United States
Department of
Agriculture

Forest
Service

June 2007

Environmental Impact Statement

Five Buttes Project

Crescent Ranger District, Deschutes National Forest
Klamath and Deschutes Counties, Oregon

Townships 21, 22, 23, 24 South and Ranges 5 ½, 6, 7, 8, 9 East

Five Buttes Project
Environmental Impact Statement
Deschutes County, Oregon

Lead Agency: **USDA Forest Service**

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Abstract: The Forest Service is analyzing proposed vegetation managent activites in the 160,000-acre Five Buttes project area on the Crescent Ranger District of the Deschutes National Forest. The purpose of the proposed actions includes reducing the risk that natural disturbance process such as insects, disease and wildfire, will lead to large-scale loss of forest resources and contributing to local and regional economies by providing timber and other wood fiber products. The proposed action (Alternative B) involves commercial and small-tree thinning of forested stands, salvage of dead lodgepole pine, prescribed burning, piling and disposal of activity-generated slash, construction of 6.4 miles of temporary roads, and obliteration of these roads following project implementation; activities in the proposed action would take place over 5,522 acres. One action alternative to the proposed action (Alternative C) was developed. Alternative C would reduce the amount of commercial harvest by about 1,287 acres while adding about 3,563 acres of fuels treatments located strategically in the project area to work with past and current fuels reduction projects to contribute to a landscape-level reduction in the risk of large wildfire. Alternative C would require the construction (and subsequent restoration to proper hydrologic function) of 5.9 miles of temporary roads. All alternatives considered in this environmental impact statement are consistent with applicable local, state and national laws and regulations and with all land management plans. Alternative C has been selected as the Preferred Alternative.

The 45-day appeal period begins the day following the date the legal notice of the decision is published in *The Bulletin*, Bend, Oregon, the official newspaper of record. The Notice of Appeal must be filed with the Reviewing Officer at:

Appeal Deciding Officer, Pacific Northwest Region, USDA Forest Service
Attn. 1570 Appeals, 333 S.W. First Avenue, PO Box 3623, Portland, OR 97208-3623

Appeals can also be filed electronically at: appeals-pacificnorthwest-regional-office@fs.fed.us or hand-delivered to the above address between 7:45 AM and 4:30 PM, Monday through Friday except legal holidays. The appeal must be postmarked or delivered within 45 days of the date the legal notice for this decision appears in the Bend Bulletin newspaper. The publication date of the legal notice in the Bend Bulletin newspaper is the exclusive means for calculating the time to file an appeal and those wishing to appeal should not rely on dates or timeframes provided by any other source.

Electronic appeals must be submitted as part of the actual e-mail message, or as an attachment in Microsoft Word (.doc), rich text format (.rtf) or portable document format (.pdf) only. E-mails submitted to e-mail addresses other than the one listed above or in other formats than those listed or containing viruses will be rejected.

It is the responsibility of those who expressed an interest during the comment period and wish to appeal a decision to provide the Regional Forester sufficient written evidence and rationale to show why the decision should be changed or reversed. The appeal must be filed with the Appeal Deciding Officer (§ 215.8) in writing. At a minimum, an appeal must include the following:

1. Appellant's name and address (§ 215.2), with a telephone number, if available;
2. Signature or other verification of authorship upon request (a scanned\ signature for electronic mail may be filed with the appeal);
3. When multiple names are listed on an appeal, identification of the lead appellant (§ 215.2) and verification of the identity of the lead appellant upon request;
4. The name of the project or activity for which the decision was made, the name and title of the Responsible Official, and the date of the decision;
5. The regulation under which the appeal is being filed, when there is an option to appeal under either this part or part 251, subpart C (§ 215.11(d));
6. Any specific change(s) in the decision that the appellant seeks and rationale for those changes;
7. Any portion(s) of the decision with which the appellant disagrees, and explanation for the disagreement;
8. Why the appellant believes the Responsible Official's decision failed to consider the comments and;
9. How the appellant believes the decision specifically violates law, regulation, or policy.

Contact Persons

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

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SUMMARY

The Deschutes National Forest proposes to conduct vegetation management activities within the 160,000-acre Five Buttes project area intended to reduce the risk of large-scale loss of forest resources to disturbance factors such as insect, disease and wildfire, as well as contribute to local and regional economies by providing timber and other wood fiber products. The area affected by the proposal is primarily within the area managed according to the Northwest Forest Plan; it predominantly includes mixed conifer forest, but also has mountain hemlock, ponderosa pine, and lodgepole pine stands. The project area contains habitat for wildlife species that rely on large trees and late- and old-structure forest as primary habitat components. The project area also includes the 21,000-acre Davis Fire of 2003; many thousands of acres of late-successional habitat were lost in the fire. Vegetation management activities are needed because vegetative conditions in the project area are such that risk of more large-scale loss of large trees and late-structure forest is extremely high. For instance, existing overstory ponderosa pine and Douglas-fir can not compete with true firs in overcrowded conditions. The trend in these forests is for the large-tree component to decline due to overcrowding from and competition with younger, smaller trees. The smaller trees are generally species that are not fire-resistant, and the overcrowded stands provide a fuels condition that favors another large-scale wildfire event.

The project area includes the 48,900-acre Davis Late Successional Reserve (LSR). Some of the most desired characteristics of these stands (such as fire resistant large ponderosa pine and Douglas-fir) are placed at risk because the increasing true fir component creates a structure that allows ground fires to reach the crowns of the larger trees; the Davis LSR Assessment (2007 revision approved by the Regional Ecosystem Office) found that the most immediate need within the LSR was to reduce the risk of catastrophic affects of insect activity, disease or wildfire in the existing late- and old-structured stands.

To address the purpose and need, the Forest Service proposed about 5,522 acres of commercial thinning activities intended to reduce the risk of wildfire on a landscape scale and improve overall forest health within treated stands.

The Five Buttes Project was initially scoped in April of 2004; at that time the project was called "Five Buttes Interface." Five public organizations submitted comments at that time. Based on comments received as well as internal and interagency discussion, the Five Buttes planning team determined that the appropriate level of analysis and documentation would include an environmental impact statement and a Record of Decision.

The Notice of Intent (NOI) was published in the Federal Register on April 1, 2005. The NOI asked for public comment on the proposal from April 1, 2005 - May 1, 2005. The Crescent Ranger District held a public field trip to the Five Buttes Project area (July 9, 2005) that was attended by ten members of the public. As an additional effort to involve the public in the planning process, the District mailed a description of the project's range of alternatives to the mailing list on January 11, 2006. Using the comments from the public and other agencies (see *Issues* section) the interdisciplinary team developed a list of issues to address.

On April 5, 2007, the Five Buttes team briefed the Provincial Advisory Committee, a group representing various federal agencies, state, American Indian tribes, and others, on public comments received and the decision to be made. The Crescent District hosted another meeting/field trip on May 21, 2007, which was attended by representatives of several environmental groups.

Key issues identified during project scoping were:

- Activities proposed in the Five Buttes project may reduce the quality, effectiveness, and distribution of habitat available to the northern spotted owl. Effects to owl habitat may impede individual owl's ability to establish and maintain breeding territories, may affect the owl's prey base, and may interfere with the ability of juvenile owls to disperse across the landscape.

- The proposed action did not go far enough in providing landscape-level reduction in risk of large-scale loss of forest resources to disturbance events, specifically wildfire.

These issues led the agency to develop one alternative to the proposed action, for a total of three alternatives. The following is a summary of the alternatives:

Alternative A: No Action
Under the No Action alternative, current management plans would continue to guide management of the project area. No additional thinning or fuels treatments would be implemented to accomplish project goals. Custodial activity would continue, such as routine maintenance. Response to environmental emergencies, such as suppression of a wildfire, would continue.

Alternative B: The Proposed Action
The Proposed Action includes a variety of vegetation management activities across approximately 5,522 acres, and would harvest approximately 18.9 million board feet of timber. Activities include:

- Thin to create or maintain single story stands and culture large trees (1,175 acres);
- Thin to reduce stand competition but retain multi-story canopy and large trees (3,153 acres);
- Thin to reduce stand competition, culture large trees and retain a combination of single story and multi-story canopy (1,160 acres); and
- Salvage dead lodgepole pine (34 acres);

Alternative B would also include activities to reduce natural fuels within harvest units, and would pile and dispose of activity-generated fuels.

In order for Alternative B to be implemented, the following are connected actions:

- About 34 miles of currently closed Maintenance Level 1 roads would be opened to allow timber hauling and other activities. Roads would be closed following implementation.
- Road maintenance, especially blading and brushing, would be performed on about 110 miles of Maintenance Level 1 and 2 roads.
- About 6.4 miles of temporary roads would be constructed to facilitate economical timber harvest removal. These would be obliterated following implementation and restored to a condition that is hydrologically functional and able to revegetate more quickly.

Alternative C
This alternative was developed to address both key issues associated with landscape scale fire behavior modification and retention of spotted owl habitat. Alternative C emphasizes reducing the likelihood and size of another large fire event like the Davis Fire of 2003, and the protection of key assets such as spotted owl home ranges, bald eagle habitat, and late- and old-structured stands. This alternative would strategically place fuels treatments on the landscape to coordinate with past treatments to create and maintain fuel modifications around identified habitats. As a result of more effective protection, some important habitat for the Northern spotted owl, such as Nesting, Roosting and Foraging (NRF) and dispersal habitat proposed for active management in Alternative B, was deferred from active management for the foreseeable future. This resulted in the reduction of the amount of commercial timber harvest by about 1,287 acres. Alternative C would harvest approximately 14.4 million board feet of timber. Management activities would take place on approximately 7,797 acres and would include:

- Thin to create or maintain single story stands and culture large trees (688 acres);
- Thin to reduce stand competition but retain multi-story canopy and large trees (2,387 acres);
- Thin to reduce stand competition, culture large trees and retain a combination of single story and multi-story canopy (1,160 acres);

Alternative C would include activities to reduce natural fuels within harvest units, and would pile and dispose of activity-generated fuels, and would add 3,563 acres of units in which only fuels-reduction activities and no commercial harvest would take place.

In order for Alternative C to be implemented, the following are connected actions:

- About 44 miles of currently closed Maintenance Level 1 roads would be opened to allow timber hauling and other activities. Roads would be closed following implementation.
- Road maintenance, especially blading and brushing, would be performed on about 118 miles of Maintenance Level 1 and 2 roads.
- About 5.9 miles of temporary roads would be constructed to facilitate economical timber harvest removal. These would be obliterated following implementation and restored to a condition that is hydrologically functional and able to revegetate more quickly.
- Future maintenance of fire behavior modification areas would require underburning and small tree thinning, subject to site-specific environmental review under the National Environmental Policy Act.

Major conclusions include:

Soils
All activities have been designed to meet Forest Plan and Regional Standards. All areas were active management is to occur would continue to function as productive sites.

Forested Vegetation
Active management in the Five Buttes project area is one of a series of several projects (Seven Buttes, Seven Buttes Return) developed over the past ten years to modify the effects that disturbance events will have on this landscape. Analysis has shown that the vegetative structure is constantly changing and cannot be sustained in any one place on the landscape for the long-term. Neither action alternative would eliminate risk of disturbance processes; however, both would take steps necessary to limit the amount and severity of large scale changes, help provide for a mix of vegetative conditions to be present at any time, and increase the resiliency of forested stands to disturbance processes.

