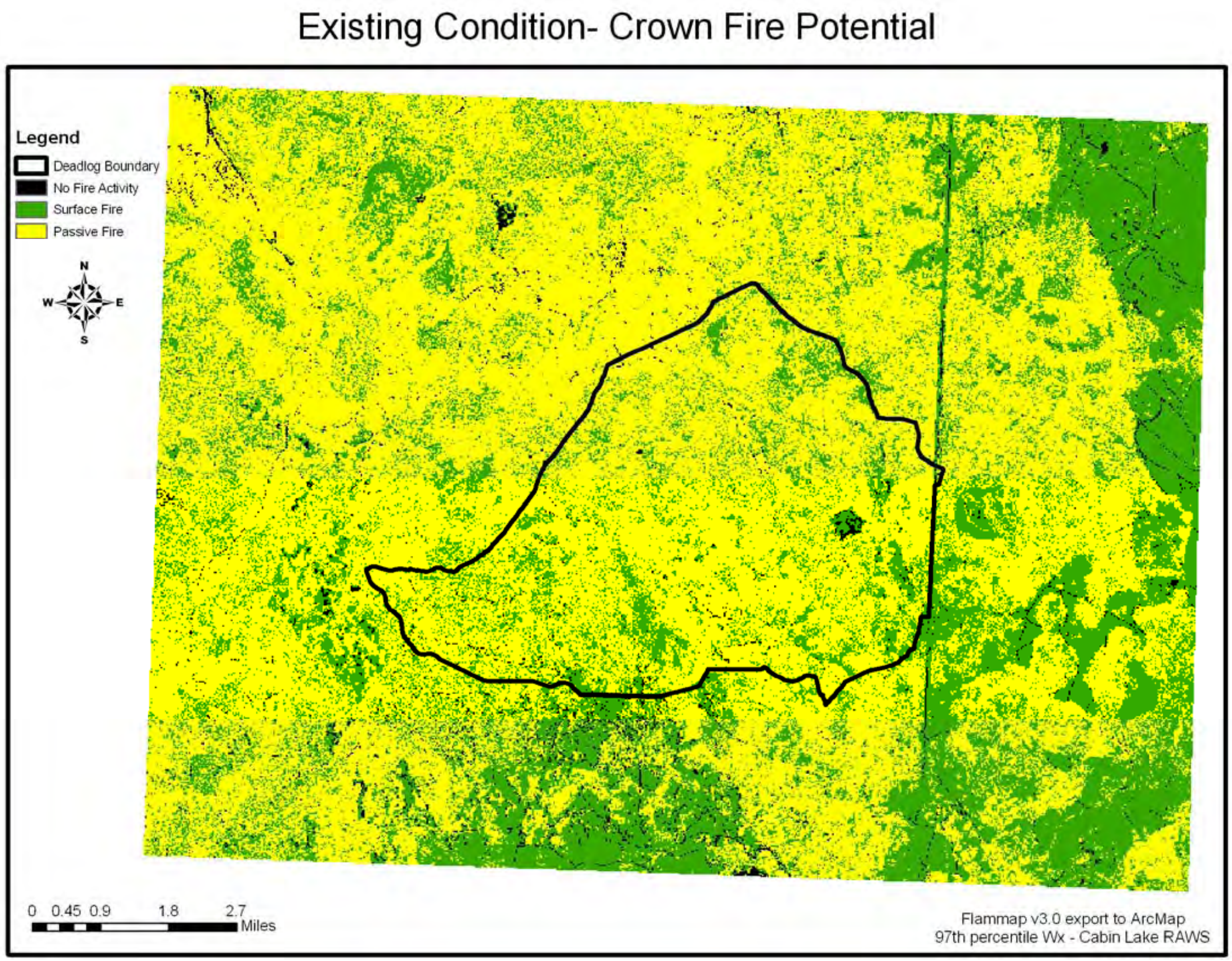


Figure 24: Alternative 2 (Proposed Action) – Wildfire Crown Fire Potential Following Treatment