Fire and Fuels
The potential effectiveness of fuels treatments in reducing the loss of late successional habitat to a large, severe wildfire was evaluated using risk modeling procedures. Active management scenarios, especially under Alternative C but also under Alternative B, significantly decreased the average burn probability when compared to the no action alternative (A). Expected loss of owl habitat was substantially reduced by Alternatives B and C.

Wildlife
This Davis Late Successional Reserve Assessment strives to achieve the desired balance of vegetative conditions spatially distributed over the landscape through time. In many plant association groups, “suitable habitat” is transient and may not be attained in any one location for very long, especially for late-successional species that require climatic climax conditions in fire-adapted landscapes on the eastside of the Cascades. Alternatives B and C move the Reserve in the direction to develop, enhance, and protect northern spotted owl habitat over time.

All alternatives, including passive management, “**May Effect, and are Likely To Adversely Affect**” the northern spotted owl. In Alternative A (no action), no risk reduction activities would occur; therefore, the potential remains for large-scale loss of northern spotted owl habitat, similar to the scale seen in the Davis Fire of 2003. In Alternatives B and C, limited active management would occur outside of Nesting, Roosting, Foraging habitat in occupied spotted owl territories; activities would also take place in spotted owl habitat outside of occupied territories, and Nesting, Roosting, Foraging habitat would be affected across the project area in the short-term.

Neither Alternative B nor C appreciably affects existing snag density and recruitment over time and across the landscape.

Fisheries
The determination in the Biological Assessment was that implementation of this project will have No Effect to bull trout or their habitat. The project will have No Impact on redband trout.

No activities would take place in Riparian Habitat Conservation Areas. There is no harvest or temporary road construction inside riparian reserves adjacent to stream channels. All activities within the riparian resources at Davis Lake have been designed to comply with the Riparian Reserve and Key Watershed standards and guidelines as specified in the Northwest Forest Plan.

Water Quality
The project area contains two streams (Crescent Creek and Odell Creek) that are listed on the EPA's 303(d) list of water quality impaired water bodies. No actions associated with this project would change the condition of any waterway or water body in the project area.

Invasive Plants
Based on the vectors and proposed activity, Alternative C was determined to have the greatest risk rating for introduction and spread of existing populations of invasive plants. The risk rating is mostly based on the amount of ground disturbance. Since Alternative C has the greatest amount of activity (including small diameter fuels reduction), the potential is the greatest. However, the 2003 Davis Fire created more favorable conditions for introduction of invasive plants than any activity considered in the Five Buttes project and Alternative A (no action) has the greatest potential for another wildfire of that proportion.

This project will use prevention as the main strategy to manage invasive plant species (R6 Invasive Plant EIS Standard #7). Actions conducted or authorized by written permit (contracts) that operate outside the limits of the road prism, require clean equipment prior to entering National Forest System Lands. All active gravel, fill, sand stockpiles, quarry sites, and borrow material will be inspected for invasive plants before use and transport. Only weed-free gravel, fill, sand, and rock would be used.

Economic and Social
Neither action alternative would generate revenues that exceed all the costs associated with the project. Alternative C is the most expensive because of the non-timber related activities that are required to reduce the risk of disturbance on a landscape scale. Alternative B has the greatest economic efficiency of the action alternatives. The Benefit/Cost ratio is 0.96.

Unroaded, Inventoried Roadless Area Resources
No activities are planned within areas considered unroaded, or within Inventoried Roadless Areas.

Wild and Scenic River
In Alternatives B and C, portions of units fall within the wild and scenic river interim corridor (1/4 mile each side of the creek) totaling 94 acres of understory thinning. Two units are within 100 feet of the rivers edge, but they are non-commercial ("fuels only") and most activities would be accomplished by hand. Understory thinning would highlight and maintain the large ponderosa pine trees within the corridor that are currently competing with understory trees for scarce water and nutrients. Also, thinning would allow the careful reintroduction of prescribed fire. Other values associated with the immediate river environment, such as water quality, fish and wildlife and riparian plant communities would have a measure of protection provided by a minor reduction in risk of an uncharacteristic wildfire in the area.

Issues to Resolve and Decision to be Made
Based upon the effects of the alternatives, the responsible official will decide to:

- Select the proposed action, an action alternative that has been considered in detail, modify an action alternative, or select the no-action alternative.
- Identify what mitigation measures will apply.
- Determine what monitoring will be necessary and where it will be completed.

The Forest Supervisor will evaluate the alternatives by:

- Examining how well they meet the underlying purpose and need for action;
- Considering their responsiveness to the issues and concerns raised by the public and other agencies; and
- Reviewing their likely environmental effects, and in particular, their short- and long-term impacts and benefits to the habitat of Federally-listed threatened and endangered species.

LIST OF ACRONYMS

ACS -	Aquatic Conservation Strategy
BA -	Biological Assessment
BCC -	Birds of Conservation Concern
BCR -	Bird Conservation Region
BE -	Biological Evaluation
BMP -	Best Management Practices
BO -	Biological Opinion
BoR -	Bureau of Reclamation
DEQ -	Oregon Department of Environmental Quality
EA -	Environmental Assessment
EIS -	Environmental Impact Statement
EPA -	Environmental Protection Agency
ESA -	Endangered Species Act of 1973
FS -	Forest Service
FSH -	Forest Service Handbook
FSM -	Forest Service Manual
HUC	Hydrologic Unit Code
INFISH -	Inland Native Fish Strategy
LRMP -	Deschutes National Forest Land and Resource Management Plan (1990)
LSR -	Late Successional Reserve
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
MOU -	Memorandum of Understanding
MSA -	Magnuson-Stevens Fishery Conservation Act
MSL -	Mean Sea Level
NLAA -	May Affect, but Not Likely to Adversely Affect
NMFS -	National Marine Fisheries Service
NWFP -	Northwest Forest Plan
OCRA -	Oregon Cascade Recreation Area
ODFW -	Oregon Department of Fish and Wildlife
OSHA -	Occupational Safety and Health Association
PAG -	Plant Association Group
PDC -	Project Design Criteria from the 2006-2009 Programmatic Biological Assessment
RHCA -	Riparian Habitat Conservation Area
RR -	Riparian Reserve
TMDL -	Total Maxium Daily Load
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
WQMP -	Water Quality Management Plan
WUI -	Wildland-Urban Interface

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CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Document Structure

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

- *Chapter 1. Purpose and Need for Action:* The chapter includes information on the history of the project proposal, existing conditions within the project area, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- *Index:* The index provides page numbers by subject.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental impact statement.

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

Background and Existing Conditions

The 160,000-acre Five Buttes project area (Figure 1-1) includes portions of twelve subwatersheds. Approximately 141,772 acres of the project area are National Forest System lands within the Deschutes National Forest, and the remaining acres are privately owned. The project area is located about 50 miles south of Bend, Oregon, in Townships 21, 22, 23, 24 South and Ranges 5 ½, 6, 7, 8, 9 East. Approximately 133,565 acres (about 83%) of the project area are within the boundary of the Northwest Forest Plan.

The Crescent Ranger District began a proactive approach to forest health issues in this area in 1996 (Seven Buttes Environmental Assessment). The Five Buttes project continues to work toward the broad goals of increasing resistance to uncharacteristically severe insect, disease, and fire events on a landscape scale and promoting and retaining large trees on the landscape. Other objectives are development, maintenance, and enhancement of wildlife habitat conditions appropriate for management areas specified in the Northwest Forest Plan, and providing for scenic quality and economic yields of forest products.

The Davis Fire (Figure 1-2), which started on June of 2003 and burned 21,000-acres in the Five Buttes project area, was the first "problem fire[1]" event to take place on the Crescent Ranger District in recorded history. Weather and fuel conditions at the time of the Davis Fire are common on the Crescent Ranger District, so the possibility exists of similar events occurring in the future.

[1] Refer to the "Fire and Fuels" section in Chapter 3 of this EIS for a definition of "problem fire."

The project area includes the 48,900-acre Davis Late Successional Reserve (Figure 1-3). The Davis Late Successional Reserve Assessment (Revised LSRA, 2006) found that the most immediate need within the Late Successional Reserve was to reduce the risk of large-scale effects of insect attack, disease, or wildfire in the existing late and old-structured stands. The Revised LSRA concluded that in some Management Strategy Areas there is an immediate need to reduce stand density and fuel loadings as well as modify fuel arrangements before habitat loss occurs in the late- and old-structured stands.

Across the landscape within the mixed conifer dry plant association group, the true-fir component has increased dramatically in recent times. This condition is found largely within the stands classified as suitable for spotted owl nesting, roosting and foraging in the project area. Because of the dry site conditions and stand structure, these stands are at the highest risk of being lost to a large-scale fire event or insect or disease attack. Some of the most desired characteristics of these stands (such as fire resistant large ponderosa pine and Douglas-fir) are placed at risk because the increasing true fir component creates a structure that allows ground fires to reach the crowns of the larger trees.

The vegetative condition of the project area is typified by very dense multistoried stands with high-hazard fuel conditions. There is an immediate need to reduce stand density and fuel loadings as well as modify fuel arrangements on the landscape before large-scale, uncharacteristic loss of late- and old-structured stands occurs.

The lodgepole pine areas are often interspersed with other plant associations, usually in relatively abrupt transitions associated with topographic change. As noted from the Davis Fire, the considerable loading of fuels that often dominates lodgepole areas is a very real threat to adjacent areas in the event of fire. In addition, these lodgepole areas are often heavily traversed and used by people who recreate in the project area, which increases the chance of human-caused fires. There is a need to identify and reduce the fuel loadings in key areas adjacent to late- and old-structured stands and other habitat areas.

Stands that historically were dominated by large pines and Douglas-fir (greater than 21” in diameter) are now dominated by smaller trees, understory species include the true firs, which are less resistant to disturbance than large pines and Douglas-fir. Existing overstory ponderosa pine and Douglas-fir can’t compete with true firs in overcrowded conditions. In a dense stand condition, replacements for the large overstory trees are not able to seed in and grow. The trend in these forests is for the large-tree component to decline due to overcrowding from and competition with younger, smaller trees. These conditions have caused a shift in species composition in the understory (mostly to true fir and lodgepole pine) leaving a few overstory ponderosa, sugar pine, white pine, and Douglas-fir. Not enough trees of the overstory species exist in the understory to adequately replace the larger trees that are being lost to density-related mortality.

The decline of large-tree dominated stands affects habitat for the bald eagle and the northern spotted owl, species listed as Threatened under the Endangered Species Act. A decline in large tree habitat near Odell and Davis Lakes could reduce the amount of nesting and perching sites available to bald eagles. Especially on the drier sites near Davis Lake, open stands have seen considerable ingrowth of small trees. Due to the problems related to overcrowding, stands that provide the large tree and multi-storied canopy structure that spotted owls need for nesting, roosting, and foraging cannot be sustained over the long term on many of the drier locations found in the project area.

Most stands within the planning area are still capable of responding favorably to management actions. In other words, the stand characteristics that are desired can be achieved and/or maintained through the vegetative treatments. An example of a stand that would not respond favorably is one that has such an infestation of disease and/or insects that desired stand characteristics are already lost.