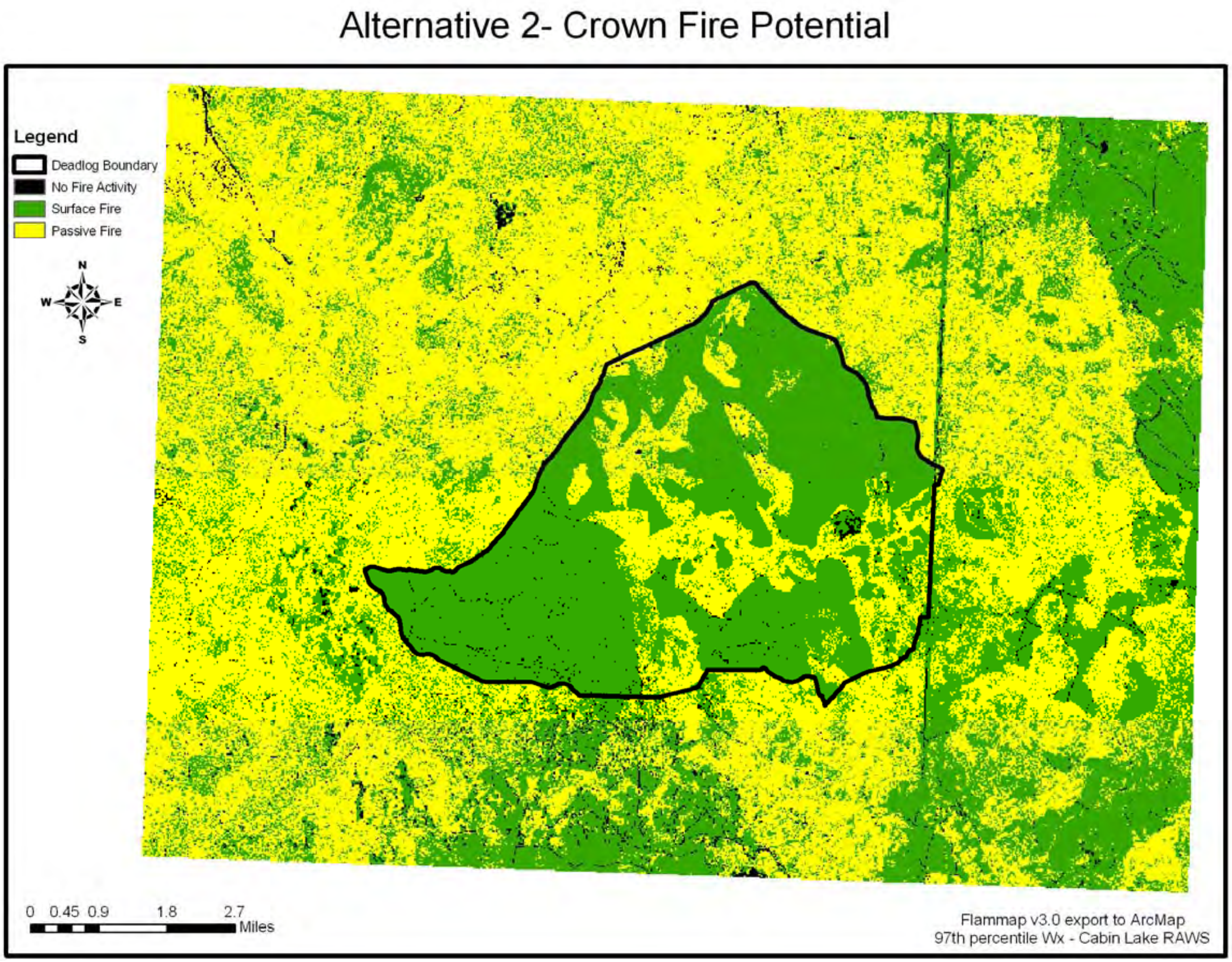


Figure 25: Alternative 3 - Wildfire Crown Fire Potential Following Treatment

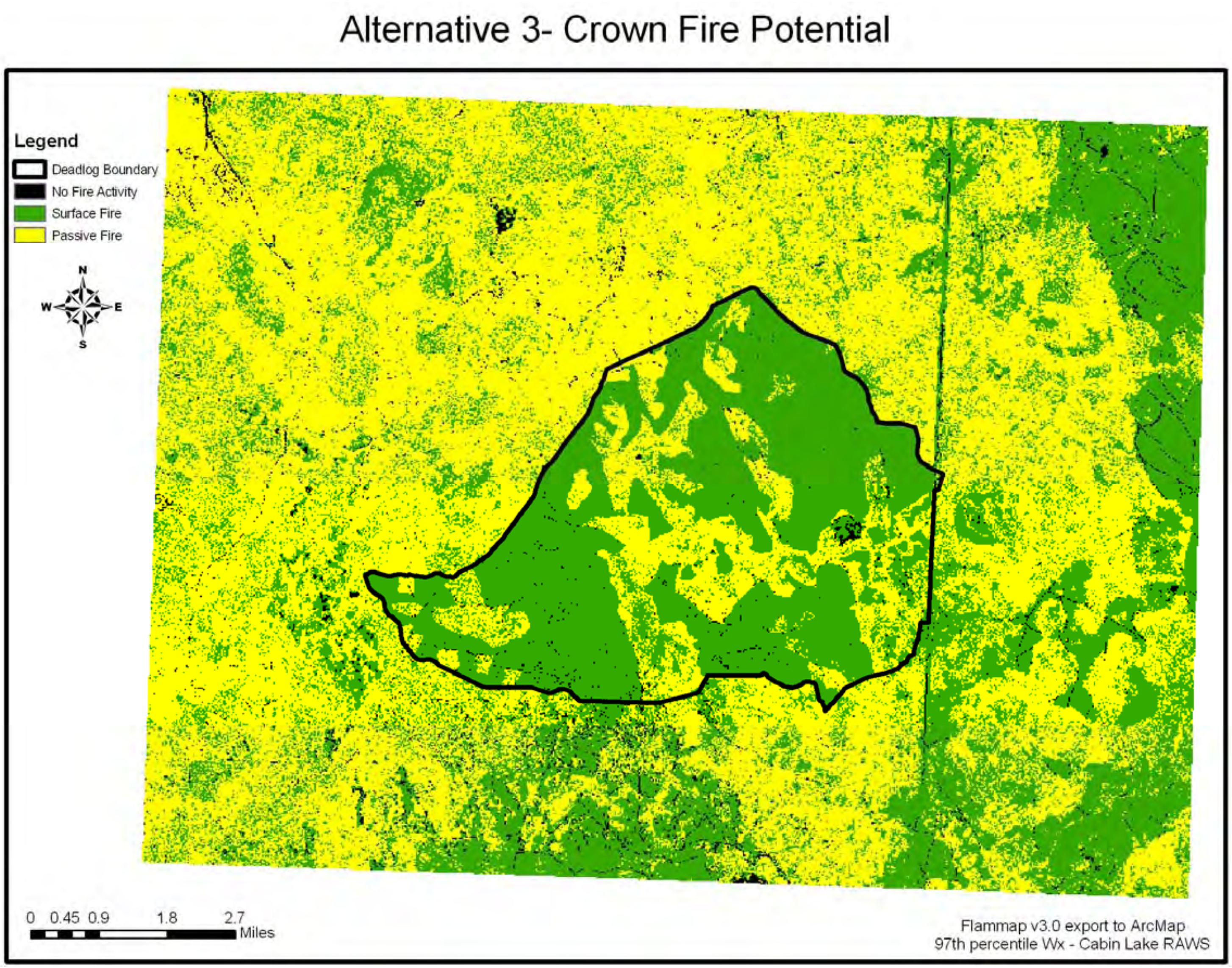


Figure 26: Alternative 1 (No Action) - Wildfire Flame Length Potential in Feet

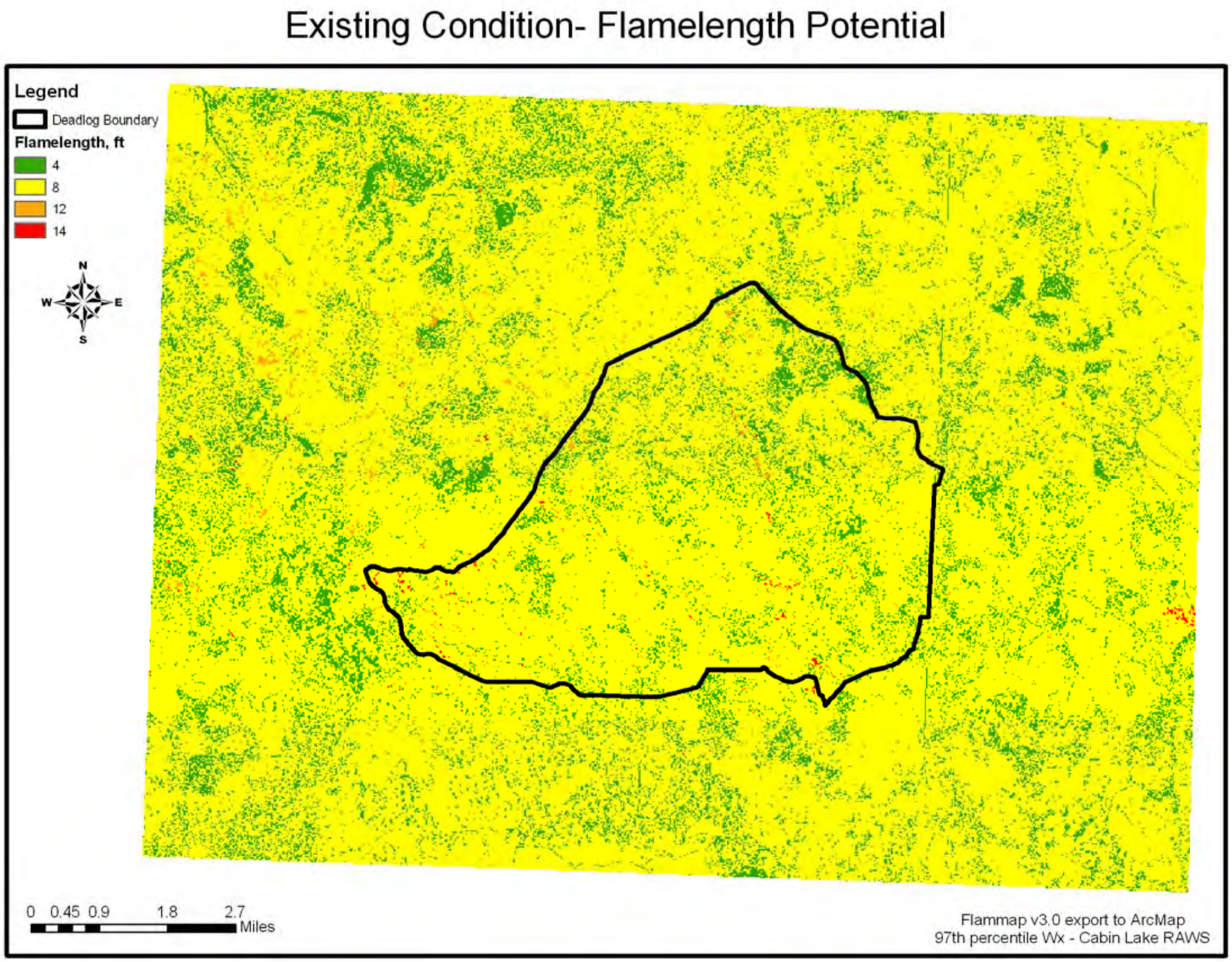


Figure 27: Alternative 2 (Proposed Action) - Wildfire Flame Length Potential in Feet