Thinning of small trees and/or larger trees, which results in timber stand density control and reduction of ladder fuels, is an attempt to mimic the vegetative structure that results from natural disturbance fire events. Logging is used to implement thinning of trees with commercial value to provide economic returns to help finance the other management activities needed to change the vegetative and fuels structures and loadings.

Management Direction

A summary of relevant laws and management direction from the Deschutes Land and Resource Management Plan (LRMP), as amended by the 1994 Northwest Forest Plan (NWFP), is located in Appendix A of this EIS. References are included in the appendix so that the reader may find additional details about this management direction. Figure 1-4 displays a map of the Five Buttes Vegetation Management project area by LRMP Management Area, and Figure 1-5 shows the project area by NWFP Allocations.

The Deschutes National Forest Land and Resource Management Plan (Forest Plan; page 4-2) contains three Forest Management Goals that are particularly relevant to this project:

- Provide a fire protection and prescribed burning program which is responsive to land and resource management goals and objectives.
- Provide old-growth tree stands for (1) preservation of natural genetic pools, (2) habitat for plants and wildlife species associated with over-mature tree stands, (3) contributions to the diversity spectrum, (4) aesthetic appeal.
- Provide an optimum level of timber production consistent with various resource objectives, environmental constraints, and economic efficiency.

All alternatives considered in detail in this EIS are consistent with the Deschutes National Forest Plan, as amended; refer to Appendix A of this EIS for more information on consistency with current laws and management direction.

Purpose and Need for Action

1. There is a need to strategically reduce fuel loadings and forest vegetation density so as to lessen the risk that disturbance events such as insect, disease, and wildfire will lead to large-scale loss of forest. As used here, the term "strategically" means to locate a mix of management actions in specific places on the landscape where they will reduce the risks to desired habitats, specifically late and old-structured stands and large trees.

2. There is a need to contribute to the local and regional economies by providing timber and other wood fiber products.

Proposed Action

The action proposed by the Forest Service to meet the purpose and need is to implement a variety of vegetation management activities across approximately 5,522 acres. The proposed action would commercially harvest about 18.9 million board feet (mmbf) and would incorporate a combination of logging methods (about 4,439 acres of ground-based logging and 1,083 acres of advanced logging systems, either cable or helicopter). Actions proposed to reduce risk on the landscape include the following:

- Thin to create or maintain single story stands and culture large trees (1,175 acres);
- Thin to reduce stand competition but retain multi-story canopy and large trees (3,153 acres);
- Thin to reduce stand competition, culture large trees and retain a combination of single story and multi-story canopy (1,160 acres);
- Risk reduction through salvage of dead lodgepole pine (34 acres);

Fuels Management inside Commercial Harvest Units

- Remove trees 6" diameter and smaller, retaining approximately 100 - 275 trees per acre (5,522 acres);
- Prune limbs to 8 feet (5,522 acres);
- Prescribed underburn retaining 15-20 percent in an unmanaged condition (3,998 acres);
- Utilize thinned trees as special forest products (3,343 acres);
- Grapple piling of activity-generated slash (4,439 acres);
- Hand pile activity-generated slash (2,275 acres);

- Dispose of piles by either prescribed burning or a combination of utilization (5,522 acres).

Connected Actions
In order for the Proposed Action to be implemented, the following connected actions would also need to be implemented[2]:

- About 34 miles of currently closed Maintenance Level 1 roads would be opened to allow timber hauling and other activities. Roads would be closed following implementation.
- Road maintenance, especially blading and brushing, would be performed on about 110 miles of Maintenance Level 1 and 2 roads.
- About 6.4 miles of temporary roads would be constructed to facilitate economical timber harvest removal. These would be obliterated following implementation and restored to a condition that is hydrologically functional and able to revegetate more quickly.

A detailed description of the proposed action, including maps showing the locations of all activities, can be found in Chapter 2 of this document.

Decision Framework

The Responsible Official for this proposal is the Forest Supervisor of the Deschutes National Forest. The Responsible Official will make a decision and document it in a Record of Decision (ROD). The Responsible Official can decide to:

- Select the proposed action, an action alternative that has been considered in detail, modify an action alternative, or select the no-action alternative.
- Identify what mitigation measures will apply.
- Determine what monitoring will be necessary and where it will be completed.

The Forest Supervisor will evaluate the alternatives by:

- Examining how well they meet the underlying purpose and need for action;
- Considering their responsiveness to the issues and concerns raised by the public and other agencies; and
- Reviewing their likely environmental effects, and in particular, their short- and long-term effects and benefits to the habitat of Federally-listed threatened and endangered species.

[2] Please refer to the Transportation System section in Chapter 3 of this document for descriptions and definitions of these activities.

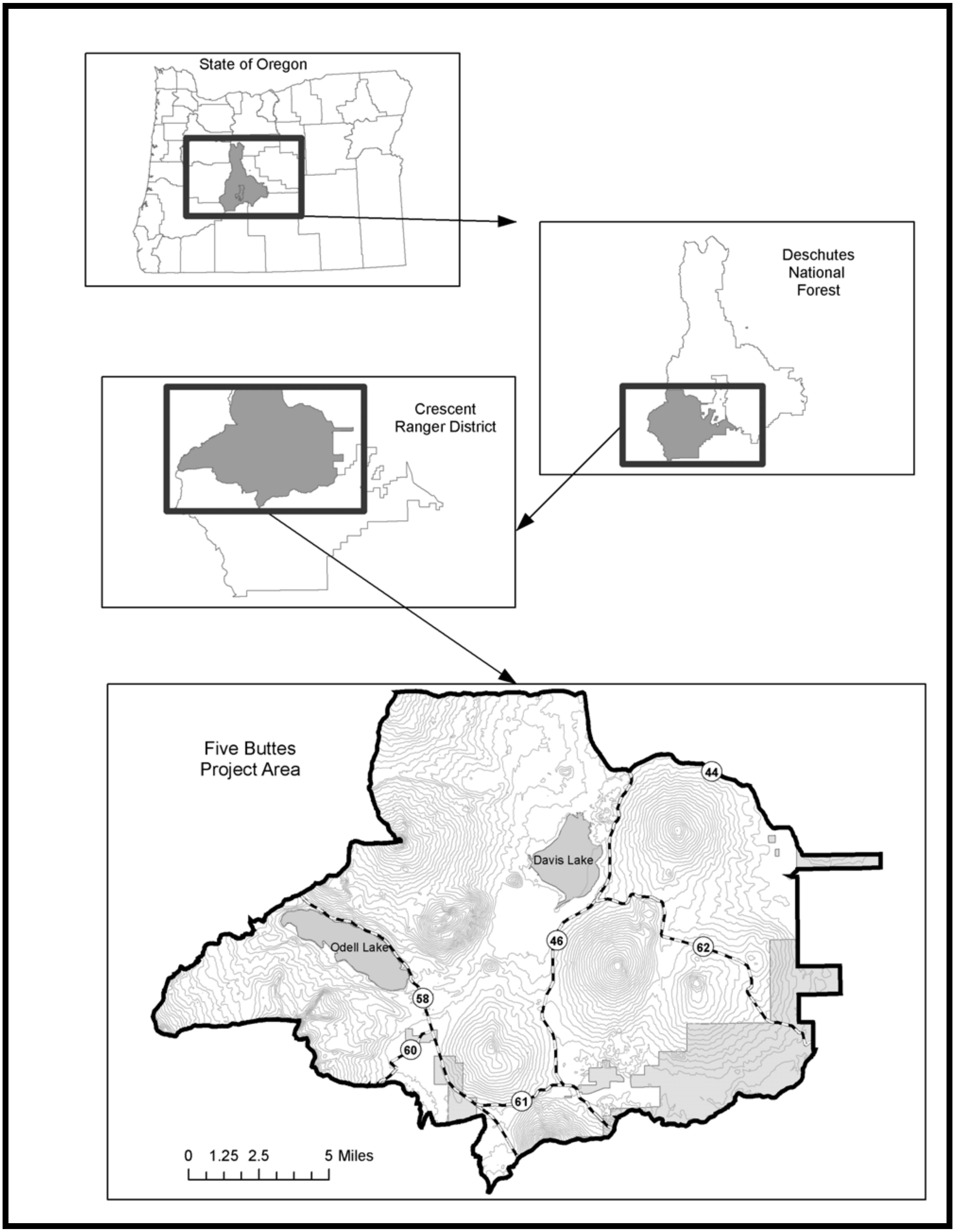

Figure 1-1. Location of the Five Buttes Project.

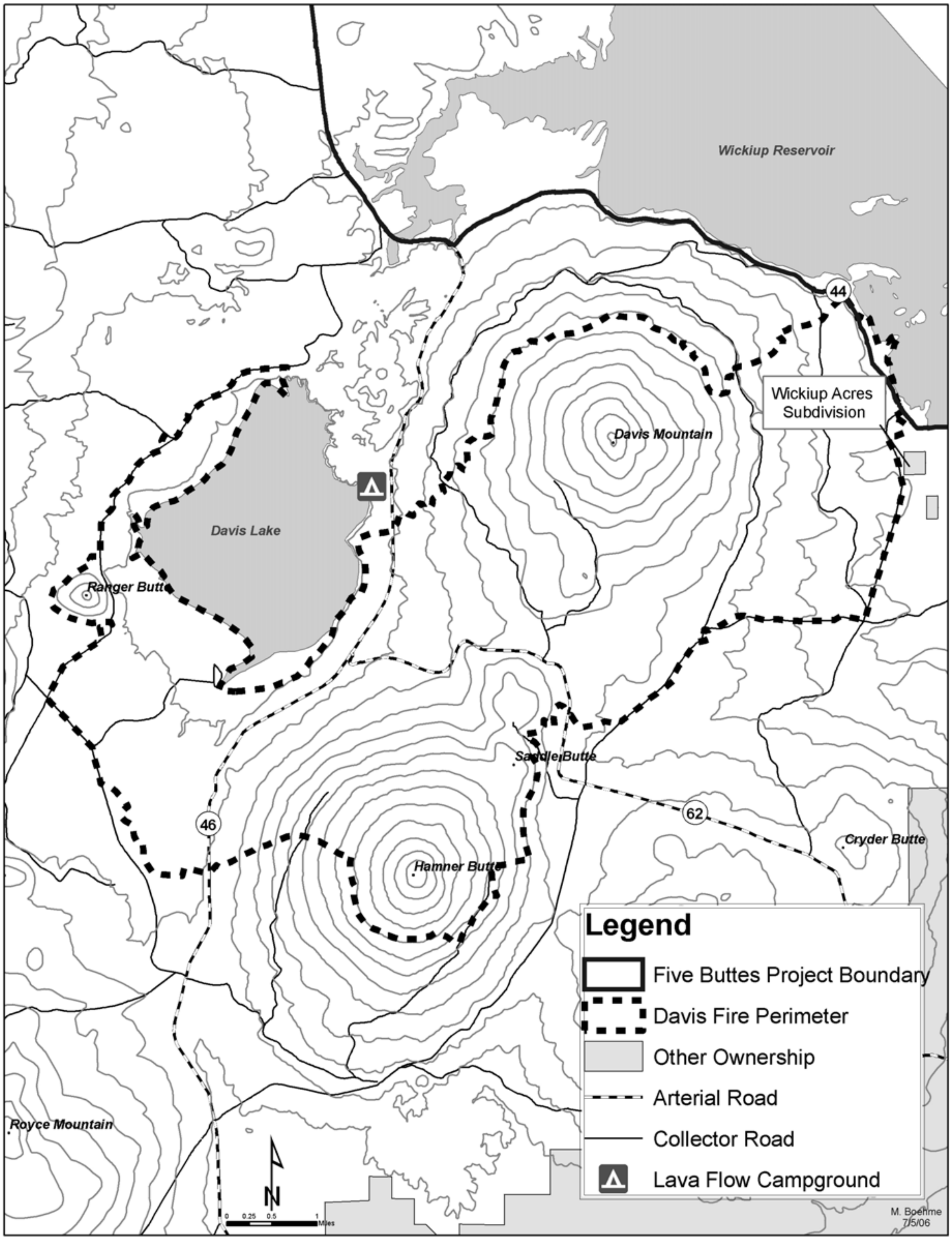

Figure 1-2. The Davis Fire of 2003.