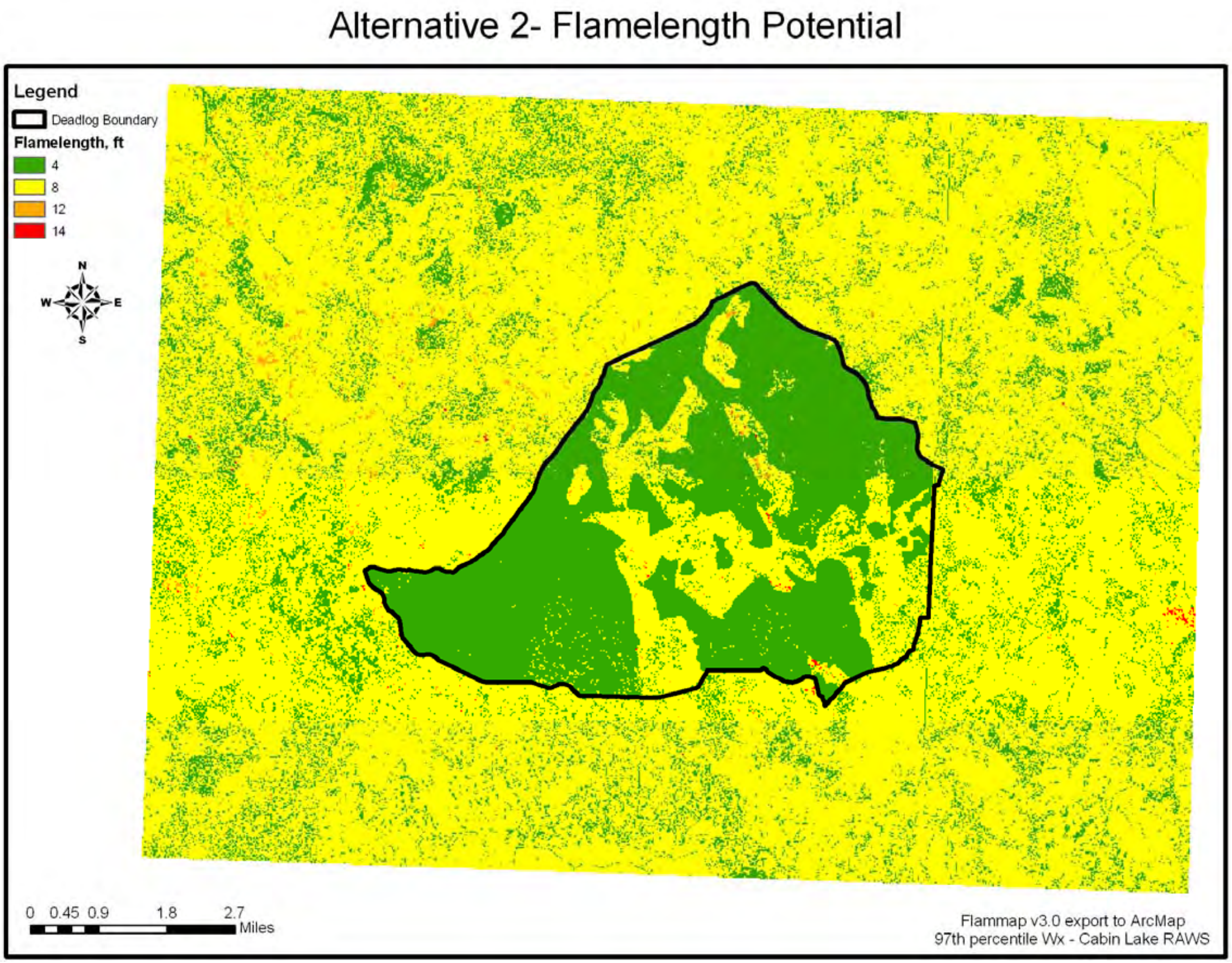


Figure 28: Deadlog Alternative 3 – Wildfire Flame Length Potential in Feet

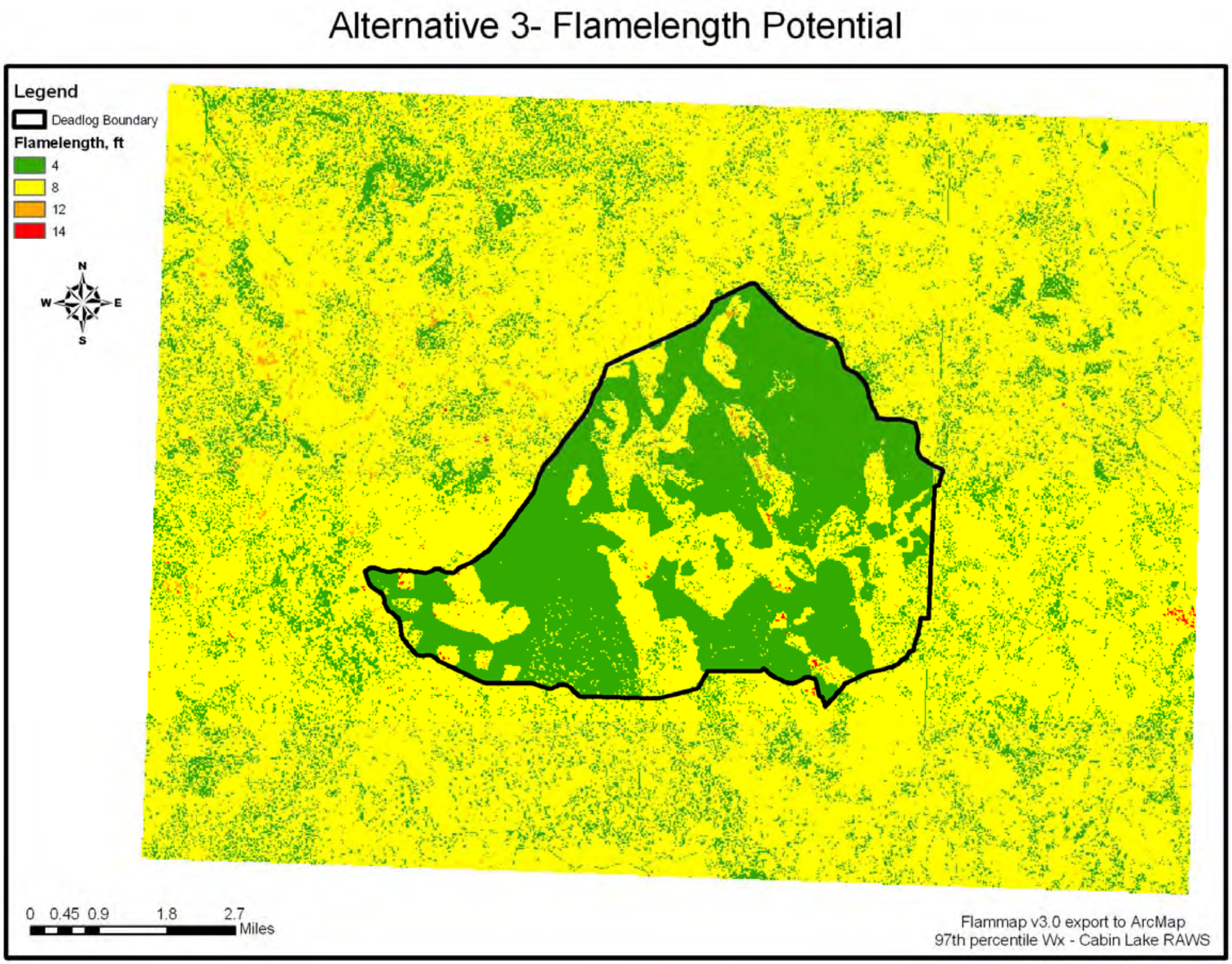


Figure 29: Alternative 1 (No Action) – Wildfire Rate of Spread Potential in Chains (66 Feet) per Hour

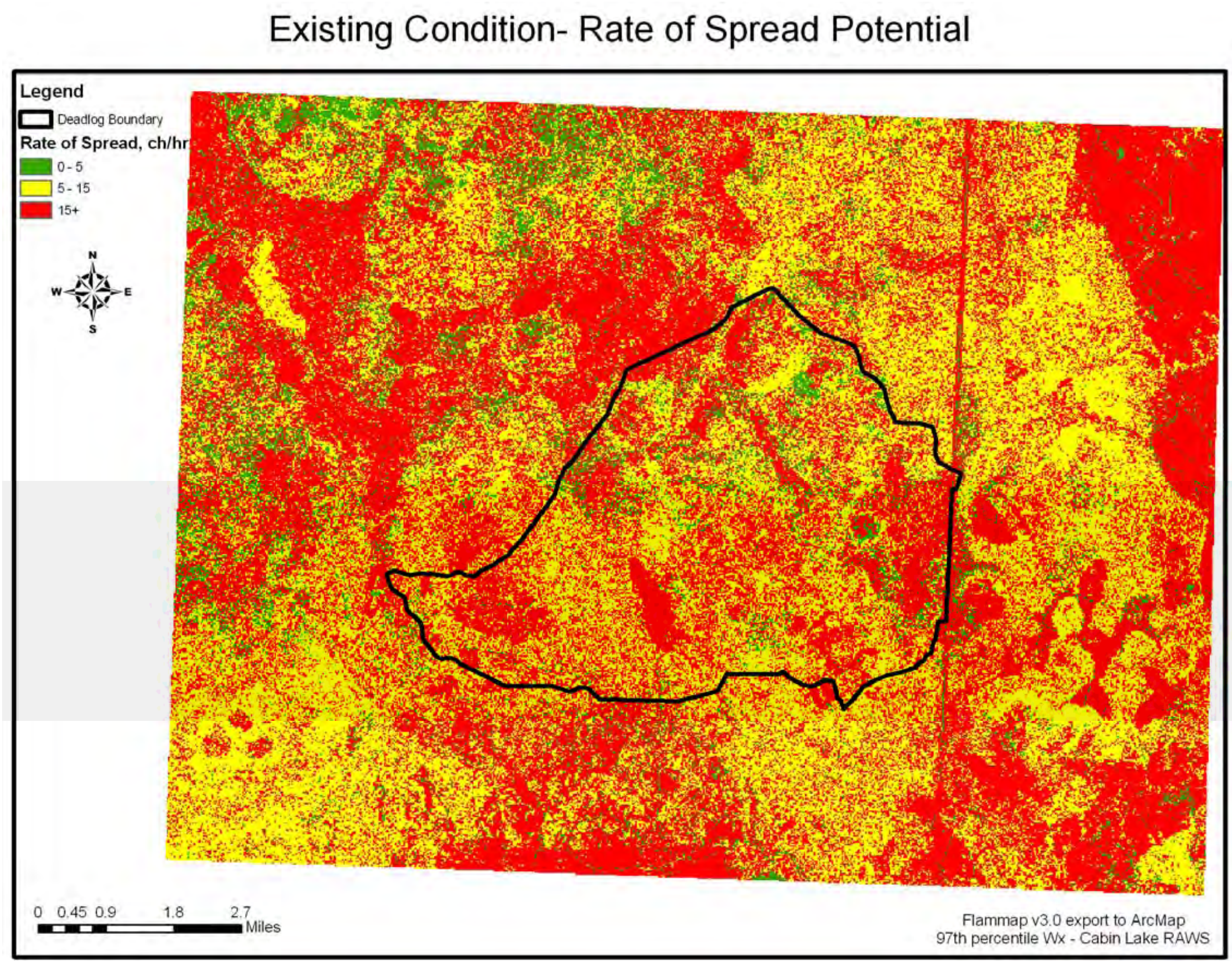


Figure 30: Alternative 2 (Proposed Action) – Wildfire Rate of Spread Potential in Chains (66 Feet) per Hour

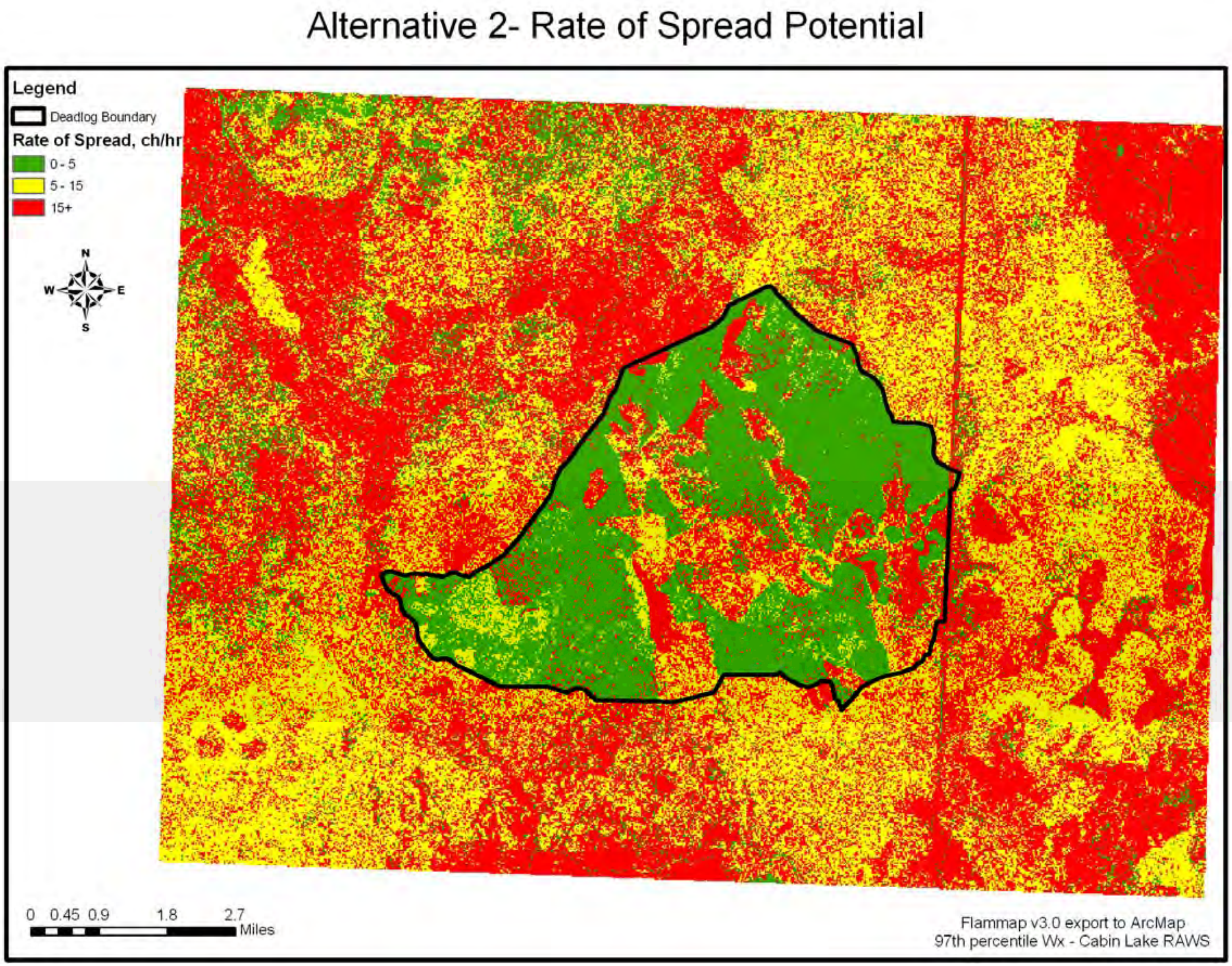
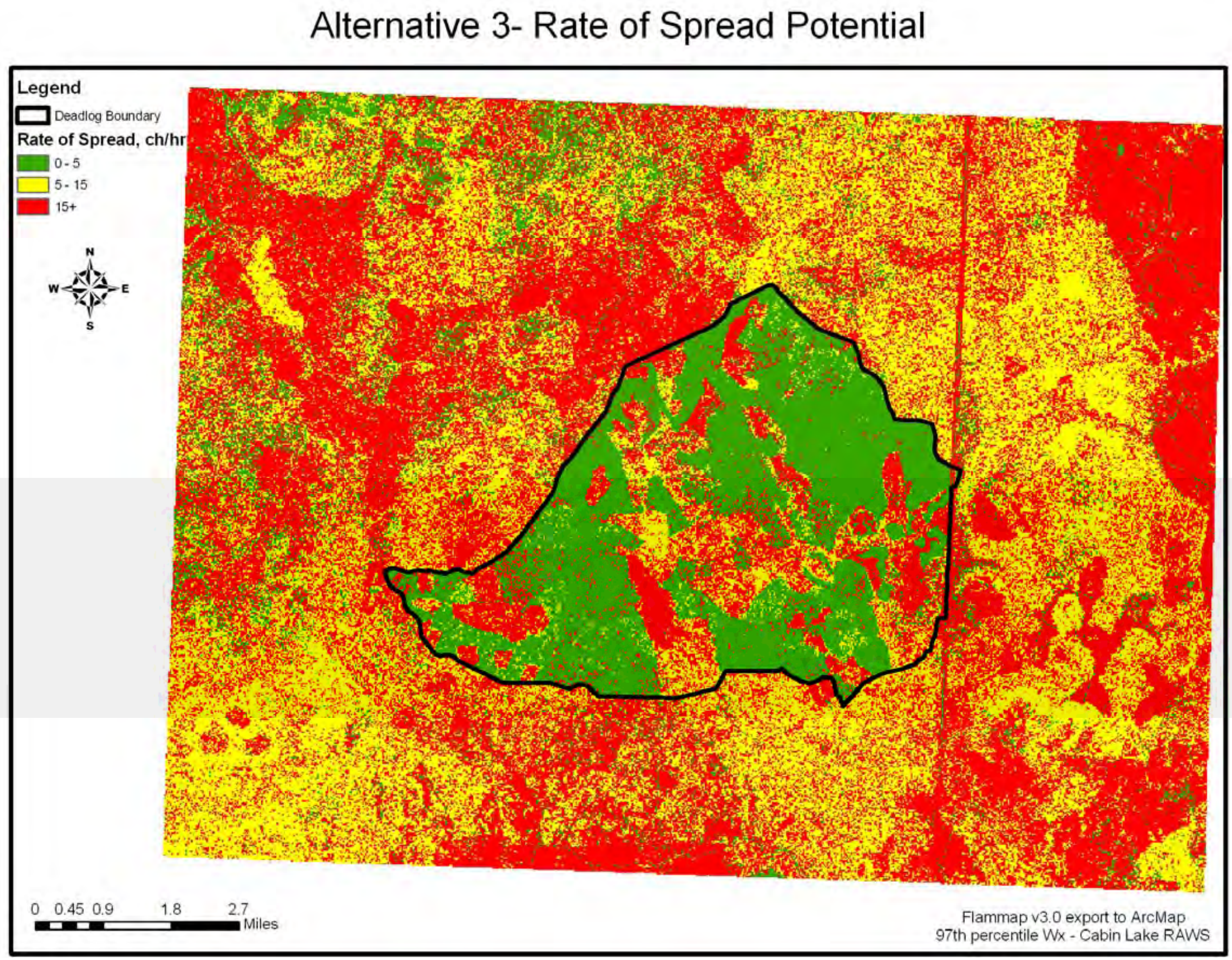


Figure 31: Alternative 3 - Wildfire Rate of Spread Potential in Chains (66 Feet) per Hour



APPENDIX D

FOREST PLAN CONSISTENCY

APPENDIX D: FOREST PLAN CONSISTENCY

RESOURCE CONSISTENCY WITH THE DESCHUTES NATIONAL FOREST LAND AND RESOURCE MANAGEMENT PLAN (LRMP) FOR THE DEADLOG VEGETATION MANAGEMENT PROJECT

The following are selected standards and guides from the Deschutes National Forest LRMP (USFS 1990). These were selected along with the goals listed for management areas and the eastside screens earlier in this document. The following table is a listing of standards and guides as a comparison table by alternative.

Table 84: Resource Tables for Forest Plan Consistency

FIRE AND FUELS			
Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
M8 General Forest			
M8-22 Suppression practices will be designed to protect the investment in managed tree stands to prevent losses of large acreages to wildfire.	No increase in protection to managed tree stands. The area remains in a condition that mostly supports stand replacement/high intensity fire. No reduction in potential fire behavior and fire growth.	Meets During fire episodes, tactical options related to fire suppression will increase with the increase in area that supports low severity/ low intensity fire. Most fires will be able to be attacked at the head and flanks by firefighters.	Meets During fire episodes, tactical options related to fire suppression will increase with the increase in area that supports low severity/ low intensity fire. Most fires will be able to be attacked at the head and flanks by firefighters.
M8-24 In ponderosa pine stands (except for reproduction stands) emphasis should be placed on burning out from existing roads and natural barriers rather than construction new firelines.	Without treatments, defensible areas where fire fighter can safely work are limited and will continue to decline throughout the area.	Meets Treatments that support low severity/ low intensity fire have been designed along existing roads and will provide defensible areas where firefighters can use these roads as firelines.	Meets Treatments that support low severity/ low intensity fire have been designed along existing roads and will provide defensible areas where firefighters can use these roads as firelines.
M8-25 Prescribed fire may be used to protect, maintain, and enhance timber and forage production. The broadest application of prescribed fire will occur in the Ponderosa pine type. Criteria for utilizing fire are as follows: To reduce risk of conflagration fire. To increase soil productivity by cycling bound nutrients.	No prescribed fire will occur in the area. Timbered stands will remain at risk to large, stand replacement fires. Encroachment of lodgepole pine and juniper into ponderosa pine stands will continue. Shrubs will continue to be in the late seral stages with no improvement to palatability.	Meets In ponderosa pine, prescribed fire will be utilized to protect, maintain, and enhance timber and forage production. The risk of large stand replacement fires will be reduced. Soil productivity will be increased with nutrient cycling. Competition of less desirable tree species will be reduced in ponderosa	Meets In ponderosa pine, prescribed fire will be utilized to protect, maintain, and enhance timber and forage production. The risk of large stand replacement fires will be reduced. Soil productivity will be increased with nutrient cycling. Competition of less desirable tree species will be reduced.

FIRE AND FUELS			
Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
To prevent encroachment of less desirable, competing tree species. To increase palatability and cover of desirable forage species. To prepare sites for reforestation.		pine stands. Early seral shrub conditions will increase in bitterbrush, thus an increase in young plants and palatability.	Early seral shrub conditions will increase in bitterbrush, thus an increase in young plants and palatability.
M8-26 The lowest cost option which meets the silvicultural, soil, water, and fire objectives should be selected.	No treatment cost associated with non action. The monetary cost per acre of no treatment will increase dramatically with the occurrence of large fire and related suppression expenses.	Meets Treatments have been developed, designed, and mitigated to meet the Deschutes LRMP S & G’s and the objectives of wildlife, archeology, silviculture, fire and fuels, soils, botany, and range resources.	Meets Treatments have been developed, designed, and mitigated to meet the Deschutes LRMP S & G’s and the objectives of wildlife, archeology, silviculture, fire and fuels, soils, botany, and range resources.
M8-27 Slash will be treated to reduce the chances of fire starts and rates of spread to acceptable levels, but will not be cleared to the point that the forest floor is devoid of all slash and logs.	Does not meet No accumulations of activity related slash will occur. Natural fuels will continue to accumulate. The chances of fire starts will not change without treatments but the potential rate of spread for fires will continue to increase.	Meets Activity fuels and natural fuels will be treated. Treatments will provide for large wood to meet wildlife needs as well as smaller diameter woody material to provide for soils productivity.	Meets Activity fuels and natural fuels will be treated. Treatments will provide for large wood to meet wildlife needs as well as smaller diameter woody material to provide for soils productivity.
M15 Old Growth Area			
M15-18 The low intensity burn acre objective for each old growth area will be the same as the adjacent management area with the lowest burn acre objective.	No treatments or management activity will occur. Wildfires will not be low intensity and are likely be stand replacement events.	Meets Fuels treatments within Old Growth and adjacent General Forest will shift potential fire severity from stand replacement to low intensity/low severity.	Meets Fuels treatments within Old Growth and adjacent General Forest will shift potential fire severity from stand replacement to low intensity/low severity.
M15-19 Prescribed fire is not appropriate in lodgepole pine stands. In Ponderosa pine and mixed conifer stands, prescribed fire may be used to achieve desired old growth characteristics. It may also be used there to reduce unacceptable fuel loadings that potentially could result in high	No prescribed fire treatments will occur. Ponderosa pine will continue to have limited growth potential because of dense understories competing for resources. Fuel loadings will perpetually support stand replacement fire until such fires occur.	Meets There are no prescribed fire treatments in lodgepole pine. Old growth ponderosa pine stands will have prescribed fire applied in order to reduce competition for resources and to create conditions that support low intensity fire.	Meets There are no prescribed fire treatments in lodgepole pine. Old growth ponderosa pine stands will have prescribed fire applied in order to reduce competition for resources and to create conditions that support low intensity fire.