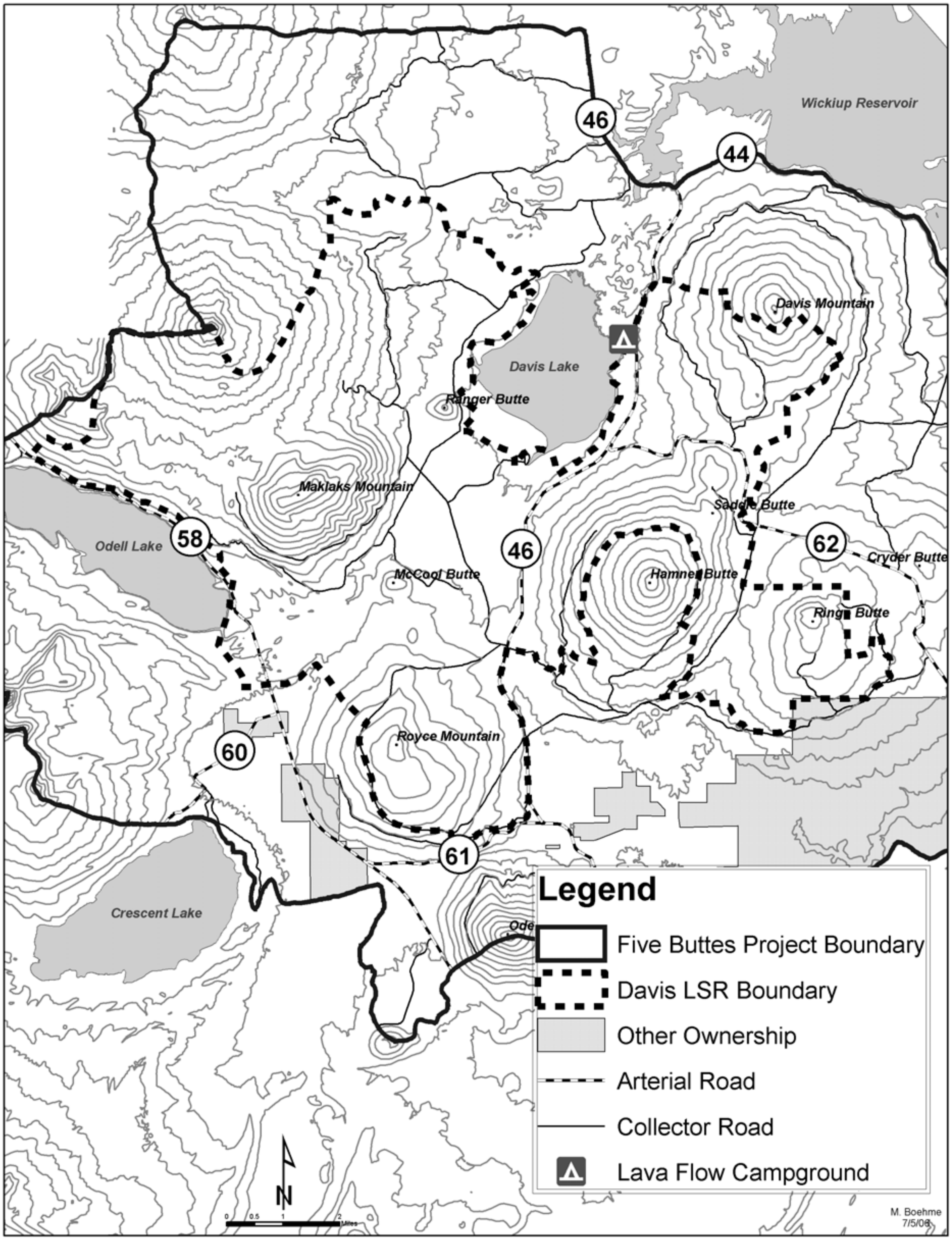

Figure 1-3. Davis Late Successional Reserve.

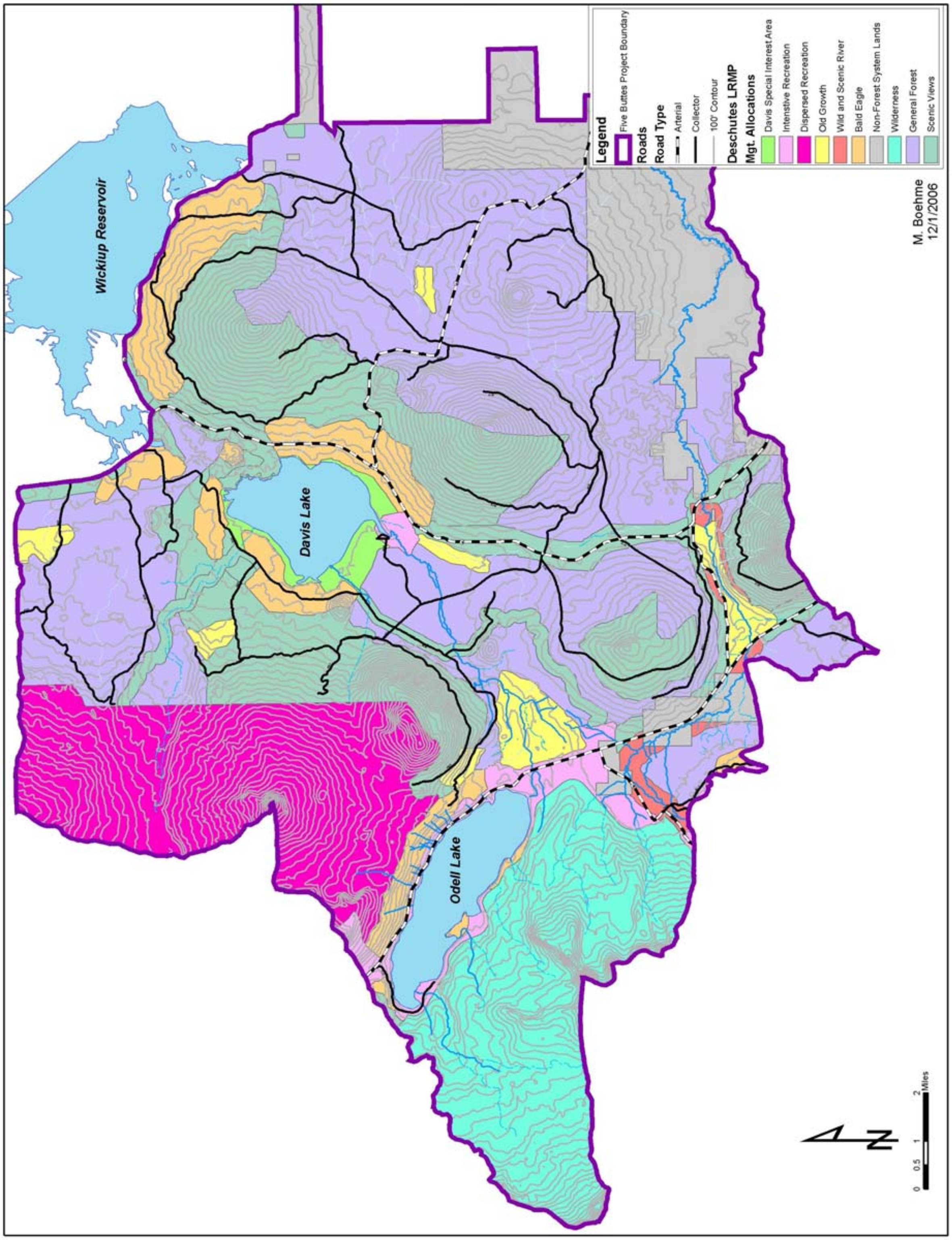

Figure 1-4. Deschutes LRMP Management Areas in the Five Buttes project area.

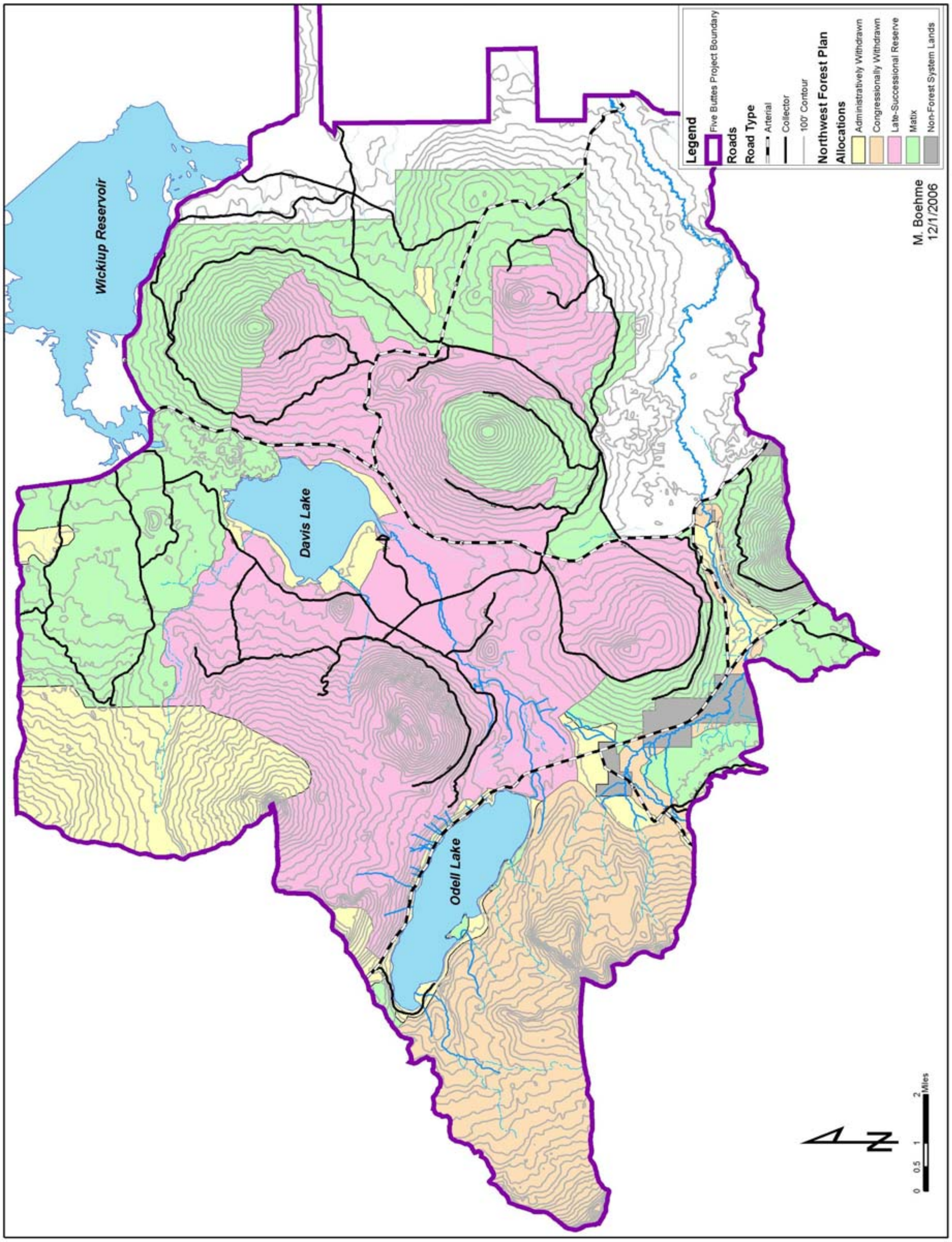

Figure 1-5. Northwest Forest Plan Allocations in the Five Buttes project area.