FIRE AND FUELS			
Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
intensity wildfire.			
M15-20 Prescribed fire is the preferred method of fuel treatment. However, If prescribed fire cannot reduce unacceptable fuel loadings, other methods will be considered.	No fuels treatments will occur. Unacceptable fuel loadings currently exist and will continue to exist until a wildfire event occurs.	Meets Prescribed fire by itself will not reduce surface fuels and canopy fuels to levels conducive to low intensity/low severity fire. Thinning treatments will occur to reduce canopy fuels and ladder fuels to reduce the probability of stand replacement fire. These treatments will be followed with prescribed fire to treat surface fuels.	Meets Prescribed fire by itself will not reduce surface fuels and canopy fuels to levels conducive to low intensity/low severity fire. Thinning treatments will occur to reduce canopy fuels and ladder fuels to reduce the probability of stand replacement fire. These treatments will be followed with prescribed fire to treat surface fuels.
M15-21 Natural fuel loading will normally be the standard.	Does not meet Natural fuel loadings will continue to exist at levels conducive to stand replacement fire until a fire occurs.	Meets Treatments will occur that lead to low intensity fire. Activity related fuels and natural fuels will be treated and reduced to acceptable levels.	Meets Treatments will occur that lead to low intensity fire. Activity related fuels and natural fuels will be treated and reduced to acceptable levels.
M9 Scenic Views			
M9-90 Low intensity prescribed fires will be used to meet and promote the Desired Visual Condition within each stand type. Prescribed fire and other fuel management techniques will be used to minimize the hazard of a large high intensity fire In foreground areas, prescribed fires will be small, normally less than 5 acres, and shaped to appear as natural occurrences. If burning conditions cannot be met such that scorching cannot be limited to the lower 1/3 of the forest canopy, then other fuel management techniques should be considered.	Does not meet No treatments will occur. Prescribed fire will not be used. The visual condition will continue to be unrepresentative to the historical appearance in ponderosa pine stands. The potential for large, stand replacement fires will not be reduced and will perpetuate over time.	Meets Prescribed fire treatments will occur in foreground, middle ground, and background view areas. Thinning, and slash piling will occur in areas where prescribed fire alone will not meet the desired visual condition. Fuel treatment in Ponderosa pine will convert the area from stand replacement fire to low severity fire. Prescribed fire prescription will be developed that limit scorch to the lower 1/3 of the canopy.	Meets Prescribed fire treatments will occur in foreground, middle ground, and background view areas. Thinning, and slash piling will occur in areas where prescribed fire alone will not meet the desired visual condition. Fuel treatment in Ponderosa pine will convert the area from stand replacement fire to low severity fire. Prescribed fire prescription will be developed that limit scorch to the lower 1/3 of the canopy.

SILVICULTURE			
Standard and Guide	**Alternative 1**	**Alternative 2**	**Alternative 3**
TM-10 Pest Management Strategies	No improvement on forest pests	Increases resistance to forest pests	Increases resistance to forest pests
Mistletoe	Mistletoe impacts will continue to expand and intensify	Mistletoe impacts will decrease in spread rates. Intensity short term will decrease.	Mistletoe impacts will decrease in spread rates. Intensity short term will decrease.
Bark Beetles	Bark beetle mortality will increase with increasing stand densities	Bark Beetle risk will be reduced to 30% of area and will generally be low for two decades.	Bark Beetle risk will be reduced to 30% of area and will generally be low for two decades.
TM-32 Uneven-aged Management with DMT	Late Old Structure stands will remain infected. Mistletoe impacts will continue to expand and intensify	Late Old Structure stands will have mistletoe reduced and where multi-age cohorts occur spread should be reduced by wide thinning.	Late Old Structure stands will have mistletoe reduced and where multi-age cohorts occur spread should be reduced by wide thinning.
FH-1 Document and mitigate the effects of forest pests to acceptable levels.	No mitigation of forest pest effects	Bark beetle and mistletoe effects mitigated through wide thinning.	Bark beetle and mistletoe effects mitigated through wide thinning.
FH-3 Prevention of pest problems.	Pest especially bark beetles will continue and increase in impacts.	Pest infection of bark beetles in stands reduced with thinning wide and leaving fewer lodgepole pine mixed stands.	Pest infection of bark beetles in stands reduced with thinning wide and leaving fewer lodgepole pine mixed stands.
M8-27 Manage Slash to acceptable levels.	No slash produced none treated	Whole tree yarding and piling reduces slash loads.	Whole tree yarding, biomass utilization and piling reduces slash loads.
M9-56 Manage lodgepole pine for healthy appearance.	No lodgepole pine overstocked stands treated.	Lodgepole pine will be youngest growth with some overstory trees left.	Lodgepole pine will be managed for regeneration on some acres and thinning may look healthy on other acres.
M9-64 Options to manage lodgepole pine on long times is limited.	No lodgepole pine overstocked stands treated.	Lodgepole pine older stands will be converted with overstory removal and shelterwood stands to young healthy stands	Lodgepole pine with overstory will be converted to younger stands while commercial thinning will keep older stands.
M15-9 Manage snags at 100 percent level	All snags remain.	Salvage of snags not planned for removal.	Salvage of snags not planned for removal.
M15-23 Monitor pests to prevent damage to adjacent areas.	Pests moving from Deadlog to adjacent areas not present.	Pests moving from Deadlog to adjacent areas not present.	Pests moving from Deadlog to adjacent areas not present.
M15-24 Practices compatible with Old Growth objectives	Old Growth objectives may not be met if mortality of large old trees accelerates	Old Growth objectives of maintaining large old tree and structure maintained.	Old Growth objectives of maintaining large old tree and structure maintained more than Alt 2

WILDLIFE			
Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
***Diversity of Plant and Animal Communities**: **TM-55** (provide habitat diversity including horizontal, vertical and vegetative species)	Meets (long-term loss of stage 7, single-story)	Meets with mitigation (retention patches and unique habitat protection)	Meets with mitigation (retention patches and unique habitat protection)
TM-56 (maintain forest structural and species diversity….wildlife habitat surrogate)	Meets (long-term loss of stage 7, single-story)	Meets with mitigation (retention patches)	Meets with mitigation (retention patches)
***Horizontal Diversity**: **TM-57** (harvest unit size greater than 40 ac. will provide horizontal diversity for deer and elk; employ variable spacing and variable unit sizes; exception stand health via density control but maintain minimum S&Gs for deer and elk). Link to WL-52 to provide a mosaic of habitats.	Not Applicable	Meets with variable tree spacing (check prescriptions) and cover retention patches. Note: no prescriptions for regen openings.	Meets with variable tree spacing (check prescriptions) and cover retention patches. Note: no prescriptions for regen openings.
TM-61 (timber management restrictions on creation of uniform structural conditions will generally not exceed 100 contiguous acres on >95% of each implementation unit).	Not Applicable	Small units for overstory and shelterwood removal	Small units for overstory and shelterwood removal
***Vertical Diversity**: **TM-62 (**provide habitat for cavity nesters and song birds via uneven-aged management or a mix with even-aged)	Not Applicable	Meets with mitigation (retention patches and OGMA/LOS prescriptions to maintain SS6)	Meets with mitigation (retention patches and OGMA/LOS prescriptions to maintain SS6)
Species Diversity: **TM-64** (maintain a diversity of tree species for cavity dependent species and song birds with an emphasis on stands which typically exhibit broad species diversity)	Not Applicable	Meets with mitigation (retention patches with both p. pine and lodgepole). No treatment of mixed conifer PAG. Elimination of juniper in low productivity sites a potential issue.	Meets with mitigation (retention patches with both p. pine and lodgepole). No treatment of mixed conifer PAG. Elimination of juniper in low productivity sites a potential issue.
TM-65 (maintain long term health and vigor of mixed conifer stands for wildlife species diversity)	Meets (short-term, likely degeneration long-term)	Meets (not applicable due to no treatment, long-term degeneration)	Meets (not applicable due to no treatment, long-term degeneration)
TM-66 (silvicultural activities in ponderosa pine/lodgepole pine assocations should emphasize establishment and maintenance of p. pine with retention of large tree component to meet cavity dependent wildlife species; diversity measured by needs of cavity dependent spp.)	Not Applicable	Meets (appropriate prescriptions developed to promote large ponderosa pine trees and retain adequate numbers of GTRs; protection of existing snags mitigation measures)	Meets (appropriate prescriptions developed to promote large ponderosa pine trees and retain adequate numbers of GTRs; protection of existing snags mitigation measures)
***Golden Eagles, Redtail Hawk and Osprey**: **WL-2** (guidance to protect forested character around nests; timber management acceptable; provide	Meets None known	Meets none known,	Meets none known,

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Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
dominate overstory and ponderosa pine where available)			
WL-3, 4, 5 (guidance to protect active nests from disturbing activities within 1/4th. mile; dates by species; site evaluation and restriction guidance)	Not Applicable	Meets none known,	Meets none known,
***Northern Goshawk:* WL-6 thru 12** (guidance on number of pairs by habitat type; emphasis management areas specified; newly found nests; nest site characteristics, avoid roading; disturbing activities restricted; active nest determination)	Meets	Meets (apply restriction period if new nests found and to existing adjacent site if active)	Meets (apply restriction period if new nests found and to existing adjacent site if active)
Eastside Screens for N. Goshawk: Timber Harvest, Interim Wildlife Standards, Scenario A, **S&G 5) a)-c)** (guidance on historic sites, seasonal restrictions, establishment of core and post- fledgling areas (PFA), retain LOS stands and enhancement of younger stands towards LOS within PFA)	Not Applicable No nest sites known within project; partial overlap of adjacent designated nest core area.	Meets Apply applicable S&Gs if new nests discovered.)	Meets Apply applicable S&Gs if new nests discovered)
***Cooper's Hawk:* WL-13 thru 20** (guidance on number of pairs, preferred stand types, emphasis management areas, use of big game cover areas in General Forest to provide habitat, nest site characteristics , identification of prospective sites prior to thinning, avoid roading, disturbing activities restricted)	Meets Two known nest sites;	Meets Restrictions on disturbance of active nests, nest cores of 15 acres each protected; invoke protection measures on newly discovered nests)	Meets Restrictions on disturbance of active nests, nest cores of 15 acres each protected; invoke protection measures on newly discovered nests)
***Sharp-shinned Hawk:* WL-21 thru WL-29** (guidance on number of pairs, nest groves description, emphasis management areas, use of big game cover in General Forest to provide habitat, nest stand characteristics, identification of prospective sites prior to thinning, avoid roading, disturbing activities restricted)	Meets None known	Meets S&Gs applicable if found; big game cover patches to provide potential habitat; discovered nests to provide 10 acres each for protection.	Meets S&Gs applicable if found; big game cover patches to provide potential habitat; discovered nests to provide 10 acres each for protection.
***Woodpeckers (Cavity Nesters):* WL 37 and 38** (MPP levels by management areas amended; compliance based upon the harvest unit area rather than individual acre evaluation)	Not Applicable	Meets with mitigation. Amended by the Eastside Screens for timber sales	Meets with mitigation. Amended by the Eastside Screens for timber sales
***Eastside Screens for Snags*:** Timber Harvest, Interim Wildlife Standards, Scenario A, **S&G 4) a), (1)** (guidance on snag sizes with >21" dbh emphasis or average dbh for overstory, 100% MPP, MPP determined by best	Not Applicable	Meets with mitigation. Does Not Meet: Snag estimates indicate that current levels do not meet 100% MPP per DecAID	Meets with mitigation. Does Not Meet (snag estimates indicate that current levels do not meet 100% MPP DecAID