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

This chapter describes and compares the alternatives considered for the Five Buttes Project. It includes a description and map of each alternative considered. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice by the decision maker. Some of the information used to compare the alternatives is based upon the design of the alternative and some of the information is based upon the environmental, social and economic effects of implementing each alternative.

Changes between Draft and Final EIS

- Additional modeling was completed and discussed in the "Alternatives Considered but Eliminated" section.

Public Involvement

The Five Buttes Project was initially proposed to the public in April of 2004; at that time the project was called "Five Buttes Interface." Five public organizations submitted comments at that time. Based on comments received, as well as internal and interagency discussion, the Five Buttes planning team determined that the appropriate level of analysis and documentation would include an environmental impact statement and a Record of Decision.

The Notice of Intent (NOI) was published in the Federal Register on April 1, 2005. The NOI asked for public comment on the proposal from April 1, 2005 - May 1, 2005. The Crescent Ranger District held a public field trip to the Five Buttes Project area (July 9, 2005) that was attended by ten members of the public. As an additional effort to involve the public in the planning process, the District mailed a description of the project's range of alternatives to the mailing list on January 11, 2006. Using the comments from the public and other agencies (see *Issues* section) the interdisciplinary team developed a list of issues to address.

A 45-day comment period for the Five Buttes Project Draft Environmental Impact Statement was provided for interested and affected publics, including appropriate local, state and federal agencies and Tribes. This period began with the publication of the Notice of Availability in the Federal Register on February 16, 2007. The public comment period ended April 2, 2007. During this period, the Forest Service received 17 separate pieces of mail from 16 sources; a range of concerns and questions were expressed. All comments were reviewed and substantive comments received focus during the comment analysis (see Appendix D of this EIS).

On April 5, 2007, the Five Buttes team briefed the Provincial Advisory Committee, a group representing various federal agencies, state, American Indian tribes, and others, on public comments received and the decision to be made. The Crescent District hosted another public meeting/field trip on May 21, 2007, which was attended by representatives of Blue Mountains Biodiversity Group, Sierra Club, and Cascadia Wildlands; at that time the groups had the opportunity to discuss their concerns with members of the project planning team.

Consultation with the Tribes
During the early stages of this project, contacts were made with affected tribes (Klamath, Confederated Tribes of Warm Springs, and Burns-Paiute). On May 16, 2006, the Forest Supervisor met with the Burns-Paiute, presented the project, and no specific concerns were raised. Government to government

consultation has been informal through meetings between the Deschutes National Forest supervisor and their representatives, scoping letters, and personal contact with natural resource members representing all there tribes. On April 5, 2007, the Five Buttes team briefed the Provincial Advisory Committee, a group which includes a representative in Natural Resources from the Confederated Tribes of Warm Springs. Also, the interdisciplinary team has offered to present proposed activities at the quarterly meetings for the Confederated Tribes of Warm Springs Reservation. No special concerns about Tribal resources were identified.

It is acknowledged that the Tribes may have lost the verbal history and they may not know where desired plant species and resources may be found. This affects their ability to tell Federal agencies where Tribal trust resources can be located on Federal lands. Restoration of the landscape would promote the types of plants, include of those used for gathering by native peoples, so they would remain or increase in the project area.

Consultation with Government Agencies
Coordination has also occurred with federal, state, and local government officials (see also Chapter 4 of the FEIS). Consultation with the U.S. Fish and Wildlife Service and the Environmental Protection Agency was extensive. On March 8, 2007, The US Fish and Wildlife Service sent a letter of support for the project, which read in part, “the Department [DOI] supports the Deschutes National Forest's proposal to implement the Five Buttes Project on a 160,000-acre area to reduce the risk of natural disturbances such as fire that may lead to large-scale loss of forest resources.” On April 2, 2007, The Environmental Protection Agency wrote, “EPA understands the risk that natural disturbance processes such as insects, disease and fire may pose to valuable forest resources. As a result, we support many of the vegetation management strategies identified in the Preferred Alternative and which are put forward to improve resource conditions while reducing the risk of large-scale loss of forest from the project area. The draft EIS also includes good analyses of potential impacts to resources in the project area, and includes mitigation measures and Best Management Practices (BMPs) to avoid and reduce the impacts.”

Issues

Issues are points of discussion, debate, or dispute about environmental effects or competing uses of the resources that may occur as a result of the proposed action. Issues provide focus and influence alternative development, including development of mitigation measures to address potential environmental effects, particularly potential negative effects. Issues are also used to display differing effects between the proposed action and the alternatives regarding a specific resource element.
The project Interdisciplinary Team sorted the comments received during initial scoping into categories to help issue tracking and response. The issues are categorized as follows:
Key issues: These are issues that cannot be resolved without some consideration of the trade-offs involved and so are used to develop alternatives and design elements. Trade-offs can be more clearly understood by developing alternatives and displaying the relative effects of these alternatives.
Analysis issues: Some issues were not used to develop alternatives and design elements, but nonetheless relate to environmental components that are considered in the analysis in Chapter 3. These issues are important for providing the Responsible Official with complete information about the effects of the project.

Key Issues

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

*Key Issue 1****: Spotted Owl Habitat***

The Five Buttes project proposes to reduce the risk of large scale forest loss to catastrophic wildfires and beetle epidemics within the 160,000-acre planning area. To address these concerns treatments would be designed to reduce fuel loadings in selected areas through a combination of underburning and/or stand density management. Commercial and small tree thinning in addition to underburning (where appropriate) would be utilized to maintain and enhance forest health including the development of large tree structure. However, the intensity of the treatments, their timing, and placement on the landscape may have a negative effect on the northern spotted owl, a federally listed species. Silvicultural activities aimed at making forested stands more resistant to insects, disease and fire may also cause a short- or long-term modification or degradation of suitable habitat. Ten of the thirteen remaining northern spotted owl territories and the majority of the suitable northern spotted owl habitat on the Crescent Ranger District are in the Five Buttes planning area.

The silvicultural and fuels treatments proposed would reduce stem density, overall canopy cover, and may reduce the amount of down wood that provides prey base habitat. These activities may reduce the quality, effectiveness, and the distribution of habitat available to the northern spotted owl in the planning area for the short- and long-term as well as directly, indirectly and/or cumulatively. Consequences of active management may have a negative effect on the northern spotted owl and its ability to establish and maintain breeding territories, provide sufficient prey base habitat, and disperse across the landscape.

The effects to the northern spotted owl will be measured using the following attributes and measures:

- Acres of Nesting, Roosting, and Foraging (NRF) habitat treated by alternative, as compared to the existing condition.
- Acres of NRF habitat treated within the Davis Late-Successional Reserve and northern spotted owl Critical Habitat Unit CHU (OR-07).
- Acres of northern spotted owl dispersal habitat actively managed in the project area.
- Acres of NRF affected by type of activity (commercial versus small tree thinning).
- Acres of activity within known spotted owl territory.

Key Issue 2. ***Strategic Placement of Treatment Units***

The proposed action responded to the identified biological needs: reducing the likelihood of large-scale disturbance from insect, disease, and wildfire processes, and maintaining large trees on the landscape.

The Interdisciplinary Team, after hearing from some members of the public that the proposed action did not go far enough to protect the landscape, looked at the set of conditions, including terrain features, vegetation conditions, and weather, which resulted in the Davis Fire. This led to identification of several parts of the Five Buttes Project area where similar terrain features and stand conditions occur, and consideration of key assets on the landscape that are associated with these conditions and that remain at risk in a wildfire scenario. This analysis, plus computer modeling and professional judgment, verified the public’s concern. Although the Proposed Action essentially had identified vegetation management in the right place to meet the Purpose and Need of the project, modeling showed that the proposed units were not large enough to be effective from a wildfire suppression standpoint. A problem fire would burn around units and between features, such as lava flows, essentially unimpeded. There are places on the landscape where unit placement and additional fuels activities in adjacent stands could improve suppression capability, reduce the risk of large-scale disturbances, and reduce the risk of tree mortality in the event of disturbances.

The degree to which each alternative addresses Key Issue #2 will be measured using the following attributes:

- Landscape scale burn probability of spotted owl home ranges, as indicated by computer modeling exercises.
- Acres of late- and old-structure stands maintained and enhanced.
- Acres of treatment that favor desired species as described above.
- Acres on which prescribed fire is used to help maintain vegetative conditions that are resilient to wildfire, as indicated by computer modeling exercises.
- Acres on which the probability of fire is reduced by vegetative and fuels manipulation activities.

Analysis Issues

Other issues and concerns were raised during scoping, that did not result in different alternatives or design elements, but are considered during the analysis process and discussed in Chapter 3. These issues are generally less focused on the elements of Purpose and Need, than are the Key Issues.

Soils - The long-term sustainability of forest ecosystems depends on the productivity and hydrologic function of soils. Ground-disturbing management activities directly affect soil properties, which may adversely change the natural capability of soils and their potential responses to natural processes and management. A detrimental soil condition often occurs where heavy equipment or logs displace soil surface layers or reduce soil porosity through compaction. Effects from these actions can potentially increase runoff and accelerate soil erosion. Detrimental disturbances reduce the soil's 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.

Wildlife – In addition to the key issue related to the northern spotted owl, the following resources are analyzed and compared by alternative:

- Threatened, Endangered, Candidate and Sensitive Species
- Survey and Manage Species
- Management Indicator Species
- Resident and Migratory Landbirds

Water Quality and Fish Habitat - Odell and Crescent Creeks are listed on the 303(d) list as "Water Quality Limited" by the Oregon Department of Environmental Quality for temperatures exceeding State guidelines. Bull trout, a federally Threatened species, and redband trout, a Regional Sensitive species, use Odell Creek. Harvest or road-building activities near streams or within riparian areas have the potential to affect water quality and fish habitat. In the design of the proposed action for the Five Buttes Project, no temporary road construction is proposed near any water; and specific Project Design Features were incorporated into alternatives to maintain water quality and fish habitat.

Botany –

- Potential effects to Threatened, Endangered, Candidate, Sensitive, and Survey and Manage plant species were analyzed.
- Proposed management activities have the potential to introduce or spread existing populations of invasive plants. Potential spread of invasive plants is a concern across the project area and this analysis incorporates prevention measures into the project design, as required by the Forest Plan and as described in the Deschutes/Ochoco Prevention Practices.

Cultural Resources – Proposed ground-disturbing activities may have an effect on cultural resources. The Davis Lake area is especially rich in cultural resources. Avoidance of potential sites was incorporated into activity unit design and Chapter 3 includes a discussion on the potential effects associated with no action, and active management.

Recreation – A developed recreation site (Lava Flow Campground) is within an area that is proposed for active management. Chapter 3 discloses the effects to visitor's use of the site and the consequences of status quo.

Economic and Social well being – The communities of Central Oregon are tied to forest management through employment, income and recreation. Chapter 3 discloses the effects of the project on the society and economics of the Central Oregon area.

Alternatives Considered in Detail

The Forest Service developed one alternative to the Proposed Action, for a total of three alternatives, including the No Action. The No Action Alternative is used as a baseline to display consequences of a passive management scenario.

Alternative A

No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No additional thinning or fuels treatments would be implemented to accomplish project goals. Custodial activity would continue, such as routine maintenance of roads and timber plantations. Response to environmental emergencies, such as suppression response to a wildfire, would continue.

Alternative B

The Proposed Action

The Proposed Action includes a variety of vegetation management activities across approximately 5,522 acres, and would harvest approximately 18.9 million board feet of timber. Refer to Figure 2-1 for locations of Alternative B units. Activities to reduce risk on the landscape include:

- Thin to create or maintain single story stands and culture large trees (1,175 acres);
- Thin to reduce stand competition but retain multi-story canopy and large trees (3,153 acres);
- Thin to reduce stand competition, culture large trees and retain a combination of single story and multi-story canopy (1,160 acres); and
- Salvage dead lodgepole pine (34 acres);

Fuels Management Activities inside Commercial Harvest Units

The following activities would be utilized to reduce activity-generated residue and to maintain fire-dependent ecosystems:

- Remove trees 6 inches diameter and smaller, retaining approximately 100 - 275 trees per acre (5,522 acres);
- Prune limbs to 8 feet (5,522 acres);
- Prescribed underburn retaining 15-20 percent of each unit in an unmanaged condition (3,998 acres);
- Utilize thinned trees as special forest products (3,343 acres) following commercial harvest;
- Grapple pile activity-generated slash (4,439 acres);
- Handpile activity-generated slash (2,275 acres); and
- Dispose of piles by either prescribed burning or in combination with utilization (5,522 acres).

Description of Fuels Management Activities

Mechanical harvest would include either yarding with the limbs attached to the top log or whole-tree yarding. In order to reduce the chance that ground fires could transition to a more dangerous crown fire, small trees up to 6-inch in diameter would be felled by hand, piled, and disposed.

Activity-generated slash may be grapple piled in most ground-based harvest units. Grapple piling machines would be confined to existing skid trails, so that potential detrimental effects to soils are confined to areas already used in the harvest operation. The amount of area the grapple can reach depends on the skid trail spacing, but it is estimated to be 60 to 70 percent.

Advanced logging systems[3] would remove as much of the activity generated slash as feasible by whole tree yarding or yarding the crown attached to the last log. Post sale fuel reduction activities would be accomplished by handpiling and disposal.

Following commercial harvest, limbs of remaining trees would be pruned to a height of about 8 feet to reduce ladder fuels and increase crown base height. It is anticipated that pruning would be applied to about 80% of each unit.

Following commercial and fuel reduction-related activities, prescribed fire is planned for most areas where it is appropriate. It also would be an option for disposal of piles if utilization becomes infeasible. After pile disposal, careful introduction of prescribed fire would be applied to fire dependent plant association groups. It is anticipated that prescribed fire would be applied to about 80% of each appropriate activity unit.

Maintenance of Fire Behavior Modification Areas over Time

In order to maintain fuels at the desired level and to remain effective through time, prescribed burning as a maintenance tool would be needed every 8-12 years after an appropriate National Environmental Policy Act (NEPA) review. Also, it is estimated thinning would occur of small trees (6 inches diameter or smaller), with handpiling and disposal every 15-20 years. Existing limbed trees would remain effective as crown base heights rise each year with tree growth. However, smaller trees selected for retention would need to be pruned, usually with each thinning entry.

Connected Actions

In order for Alternative B to be implemented, the following are connected actions[4]:

- About 34 miles of currently closed Maintenance Level 1 roads would be opened to allow timber hauling and other activities. Roads would be closed following implementation.
- Road maintenance, especially blading and brushing, would be performed on about 110 miles of Maintenance Level 1 and 2 roads.
- About 6.4 miles of temporary roads would be constructed to facilitate economical timber harvest removal. These would be obliterated following implementation and restored to a condition that is hydrologically functional and able to revegetate more quickly.

Alternative C

This alternative was developed to address both key issues associated with landscape scale fire behavior modification and retention of spotted owl habitat. Alternative C emphasizes reducing the likelihood and size of another large fire event like the Davis Fire of 2003, and the protection of key assets such as spotted owl home ranges, bald eagle habitat, and late- and old-structured stands. This alternative would strategically place fuels treatments on the landscape to coordinate with past treatments to create and maintain fuel modifications[5] around identified habitats. As a result of more effective protection of key assets, some important habitat for the northern spotted owl, such as Nesting, Roosting and Foraging (NRF) and dispersal habitat proposed for active management in Alternative B, was deferred for the foreseeable future. This resulted in the reduction of the amount of commercial timber harvest by about 1,287 acres. Alternative C would harvest approximately 14.4 million board feet of timber. Refer to Figure 2-2 for the locations of Alternative C units. Management activities to reduce risk on the landscape would take place on approximately 7,797 acres and would include:

- Thin to create or maintain single story stands and culture large trees (688);
- Thin to reduce stand competition but retain multi-story canopy and large trees (2,387);

[3] Advanced logging systems may include helicopter or skyline logging, and are used where necessary to maintain soil productivity.
[4] Please refer to the Transportation System section in Chapter 3 of this document for descriptions and definitions of these activities.
[5] Fuel modifications are intended to result in areas in which fire behavior would reduce in severity enough to improve suppression effectiveness.

- Thin to reduce stand competition, culture large trees and retain a combination of single story and multi-story canopy (1,160);

Fuels Management Activities inside Commercial Harvest Units
The following activities would be utilized to reduce activity-generated residue and to maintain fire-dependent ecosystems:

- Remove trees 6 inches diameter and smaller, retaining approximately 100 - 275 trees per acre (4,325 acres);
- Prune limbs to 8 feet (4,325 acres);
- Prescribed underburn retaining 15-20 percent in an unmanaged condition (3,939 acres);
- Utilize special forest products following commercial harvest (2,593 acres);
- Grapple pile activity-generated slash (3,453 acres);
- Handpile forest residue (1,932 acres) and
- Dispose of piles by either prescribed burning or in combination with utilization (4,325 acres).

Fuels Management Activities outside Commercial Harvest Units ("Fuels-only Units")
The following fuels management activities on 3,563 acres would be utilized to reduce natural fuel loading within existing activity areas adjacent to commercial harvest units:

- Remove trees 3 inches diameter and smaller in stands that meet the description of Nesting, Roosting, and Foraging (NRF) habitat for spotted owls, retaining approximately 110 - 190 trees per acre (394 acres);
- Remove trees 6 inches diameter and smaller in stands that are not identified as NRF, retaining approximately 100 - 275 trees per acre (385 acres);
- In stands that have a mixture of NRF and non-NRF, removing trees up to 3 inches diameter in NRF and up to 6 inches diameter in non-NRF, retaining approximately 100 - 275 trees per acre (2,782 acres);
- Prune limbs to 8 feet (2,092 acres);
- Prescribed underburn small diameter natural fuels in non-NRF (approximately 1,148 acres);
- Utilize special forest products following natural fuels reduction activities (3,480 acres);
- Grapple pile slash (1,097 acres);
- Hand pile natural fuel residue (3,563 acres); and
- Dispose of piles by either prescribed burning or in combination with utilization (3,563 acres).

Description of Fuels Management Activities inside Commercial Harvest units
The descriptions of fuels management activities associated with commercial harvest would be the same as described under Alternative B.

Description of Fuels Management in Areas outside of Commercial Harvest Units
The objective of these activities is to create areas where fire behavior is modified or maintained by altering fuel profiles. Fuels management would reduce surface fuel loading and increase the crown base height to reduce vertical continuity of fuels. Strategic activities are designed to use existing landscape features, such as lava flows, and existing and proposed activity areas to break the fuel continuity between spotted owl habitat and ultimately protect downwind communities. This would reduce the likelihood of multiple owl home ranges burning on the days most susceptible to a wildfire event.

Fuels management activities are similar as described in the commercial harvest units except all activities would be accomplished by hand and except for the prescribed burning of handpiles in all units, reintroduction of prescribed fire would only occur in non-NRF and appropriate fire-dependent stands. There would be no prescribed burning within occupied spotted owl home ranges[6].

The maintenance of areas where fire behavior is modified would also need future prescribed underburning and small diameter thinning as described for Alternative B, after appropriate NEPA review.

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[6] At the time this FEIS was written, occupied spotted owl home ranges included those of the McCool, Hamner, Maklaks and Royce owl pairs.

Connected Actions

In order for Alternative C to be implemented, the following are connected actions[7]:

- About 44 miles of currently closed Maintenance Level 1 roads would be opened to allow timber hauling and other activities. Roads would be closed following implementation.
- Road maintenance, especially blading and brushing, would be performed on about 118 miles of Maintenance Level 1 and 2 roads.
- About 5.9 miles of temporary roads would be constructed to facilitate economical timber harvest removal. These would be obliterated following implementation and restored to a condition that is hydrologically functional and able to revegetate more quickly.
- Future maintenance of fire behavior modification areas would require underburning and small tree thinning, subject to site-specific environmental review under the National Environmental Policy Act.

[7] Please refer to the Transportation System section in Chapter 3 of this document for descriptions and definitions of these activities.