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Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
available science)		recommendations for ponderosa pine or lodgepole pine habitats (50% TL); mitigation measures to protect and create snags	recommendations for ponderosa pine or lodgepole pine habitats (50% TL); mitigation measures to protect and create snags)
Mule Deer Outside of Deer Management Area 7 (Summer Range): **WL-52** (guidance on providing a mosaic of forested conditions for security and thermal cover, travel corridors, visual screens, and harassment protection; deer herd management objectives by unit)	Currently does not meet hiding cover standards or provide travel corridors.	Forest Plan Amendment to reduce density for protection from wildfire and insect loss. 10% retention patches in black-bark stands.	Forest Plan Amendment to reduce density for protection from wildfire and insect loss. 10% retention patches in black-bark stands.
WL-53 (guidance on "target open road densities" of 2.5 mi/sq. mi. in summer range, based on implementation units, must use procedures detailed in the Transportation standards for determination). Reference TS-11 thru TS-14.	Does Not Meet	Proposed road closures and decommissioning post-sale will reduce road density; existing Green Dot system also mitigates	Proposed road closures and decommissioning post-sale will reduce road density; existing Green Dot system also mitigates.
WL-54 (guidance on hiding cover areas, 30% minimum of each implementation unit, 70% of each implementation unit in hiding cover or within 600' of cover, black bark exception with separate S&Gs, generally 6 ac.+ un-thinned patches to be retained, ½ ac. unthinned clumps minimum size, residual dead and down direction, locate clumps away from roads)	Does Not Meet	Cover retention patches within non-black bark harvest units @ 10-20%; higher retention in specified stands identified to meet deer movement as well as to meet Cooper's and sharp-shinned hawks direction; 70% direction unknown.	Cover retention patches within non-black bark harvest units @ 10-20%; higher retention in specified stands identified to meet deer movement as well as to meet Cooper's and sharp-shinned hawks direction; 70% direction unknown.
WL-56 (guidance on travel corridors to link stands meeting clump/unit conditions in WL-54 as needed)	Not Applicable	Inadequate hiding cover Wildlife corridors per Eastside Screens and 20% retention patches in OGMA and 10% retention patches in black-bark.	Inadequate hiding cover Wildlife corridors per Eastside Screens and 20% retention patches in OGMA and 10% retention patches in black-bark.
WL-57 (assumption that hiding cover will meet deer thermal cover requirements)	Does Not Meet	Forest Plan Amendment for hiding cover / stand density reduction to reduce risk from wildfire and pests. Summer range thermal cover needs is debatable; no transition range present in project area.	Forest Plan Amendment for hiding cover / stand density reduction to reduce risk from wildfire and pests. Summer range thermal cover needs is debatable; no transition range present in project area.

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Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
WL-58: Retain narrow strip of trees along roads to reduce sight distance if possible	Not Applicable	Unkown: Limited opportunities - No specified areas for retention identified; potential conflicts with fuels objectives.	Unknown: Limited opportunities - No specified areas for retention identified; ; potential conflicts with fuels objectives.
***Black Bark Pine Management:* WL-59:** Retain 10% of treated stands in clumps of visual screening, details on sizes and distribution	Not Applicable	Meets	Meets
WL-60: Guidance on identification of site specific needs at project level by IDT	Not Applicable	None specified	None specified
***Pine Marten*: WL-61 thru WL-63:** Forest types with preference for lpp, mc and mountain hemlock, emphasis management areas, big game cover areas may be used in MAs like General Forest, preference for concentrations of CWM to be left at one/acre after any timber harvest	Meets	Meets (reference CWM S&Gs and amended Eastside Screens; no salvage of down trees)	Meets (reference CWM S&Gs and amended Eastside Screens; no salvage of down trees)
***Townsend's Big-eared Bat*: WL-64 thru WL-71:** Caves management as preferred habitat)	Not Applicable No known caves	S&Gs applicable if caves discovered. Literature documents use of tree hollows and lava outcrops (day roosts).	S&Gs applicable if caves discovered. Literature documents use of tree hollows and lava outcrops (day roosts).
***Species Associated with Logs and Down Woody Debris*: WL-72:** Retention levels for down logs after timber harvest, minimum sizes, charring should be minimized)	Not Applicable	Amended by Eastside Screens	Amended by Eastside Screens
WL-73: Retention of slash piles @ 1/acre if minimum logs are not available; also reference Eastside Screens S&Gs described below on logging debris retention)	Not Applicable	Meets - Address via implementation coordination; potential conflict with prescribed fire and/or piling post-logging	Meets - Address via implementation coordination; potential conflict with prescribed fire and/or piling post-logging
***Eastside Screens for CWM (Logs)*:** Timber Harvest, Interim Wildlife Standards, Scenario A, **S&G 4) a), (2)** (guidance on retention of pre-activity down logs, if levels below minimums retain logging debris, GTRs for logs not required, falling trees for logs not required, snag retention/GTRs will meet future logs, exception on amounts of logs for protection of life/property from fires, prescribed burning allowed, prescribed burns prescriptions to ensure maximum consumption restrictions are met, leave logs in current lengths with no	Not Applicable Current conditions for ponderosa pine and mixed conifer habitats meet minimums Lodgepole pine habitat for current down logs do not meet minimums;	Meets with mitigation: (Current conditions for ponderosa pine and mixed conifer habitats do not meet minimums; Losses are expected, reducing levels below minimums due to prescribed burning and/or piling post-harvest particularly in ponderosa pine; reference PDCs and applicable S&Gs, e.g. logging debris piles, for	Meets with mitigation: (Current conditions for ponderosa pine and mixed conifer habitats do not meet minimums; Losses are expected, reducing levels below minimums due to prescribed burning and/or piling post-harvest particularly in ponderosa pine; reference PDCs and applicable S&Gs, e.g. logging debris piles, for

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Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
cutting, arrangement as is without scattering, pieces per acre by habitat type prescribed, minimum sizes specified)		mitigations. Meets with mitigation (lodgepole pine habitat for current down logs do not meet minimums; project will apply cited mitigation measures and related PDCs)	mitigations. Meets with mitigation (lodgepole pine habitat for current down logs do not meet minimums; project will apply cited mitigation measures and related PDCs)
Species Associated with Various Plant Communities and Successional Stages: **WL-74** (guidance to provide diversity of various successional stages through time; large homogeneous areas of the same species or successional stages will be avoided)	Meets	Meets (treatments will not alter current ratios of structural stages; promotion of SS7 in the long-term; black bark stands problematic but S&G lacks quantification criteria). Note: reference TM-55. 57, 61, 62, 63.	Meets (treatments will not alter current ratios of structural stages; promotion of SS7 in the long-term; black bark stands problematic but S&G lacks quantification criteria). Note: reference TM-55. 57, 61, 62, 63.
Species Associated with Special or Unique Habitats: **WL-75** (guidance for spp. associated with seeps, cliffs and talus slopes during project development)	Not Applicable	Meets (reference location information in Wildlife Report) Note: literature supports inclusion of several other important habitat types (e.g. aspen, mountain mahogany, meadows, etc. Reference PDCs.)	Meets (reference location information in Wildlife Report) Note: literature supports inclusion of several other important habitat types (e.g. aspen, mt. mahogany, meadows, etc. Reference PDCs.)
Management Area 7 Deer Habitat			
General Theme and Objectives: (overall direction to optimize habitat conditions on deer winter and transition ranges; details on cover/forage ratios (40:60 with 10% hiding and 30% thermal) and forage enhancement)	Currently does Not Meet:	Not applicable (cover deficit; shrub treatments will leave a mosaic of seral stages with 40-50% untreated)	Not applicable (cover deficit; shrub treatments will leave a mosaic of seral stages with 40-50% untreated)
Ponderosa Pine- Suitable Timber Lands: **M7-5** (guidance on percentage of crown cover being 40% with trees 30' high for thermal cover. Exception noted for low site productivity, but concludes with a minimum of 40% and greater crown cover preferred)	Currently does Not Meet:	Not applicable (current conditions are not providing this level of crown cover in sufficiently large areas to qualify as thermal cover; no timber harvest prescribed in MA7 units)	Not applicable (current conditions are not providing this level of crown cover in sufficiently large areas to qualify as thermal cover; no timber harvest prescribed in MA7 units)
Wildlife: **M7-10** (guidance on providing a mosaic of forested conditions to include escape and hiding cover, thermal cover, travel corridors, visual screens, and	Currently does Not Meet:	Not applicable (the MA7 acreage, 586 acres, is too small to provide all of these attributes; no timber	Not applicable (the MA7 acreage, 586 acres, is too small to provide all of these attributes; no timber