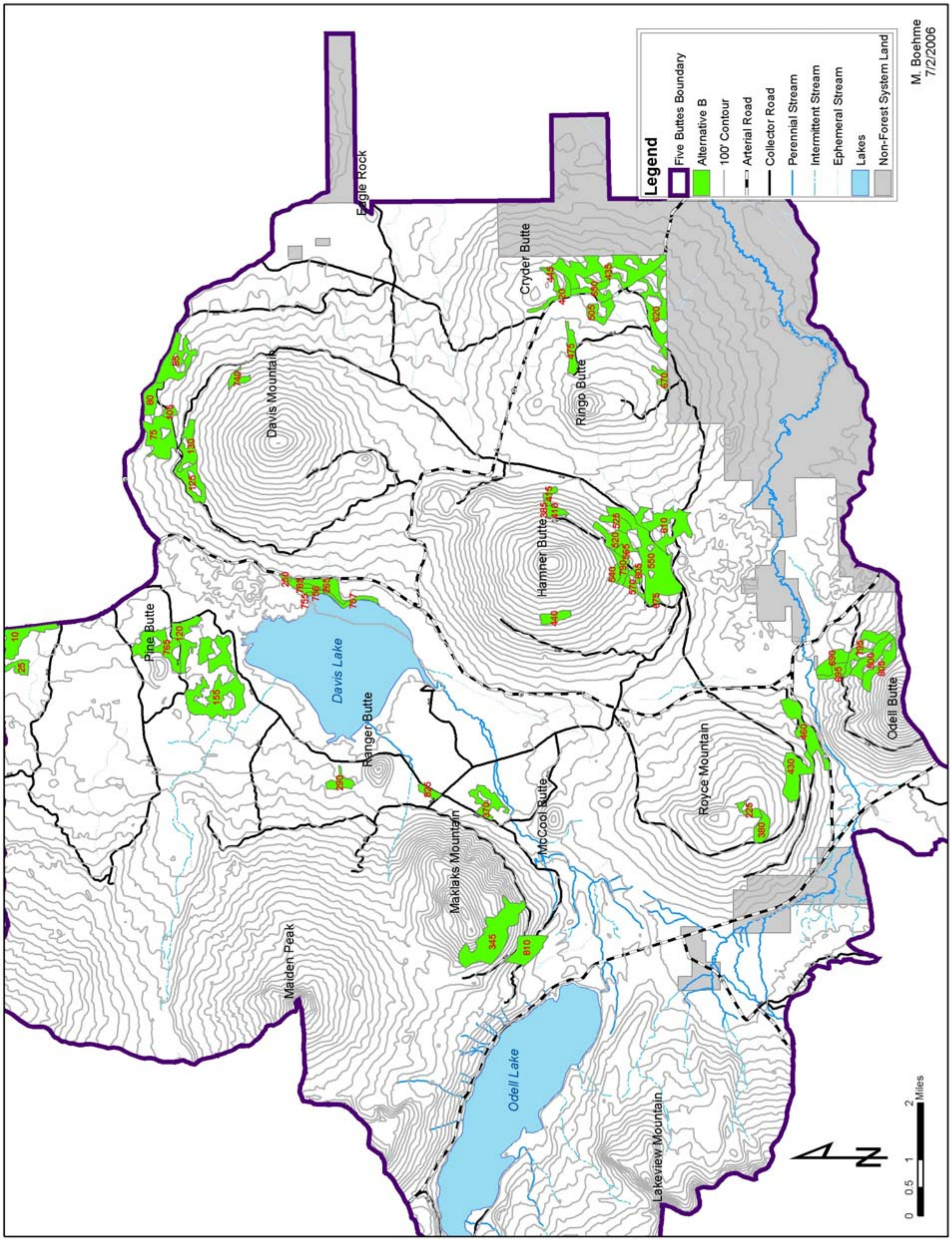


Figure 2-1. Five Buttes Project Alternative B.

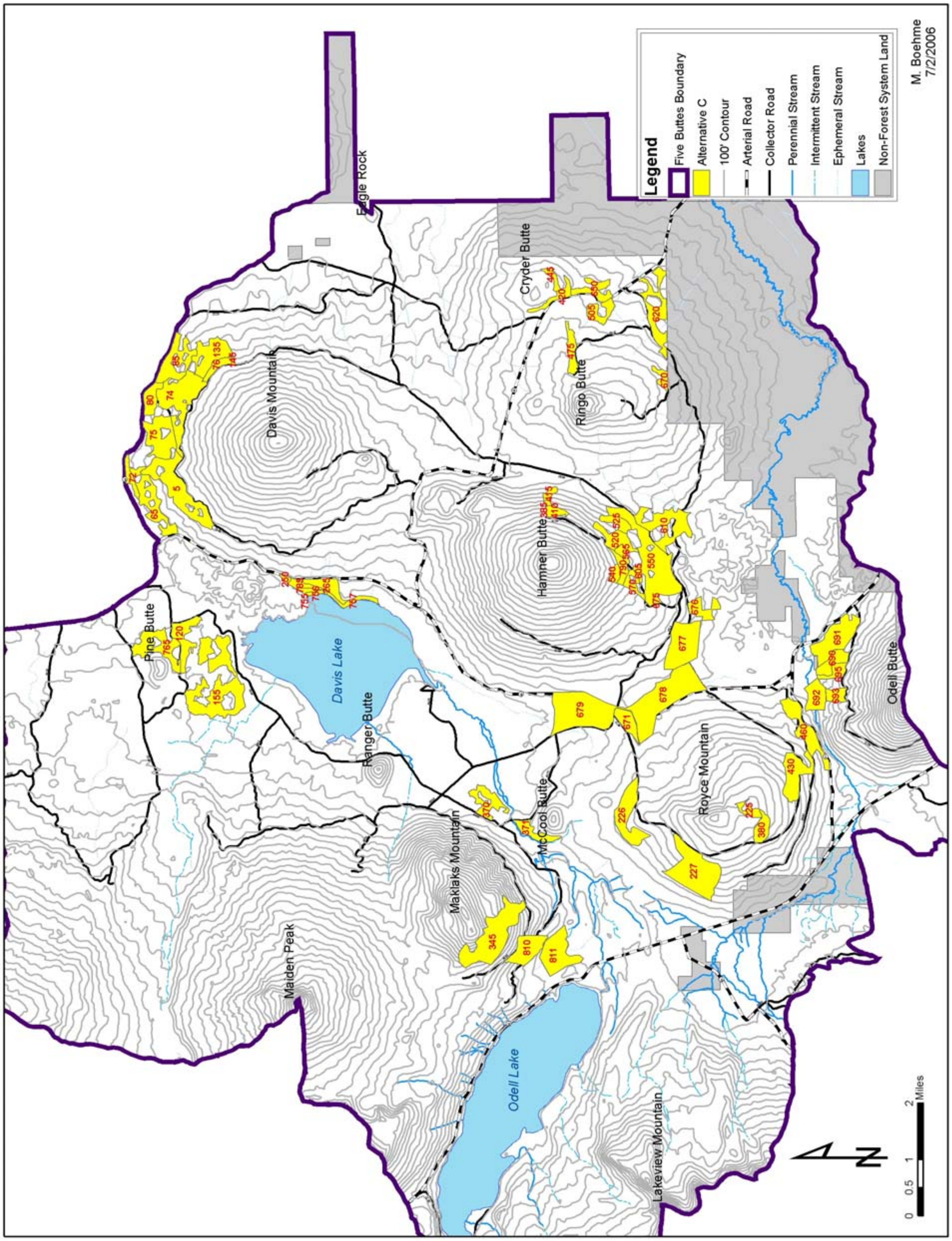


Figure 2-2. Five Buttes Project Alternative C.

Resource Protection Measures

Project Design Features Common to All Action Alternatives

The following features are incorporated into the design of all activities included in the Five Buttes project. These are features that are considered routine, have been used on similar projects and are either incorporated into contract provisions or accomplished between appropriate resource specialists, and have proven to be effective. Project design features are used as a basis for determining and disclosing effects in the Environmental Consequences discussions.

Vegetation Management

Thinning: Thinning of conifer trees of all sizes is to be done in such a way that:

- The diversity of species on the site is retained, though the proportion of one species over another may change considerably. Generally, the preference for conifer species to retain is (from highest to lowest): Douglas-fir, sugar pine, western white pine, Shasta red fir, mountain hemlock, ponderosa pine, white fir/grand fir, and lodgepole pine. These preferences may vary on specific sites depending on the abundance of a given species, presence of pathogens, vegetative potential, and/or site specific objectives.

- The largest of the large trees remain on the site.

- Where large trees exist in sufficient numbers, harvest would not reduce the number of trees greater than 21" dbh below 12 per acre; it is expected that 12 large trees cannot be retained on every acre, but would be dispersed across each activity unit at an overall average of 12 trees per acre or more.

- Structural diversity will be clearly maintained on the landscape, but may not be very diverse in a given activity unit. This means some individual areas may be single-storied, others two-storied, and still others with more canopy layers.

- Areas with an excess of basal area in large trees (generally over 21 inches in diameter) may need to have some of those trees removed to meet biolobical objectives. If so, trees to remove should be selected in such a way that:
  - They don't have the crown or the physiological characteristics to be useful to wildlife or to be able to respond to thinning.
  - They have numerous other larger suitable trees nearby that can remain to meet long-term objectives.
  - They do not appear on the verge of imminent mortality so as to contribute to snag densities in the short term (this is a consideration in areas where snag numbers are low).
  - Trees of high value to wildlife should remain on site. Examples include, but are not limited to, true fir with conks that would indicate a future hollow log, non-lodgepole trees with multiple tops, trees with very large limbs, etc.

Commercial Harvest: Since the commercial market fluctuates widely, a precise division between small tree and commercial products is not defined with this document. Implementation of this project will utilize the smallest materials the commercial market will bear at the time of implementation. Commercial material will be thinned and removed using harvest methods that ensure soil productivity and minimal damage to residual trees.

Soil and Water Quality

- Best Management Practices (BMPs) (USDA 1988) apply. Specific BMPs are for Timber Management (pp. 1-21), Road Systems (pp. 22-42), Fire suppression and Fuels Management (pp.43-47), Watershed Management (pp. 48-55), and Vegetative Manipulation (pp. 71-73). These practices maintain the physical integrity of the aquatic system and in cooperation with the State of Oregon, are required to be followed in accordance with the Clean Water Act. For a complete list, see Appendix A, Management Direction.

- Buffers of a minimum of 50 feet from the outer edge of riparian vegetation would be maintained in riparian reserves. Except in specific instances, all vegetation management and related activities would take place outside of riparian buffers. For more information, please reference the Hydrology and Water Quality section in Chapter 3 of this EIS.

- 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 that erosion control structures are stabilized and working effectively (LRMP SL-1; Timber Management BMP T-16, T-18).

- 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).

- Minimize erosive effects of concentrated water through the proper design and construction of temporary roads (Road BMP R-7).

- Conduct regular preventive maintenance to avoid deterioration of the road surface and minimize the effects of erosion (Road BMP R-18, R-19).

- Retain adequate supplies of large woody debris (greater than 3-inches in diameter) to provide organic matter reservoirs for nutrient cycling following completion of all project activities (LRMP SL-1). It is recommended that a minimum of 5 to 10 tons per acre of woody debris be retained on dry, ponderosa pine sites to help maintain long-term site productivity.

- Strive to maintain existing sources of unburned or partially consumed, fine organic matter (organic materials less than 3-inches in diameter; commonly referred to as the duff layer), wherever possible, within planned activity areas. (LRMP SL-6; Fuels Management BMP F-2; Timber Management BMP T-13).

- Maintain spacing of 100 to 150 feet for all primary (main) skid trail routes, except where they converge at landings. If closer spacing is necessary due to complex terrain, the Timber Sale Administrator must provide advance approval. Main skid trails spaced 100 feet apart will maintain soil quality on 89% of the unit area. For 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 maintain soil quality on 93% 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.

- 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.

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

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

- When possible, 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).

- 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. Machine piling equipment must stay on existing skid trails and landings.

- On steep pitches (slopes of 30 % or steeper) less than 100 feet long, equipment will be permitted to make one pass out and one pass back to harvest trees. In other areas, directional felling of trees to skid trails and /or line pulling should be utilized to harvest trees. Where steep pitches occur, they typically make up only a small portion of the activity unit; in general, units are of more gentle terrain.