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Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
harassment reduction)		harvest prescribed in MA7 units)	harvest prescribed in MA7 units)
M7-11 (guidance on size of analysis area to be greater than 3,000 acres)	Not Applicable	Not applicable (only 586 ac. or 3.8% of Wigtop WRHU within the project boundary)	Not applicable (only 586 ac. or 3.8% of Wigtop WRHU within the project boundary)
Cover: **M7-13** (guidance on crown cover to be greater than 40% with trees 30' tall)	Currently Does Not Meet	Not applicable (current conditions are not providing this level of crown cover in sufficiently large areas to qualify as thermal cover; no timber harvest prescribed in MA7 units)	Not applicable (current conditions are not providing this level of crown cover in sufficiently large areas to qualify as thermal cover; no timber harvest prescribed in MA7 units)
Forage: **M7-14** (guidance on maintenance and improvement of forage conditions; variety of plants with mix of age classes of shrubs; improve forage in areas with poor vigor shrubs)	Meets	Meets (increase in early seral age class from prescribed burns; mosaic to be created by dripline burn prescription; identify MA7 units in EIS)	Meets (increase in early seral age class from prescribed burns; mosaic to be created by dripline burn prescription; identify MA7 units in EIS)
M7-15 (guidance on forage improvement activities not directly associated with tree stands; size of units 300-500 acres; treatments spaced 600-1,200' apart in a single year)	Not Applicable	Meets (implementation coordination required on fuels units)	Meets (implementation coordination required on fuels units)
***Arrangement**:* **M7-16** (guidance on forage created via timber harvesting; maintain thermal cover adjacent to forage; provide irregular mosaic of trees and openings in the long-term)	Not Applicable	Not Applicable Fuels treatments only in MA7, no timber management; Treatments will create a mosaic of forage.)	Not Applicable Fuels treatments only in MA7, no timber management; treatments will create a mosaic of forage.
***Transportation**:* **M7-22** (guidance on road density to average 1.0-2.5 mi./sq. mi.; threshold for evaluation and not absolute standard; reference Transportation S&Gs if exceeded).	Unknown	Unknown (road density for MA7 portion not calculated due to its small size; no new roads proposed; reference project-wide road density analysis)	Unknown (road density for MA7 portion not calculated due to its small size; no new roads proposed; reference project-wide road density analysis)
M7-23 (guidance on minimizing disturbance for both winter period and hunting season via optional administrative closures)	Meets (existing Green Dot road closure system; no winter period restrictions)	Meets (existing Green Dot road closure system; no winter period restrictions)	Meets (existing Green Dot road closure system; no winter period restrictions)
***Prescribed Burning**:* **M7-27** (guidance on use of prescribed fire to	Not Applicable	Meets (implementation	Meets (implementation

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Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
maintain plant diversity; provide reestablishment of bitterbrush within 20 years; limits annual treatments to 2.0-2.5% annually in MA7). Note: Forest direction to apply by herd unit.		coordination on fuels treatments; dripline burn prescriptions to provide diversity)	coordination on fuels treatments; dripline burn prescriptions to provide diversity)
Management Area 8 General Forest			
***Wildlife**:* **M8-15** (guidance on application of minimum standards for wildlife using the Forest-wide S&Gs; higher levels for habitat if no conflict with timber management objectives).	Not Applicable	Meets (as amended by screens; also reference preceding Forest-wide S&Gs)	Meets (as amended by screens; also reference preceding Forest-wide S&Gs)
***Fuel Loadings**:* **M8-27** (guidance on slash treatments; retention of slash and larger dead material at sufficient levels to provide soil protection, microclimates for tree establishment, and small mammal habitat)	Not Applicable	Meets (as amended by screens; also reference preceding Forest-wide S&Gs)	Meets (as amended by screens; also reference preceding Forest-wide S&Gs)
Management Area 9 Scenic Views			
***Vegetative Management**:* **M9-13** (guidance on retention of adequate snags for wildlife provided no conflicts with visual quality in ponderosa pine)	Not Applicable	Unknown (snag levels not surveyed in this MA; also reference preceding Forest-wide S&Gs)	Unknown (snag levels not surveyed in this MA; also reference preceding Forest-wide S&Gs)
M9-63 (guidance on retention of cull logs, snags and replacement to meet wildlife requirements provided no conflicts with visual quality in lodgepole pine)	Not Applicable	Meets (as amended by screens; also reference preceding Forest-wide S&Gs)	Meets (as amended by screens; also reference preceding Forest-wide S&Gs)
***Wildlife**:* **M9-79 thru M9-82** (guidance on snags, snag replacement trees, habitat improvement, deer migration crossings on roads)	Not Applicable	Meets (as amended by screens,; also reference preceding Forest-wide S&Gs)	Meets (as amended by screens; also reference preceding Forest-wide S&Gs)
Management Area 15 Old Growth			
***General Theme and Objectives**:* (guidance on management of OGMAs for large trees, abundant standing and down trees, and vertical structure w/exception for lodgepole pine; designation of the goshawk as the management indicator species for ponderosa pine)	Meets	Meets (reference preceding S&Gs for snags, down logs and vertical structure)	Meets (reference preceding S&Gs for snags, down logs and vertical structure)
***Timber**:* **M15-4 thru M15-6** (guidance on vegetative manipulation only allowed to perpetuate or enhance old growth characteristics; substitution of areas after catastrophic events; firewood cutting prohibited)	Not Applicable	Meets (reference harvest prescriptions for units within the OGMA and the silviculture report)	Meets (reference harvest prescriptions for units within the OGMA and the silviculture report)
***Wildlife**:* **M15-9** (guidance on snags and live trees for future snags to be maintained at the 100% MMP level of primary excavators; dead, down trees will be managed to maximize biological diversity)	Currently does not meet	Meets with mitigation (snag estimates indicate that current levels do not meet 100% MPP per DecAID	Meets with mitigation (snag estimates indicate that current levels do not meet 100% MPP per DecAID

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Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
		recommendations; Snag losses to safety and prescribed fire will reduce levels; Mitigation measures to protect and create snags.	recommendations; Snag losses to safety and prescribed fire will further reduce levels; mitigation measures to protect and create snags
Transportation**: **M15-14 (guidance on limiting road or trail access to the minimum; roads no longer needed will be closed and allowed to revegetate naturally; helispots and transmission corridors not allowed)	Meets	Meets (reference transportation and soils analysis for proposed road closures; check details on closures vs. decommissioning, i.e. natural or not)	Meets (reference transportation and soils analysis for proposed road closures; check details on closures vs. decommissioning, i.e. natural or not)
Fire Management--Prescribed Fire: **M15-19**: (guidance on using prescribed fire in achieving old growth characteristics; use to reduce unacceptable fuel loadings; do not use in lodgepole pine)	Not Applicable	Meets (reference fuels and silviculture prescriptions)	Meets (reference fuels and silviculture prescriptions)
Fuel Treatment Other Than Prescribed Fire: **M15-20**: (guidance on using prescribed fire as the preferred treatment method but other methods allowable to reduce unacceptable fuel loadings)	Not Applicable	Meets (reference silviculture/fuels prescriptions)	Meets (reference silviculture/fuels prescriptions)
Forest Health: M15-23, 24 (guidance on monitoring pests to prevent unacceptable damage to adjacent areas; use Forest-wide S&Gs for Forest Health; only practices compatible with old growth objectives allowed to treat insects and diseases)	Not Applicable	Meets (reference silviculture/fuels prescriptions)	Meets (reference silviculture/fuels prescriptions)
Eastside Screens for Late and Old Structure (LOS): Timber Harvest, Interim Wildlife Standards, Scenario A, **S&G 1)** (allows some timber sale activities with LOS stages that are within or above HRV which maintain or enhance LOS; allowable to manipulate one type of LOS to move stands into the LOS stage that is deficit if it meets historical conditions)	Not Applicable	Meets (reference silviculture report and prescriptions)	Meets (reference silviculture report and prescriptions)
2) (outside of LOS other types of timber sale activities are allowed provided they maintain and/or enhance LOS component within the treated stands; standards **a) thru c)** provide specific direction for prescriptions)	Not Applicable	Meets (reference silviculture report and prescriptions)	Meets (reference silviculture report and prescriptions)
3) (maintain connectivity and reduce fragmentation of LOS, standards include: **a)** provide connectivity	Not applicable	Meets (reference Wildlife Report and file map on	Meets (reference Wildlife Report and file map on

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Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
between all LRMP designated "old growth/MR" habitats, **(1)** network pattern of connectivity with at least 2 different directions; **(2)** specifics on stand characteristics including having medium or large diameter trees, canopy closures within top 1/3rd. of site potential, minimum width of 400' with specified exception rule; use best stands available; **(3)** keep length of corridors as short as possible; **(4)** harvest within corridors permitted if (2) criteria are met plus leaving available understory in patches or scattered to assist supporting stand density and cover, some understory removal allowable depending upon site; **b)** do not apply even-aged regeneration or group selection treatments in non-LOS stands that are located within or surrounded by LOS, use non-regeneration or single-tree selection prescriptions to move these stands to LOS conditions)		LOS/OGMA corridors; check silviculture units/prescriptions overlapping designated corridors)	LOS/OGMA corridors; check silviculture units/prescriptions overlapping designated corridors)

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Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
M15 Old Growth Area			
M15-23 Monitor pests to prevent damage to adjacent areas.	Pests moving from Deadlog to adjacent areas not present.	Bark beetle and mistletoe spread will be reduced.	Bark beetle and mistletoe spread will be reduced.
M15-24 Practices compatible with Old Growth objectives...	Old Growth objectives may not be met if mortality of large old trees accelerates	Old Growth objectives of maintaining large old tree and structure maintained.	Old Growth objectives of maintaining large old tree and structure maintained more than Alt 2
Forest Health			
FH-1 It is the responsibility of the resource manager to consider, document and mitigate, if possible, the potential impact of forest pests, both on short and long-term land management objectives	FVS mistletoe impact analysis included no action alternative for current condition, 20, 40, and 100 years from present.	FVS mistletoe impact analysis included action alternative for current condition, 20, 40, and 100 years from present.	FVS mistletoe impact analysis included action alternative for current condition, 20, 40, and 100 years from present.
FH-3 Management strategies should emphasize prevention of pest problems rather than suppression activities.	Adoption of alternative will not emphasize prevention of pest problems.	Adoption of alternative will emphasize prevention of pest problems through selective thinning practices.	Adoption of alternative will emphasize prevention of pest problems through selective thinning practices.
FH-4 Treatment of pest problems should be a result of integrated area	All dwarf mistletoe infected stands with	All dwarf mistletoe infected stands with	All dwarf mistletoe infected stands with

PATHOLOGY			
Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
analysis to achieve quantifiable land management objectives. Treatment on an isolated stand by stand basis is not recommended.	stand exam data were analyzed with LOS component and blackbark conditions.	stand exam data were analyzed with LOS component and blackbark conditions.	stand exam data were analyzed with LOS component and blackbark conditions.
FH-5 It may not be possible, or desirable, to treat all affected stand in an analysis area in one entry. Priority systems for treatment will need to be established by the interdisciplinary team. These systems could be based on a number of factors including: loss of future management option if treatment is delayed, diversity, site productivity, visual and/or wildlife considerations.	Could lose significant portions of old tree component if left untreated.	Will promote the retention of the old tree component and development of current blackbark stands into LOS.	Will promote the retention of the old tree component and development of current blackbark stands into LOS.
TM-10 The silvicultural prescription will consider integrated pest management. Pests include insects, diseases, animals, and vegetation. Where conditions are such that unacceptable damage or reductions in tree growth can be predicted, protection measures may be warranted prior to the actual damage occurring.	Will not consider preemptive treatment of stands currently at risk from bark beetle, wildfire, and dwarf mistletoe.	Will be preemptive in treatment of stands currently at risk from bark beetle, wildfire, and dwarf mistletoe.	Will be preemptive in treatment of stands currently at risk from bark beetle, wildfire, and dwarf mistletoe.
TM-32 Uneven-aged management is most applicable in stands free of dwarf mistletoe. Uneven-aged management should be restricted to stands where dwarf mistletoe can be stabilized indefinitely at a low infection level in the trees comprising the regulated stand. This will insure that no more than a 10% loss in productivity will occur. Maintaining mistletoe at low levels will be easiest where mistletoe occurs on species which are minor components of the stand. In single species stands, or stands where mistletoe infects the dominant species, stabilization will be more difficult both to accomplish and to predict.	Productivity losses due to dwarf mistletoe will be more severe without treatment compared to treated stands and are projected to exceed 10% at the stand level within 40 years.	Productivity losses due to dwarf mistletoe will be less in dwarf mistletoe infected treated stands than in untreated stands for up to 40 years following treatment at which point they are projected to exceed 10%.	Productivity losses due to dwarf mistletoe will be less in dwarf mistletoe infected treated stands than in untreated stands for up to 40 years following treatment at which point they are projected to exceed 10%.
TM-33 Consultation with the Zone Pathologist and careful record keeping is critical in these higher risk situations. In lightly infected stands where the mistletoe infected trees occur in patches, group selection may be an appropriate management technique; especially with good boundary design and follow up treatments of trees surrounding the cut area. Conifer species to plant include Ponderosa pine, western larch and western white pine which are tolerant	Will not address mistletoe in affected stands.	Will adequately address management of mistletoe in stand by selectively removing most severely infected trees, increasing spacing around infected residual trees, and introducing prescribed fire into stands.	Will adequately address management of mistletoe in stand by selectively removing most severely infected trees, increasing spacing around infected residual trees, and introducing prescribed fire into stands.

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Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
or moderately tolerant to root rots.			
TM-43 “Management of Advanced Regeneration” Trees of acceptable condition will generally have the following characteristics: * Trees are free of dwarf mistletoe bole infections and predicted to maintain a minimum of 10 inches of leader growth annually within a 20 year period.	Will not address trees infected with mistletoe.	Will selectively remove the regenerating trees most severely infected with mistletoe and leave lightly and uninfected trees which are likely to maintain 10 inches of leader growth.	Will selectively remove the regenerating trees most severely infected with mistletoe and leave lightly and uninfected trees which are likely to maintain 10 inches of leader growth.
TM-48 “Natural Regeneration” Appropriate stand and site conditions for natural regeneration include: * Seed trees can be dwarf mistletoe infected but in that case must be removed or girdled before regeneration reaches a height of 3 feet. If dwarf mistletoe infected trees are retained to meet wildlife habitat needs, they should be killed in place to avoid infecting regeneration.	Will not address infected regeneration.	Has a provision to girdle live infected trees greater than or equal to 21 inches DBH three years following introduction of fire and to remove infected regeneration at that time.	Has a provision to girdle live infected trees greater than or equal to 21 inches DBH three years following introduction of fire and to remove infected regeneration at that time.
M9-37 “Vegetative Management” Even-aged management may be practiced where appropriate for insect and disease control.	Will not address insect and disease management in even-aged blackbark stands.	Appropriate even-aged insect and disease management of blackbark stands affected by mistletoe will be practiced through selectively removing most severely infected trees, reducing stand basal areas, and introducing prescribed fire into affected stands.	Appropriate even-aged insect and disease management of blackbark stands affected by mistletoe will be practiced through selectively removing most severely infected trees, reducing stand basal areas, and introducing prescribed fire into affected stands.
M9-96 Monitoring and vegetative management will emphasize the control or prevention of major insect and disease problems Minor insect infestations or root rot centers may not require immediate treatment, as long as they are consistent with the desired visual condition for the species in which they occur Insect and disease problems in the Scenic Views Management Area will be monitored to determine their rate of spread and degree of risk to the visual resource.	Will not address the control or prevention of insect and disease problems in the project area.	Will emphasize the control of mistletoe infection and the prevention of bark beetle attack within the project area.	Will emphasize the control of mistletoe infection and the prevention of bark beetle attack within the project area.

RANGE			
Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
M8 General Forest			
M8-9 Timber harvesting and post-harvesting activities . . . should be scheduled to accommodate grazing systems.	No change in grazing operations	Develop an Implementation Plan for planned activities that addresses range operations including allotment use and pasture rotations.	Develop an Implementation Plan for planned activities that addresses range operations including allotment use and pasture rotations.

BOTANY			
Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
TES Plant Species			
TE-1 During environmental analysis of each project activity, available habitat, location records, and other information will be reviewed determine whether known or suspected locations of Sensitive plant species or their habitat occur.	Meets No known Sensitive plant species are documented within or closely adjacent to the project area.	Meets No Sensitive plant species are documented within or closely adjacent to the project area.	Meets No Sensitive plant species are documented within or closely adjacent to the project area.
TE-3 When suitable habitats or reported locations are suspected to occur in the area of influence of the project, a field reconnaissance will be performed to more precisely verify the presence, abundance and distribution of the Sensitive species. If the search is conducted during a season of the year when positive identification is probable and no listed species are found, this fact will be documented and no further investigation is needed.	Meets The presence of potential habitat for Sensitive plant species *Botrychium pumicola* and *Castilleja chlorotica*. Surveys conducted in 1990, 1998 and 2005, targeted high-probability habitat resulted in no detections.	Meets The presence of potential habitat for Sensitive plant species *Botrychium pumicola* and *Castilleja chlorotica*. Surveys conducted in 1990, 1998 and 2005, targeted high-probability resulted in no detections.	Meets The presence of potential habitat for Sensitive plant species *Botrychium pumicola* and *Castilleja chlorotica*. Surveys conducted in 1990, 1998 and 2005, targeted high-probability habitat resulted in no detections.

SCENIC			
Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
M8 General Forest			
M8-19: To the extent possible, the highest visual quality level will be provided.	Meets Scenery Management System Guidelines	Meets: Reduces foreground stand density. Opens views into the forest, with residual larger trees remaining.	Meets: Reduces foreground stand density. Opens views into the forest, with residual larger trees remaining.
M9 Scenic Views			
M9-4 Ponderosa pine in Foreground Scenic Views MA areas	Meets Scenery Management System Guidelines	Meets: Reduces foreground stand density. Opens views into the forest, with residual larger trees remaining.	Meets: Reduces foreground stand density. Opens views into the forest, with residual larger trees remaining.
M9-5 Existing mosaic of tree sizes and size class diversity perpetuated by	Meets Scenery Management System	Meets: Reduces foreground stand	Meets: Reduces foreground stand

SCENIC			
Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
managing some of the trees within each size class.	Guidelines	density. Opens views into the forest, with residual larger trees remaining and, where possible, size class diversity.	density. Opens views into the forest, with residual larger trees remaining and, where possible, size class diversity.

Forest Roads			
Standards and Guidelines	**Alternative 1**	**Alternative 2**	**Alternative 3**
M8 General Forest			
TS-11: Density guidelines are not intended to be objectives in themselves, but are a means to accomplish wildlife resource objectives.	Does not meet road density guidelines for wildlife.	Reduces road density from 4.7 to 3.1 miles per square mile.	Meets Scenery Management Guidelines
TS-12: Guideline densities will be used as thresholds for a further evaluation and will not serve as the basis for assessing conformance with the Forest Plan.	Does not meet road density guideline thresholds.	Reduces road density from 4.7 to 3.1 miles per square mile. Does not meet the threshold of 2.5 miles per square miles in General Forest	Reduces road density from 4.7 to 3.1 miles per square mile. Does not meet the threshold of 2.5 miles per square miles in General Forest
TS-13: If a preferred project alternative would exceed these guidelines, a detailed further evaluation by a wildlife biologist would be required. … If the evaluation concludes that the net effect of the project is compatible with the Forest Plan wildlife objectives as proposed or with mitigation measures, or significantly enhances the conformance of the Implementation Unit with wildlife objectives, the project will be considered compatible with Forest Plan direction.	Does not meet road density guidelines for wildlife.	Reduces road density from 4.7 to 3.1 miles per square mile. Does not meet the threshold of 2.5 miles per square miles in General Forest. Considered compatible with Forest Plan direction.	Reduces road density from 4.7 to 3.1 miles per square mile. Does not meet the threshold of 2.5 miles per square miles in General Forest. Considered compatible with Forest Plan direction.
TS-14: The biologist's evaluation would be used by the project ID Team and line officer in deciding on a plan with best satisfies multiresource needs, and in preparing the NEPA document and Decision Notice. … Selection of project alternatives, which further evaluation finds are not compatible with Forest Plan wildlife objectives or will not significantly enhance conformance of the Implementation Unit with wildlife objectives, will require an amendment of the Plan.	Does not meet road density guidelines for wildlife.	Reduces road density from 4.7 to 3.1 miles per square mile. Does not meet the threshold of 2.5 miles per square miles in General Forest. Considered compatible with Forest Plan direction. Green dot closures during hunting season.	Reduces road density from 4.7 to 3.1 miles per square mile. Does not meet the threshold of 2.5 miles per square miles in General Forest. Considered compatible with Forest Plan direction. Green dot closure during hunting season