- Slash disposal using fire should be done during the cool and moist seasons of spring and fall.

Wildlife

- Fifteen (15%) to 20% of each unit will be retained in an unmanaged condition. These “leave” areas would be strategically located to retain desired wildlife habitat (such as dense multi-storied stands, accumulations of snags and down logs, and the largest available green trees), unique habitats (such as rock outcrops and mixed conifer/hardwood stands), and other resources, such as cultural heritage sites.

- If previously unknown nest sites of threatened or endangered avian species are discovered during contract operations, project activities would not take place within an established distance from the occupied nest during periods of sensitivity, as described in Table 2-1. Activities that may disturb each species would be determined by a Crescent district wildlife biologist, but generally include hauling, timber harvest, temporary road construction, small tree thinning, prescribed slash burning and underburning. Seasonal restrictions may be waived in a given year if a district wildlife biologist confirms non-nesting status, nest failure, or that the habitat is not occupied; waivers are only valid until the following January 1.

- Seasonal restrictions on all occupied wildlife habitat sites identified in this EIS would be placed as described in Table 2-1. If new occupied habitats are discovered during layout or impmentation of the Five Buttes project, every attempt would be made to meet LRMP standards and guidelines as they relate to the species in question.

Table 2-1. Seasonal restrictions on disturbing activities near active nest sites.

Species	Buffer Distance	Restricted Season
Northern spotted owl (nest)	¼ mile (most activities) or ½ mile (helicopter operations)	March 1 - August 31
Northern bald eagle (nest)	½ mile (line-of-sight) or ¼ mile (non line-of-sight)	January 1 – August 31
Bald eagle (winter roost)	To be determined by district wildlife biologist	November 1 - April 30
Goshawk (nest)	¼ mile	March 1 - August 31
Osprey (nest)	¼ mile	April 1 - August 31
Red-tailed hawk (nest)	¼ mile	March 1 - August 31
Sharp-shinned hawk (nest)	¼ mile	April 15 - August 31
Great gray owl (nest)	¼ mile	March 1 - June 30
Great blue heron (nest)	¼ mile	March 1 - August 31
Wolverine (den)	2 miles	February 1 - May 30
Deer and Elk (fawning/calving habitat	To be determined by district wildlife biologist	May 1 - June 30

- Activities in bald eagle nest stands would be cooperatively designed by a wildlife biologist, a silviculturist and a fuels planner to reduce ladder fuels (brush, seedlings and saplings) in a way that provides for the longevity of existing nest habitat and encourages the development of future nest trees, as described in the appropriate Bald Eagle Management Area (BEMA) plan.

- In order to achieve an integrated plan with a complex prescription and ensure consistency with the Five Buttes decision, a wildlife biologist would be involved in marking commercial harvest units in the East Davis BEMA near Lava Flow campground.

- If a sharp-shinned hawk nest is discovered during layout of the Five Buttes project, temporary roads will be located outside of nest stands.

- If a great gray owl nest is discovered during layout of the Five Buttes project, a forested stand of at least 30 acres will be maintained around the nest site (LRMP, WL-31).

- To protect potential bat habitat, timber harvest and other vegetation removal will be prohibited on lava pressure ridges and rock outcrops exceeding 100 square feet.

- Existing snags greater than 9 inches in diameter would not be reduced except where snags must be felled for occupational safety reasons. These snags are to be retained for down wood. Felled snags or other down wood may be moved off roads and landings, but not removed from the site.

- Existing down wood greater than 9 inches in diameter would not be reduced except in fuel modification units. While leaving down wood in place is preferred, it is recognized that some manipulation may be needed to meet stand prescription objectives. In all units, down wood may be manipulated (shifted, clumped, grouped, driven over, etc.) as little as necessary to meet objectives. Whole trees may be broken into 8-12’ pieces or longer.

- Units designed to have fuels modified through time are to maintain the following conditions:

  - In stands dominated by ponderosa pine (including ponderosa pine-dominated mixed conifer), leave 12-20 tons/acre greater than 9” diameter or 11-16 whole trees 16-22” diameter or equivalent. In stands where lodgepole pine dominates the down wood component, leave 8-10 whole lodgepole pine trees per acre from among the largest on-site in addition to retaining all down wood that is not lodgepole pine.
  - In mixed conifer and mountain hemlock stands, leave 11-42 tons per acre greater than 9” diameter or 11-38 whole trees 16-22” diameter or equivalent.
  - In lodgepole pine stands, leave 7-42 tons per acre greater than 9” diameter or 17-105 whole trees 8-12” diameter or equivalent.

- Whenever possible, cull material greater than or equal to 15 inches in diameter would be retained in the unit and not moved to landings.

- Live trees not intended for removal but damaged during vegetation management activities would remain standing if they do not pose a hazard. If they are felled, they are to be retained for down wood requirements.

- In stands currently below minimum snag levels, as determined by presale tally, sufficient live overstory trees would be retained to create snags. Snag creation to increase snag densities would take place as funding is available. Locations for snag creation would be prioritized as follows:

  1. Within the Davis Late-Successional Reserve,
  2. Within Matrix,
  3. In areas east of the northern spotted owl range line.

- Snag minimums are as described in Table 2-2.

Table 2-2. Snag minimums in Five Buttes project activity units.

Location	Habitat	Snags
LSR	MH	15 snags/acre > 9" dbh with at least 4 snags/acre > 19.9" dbh
	MC Climax	16 snags/acre > 9" dbh with at least 5 snags/acre > 19.9" dbh
	MC/PP Fire Climax	10 snags/acre > 9" dbh with at least 5 snags/acre > 19.9" dbh
	LP	13 snags/acre of the largest available
Matrix	MH	2.85 snags/acre > 10" dbh with 0.6 snags/acre > 20" dbh
	PP	3.87 snags/acre > 10" dbh with 0.6 snags/acre > 20" dbh
	MC	3.93 snags/acre > 10" dbh with 0.6 snags/acre > 20" dbh
	LP	2.85 snags/acre > 10" dbh with 0.66 snags/acre > 12" dbh
East of the NSO Line	PP	2.25 snags/acre > 15" dbh with 0.14 snags/acre > 20" dbh
	MC	2.25 snags/acre > 15" dbh with 0.14 snags/acre > 20" dbh
	LP	1.8 snags/acre > 10" dbh with 0.59 snags/acre > 20" dbh

- In units where the fire behavior is modified for strategic reasons and where piling of material occurs, retain two large piles of material (minimum 15' x 15' x 10') per acre to meet wildlife habitat objectives.

- Prescribed burning would be accomplished in a mosaic pattern with unburned areas within the burn in addition to designated leave areas. No underburning or broadcast burning would take place in early-seral mixed conifer, mid-seral mixed conifer, and lodgepole pine habitat types other than minor creeping from burning piles. Exceptions would be in early-seral mixed conifer stands that are managed to emphasize ponderosa pine and/or sugar pine associated species and within areas that have been identified as requiring management for strategic fuels reduction.

- To concurrently meet wildlife objectives for retention of larger dead wood and fuels objectives for reduction of large fire risk, burn prescriptions and fuels moistures should be such that snags ≥ 15-19 inches dbh and down wood ≥ 12-16 inches diameter at the large end would not be reduced and would have limited charring. Snags ≥ 20 inches dbh and down wood ≥ 16 inches diameter at the large end that are in an advanced stage of decay or that have ants present[8] would be protected. It is assumed that reduction of snags and down wood < 12 inches is most effective in meeting fuels objectives. Grapple and hand piles would not include material < 11 inches at the large end. If snag and down wood within a unit do not meet identified minimums, the largest material available would be retained.

- Prescribed fire managers will use smoke management forecasts in order to minimize smoke from fuels reduction activities from entering into places where smoke is undesirable, including Class 1 airsheds and designated areas, as well as sensitive wildlife habitat areas such as spotted owl nesting habitat and potential bat roosting areas.

Invasive Species

- Prevention will be emphasized as the preferred strategy for invasive plant management. *Guideline*

[8] Ants in decayed snags and logs provide forage for pileated woodpeckers.

- Actions conducted or authorized by written permit (contracts) that operate outside the limits of the road prism, require cleaning of all heavy equipment (i.e., bulldozers, skidders, other logging equipment) prior to entering National Forest System Lands. *R6 Standard #2*

- Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants in consultation with District or Forest-level invasive plant specialists, incorporate invasive plant prevention practices as appropriate (road maintenance and re-opening roads). *R6 Standard #8*

- Remove mud, dirt, and plant parts from all heavy equipment that will operate outside the limits of the road prism prior to entering NFS lands AND before moving into a new or different project area. Cleaning must occur in areas where removed weed seeds will not create additional problems. *Requirement R6 Standard #2.*

- Require all Forest Service employees to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and personal equipment prior to leaving a project site infested with weeds. *Guideline*

- Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that are judged to be weed free by District or Forest weed specialists. *Requirement R6 Standard #7*

- Noxious weed risk assessments will be completed, and weed management will be considered in all NEPA planning activities where ground disturbance or invasive plant dispersal vectors are involved. *Requirement R6 Standard #1*

Air Quality

- Reduce particulate emission through utilization to the extent practical (i.e. pulling trees to the landing with limbs attached and biomass utilization versus prescribed burning).

Mitigations Common to All Action Alternatives

The following mitigation measures are an integral part of each of the action alternatives. They are listed here separately to avoid repeating them in each alternative description.

The effectiveness of each measure is rated at high, moderate, or low to provide a qualitative assessment of how effective the practice will be in preventing or reducing resource impacts. These mitigation measures and design elements are considered in the effects discussions of Chapter 3.

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

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

Wildlife

The mitigation measures described for known wildlife activity locations and those described in Table 2-1 will apply to any new nest sites or other wildlife activity locations discovered during project implementation.

1. Seasonal restrictions as described in Table 2-1 will be applied to known northern bald eagle nests in units 74, 80, 85, 105, 135, 265, 290, 755, 757 and 795. *High* (LRMP WL-1)

2. Seasonal restrictions as described in Table 2-1 will be applied to known northern bald eagle winter roost habitat located in units 74, 85, 135, 265 and 757. *High* (LRMP WL-1)

3. Seasonal restrictions as described in Table 2-1 will be applied to known osprey nests located in units 10, 24, 155, 265, 765 and 811. *High* (LRMP WL-3)

4. Active osprey nest sites as identified in Measure #3 will be protected by maintaining the forested character of the surrounding area with at least four dominant overstory trees per acre suitable for nest and perch trees. Ponderosa pine will be favored where available**.** *High* (LRMP WL-2)

5. Seasonal restrictions as described in Table 2-1 will be applied to known red-tailed hawk nests located in units 71, 75 and 155. *High* (LRMP WL-3).

6. Active red-tailed hawk nest sites as identified in Measure #5 will be protected by maintaining the forested character of the area at least 300 feet in radius around the nest. Timber management may occur within this area, but must maintain an average of four dominant overstory trees per acre suitable for nest and perch trees. Ponderosa pine will be favored where available. *High* (LRMP WL-2)

7. Seasonal restrictions as described in Table 2-1 will be applied to known mule deer fawning and elk calving habitat located in units 265, 370, 371, 676, 691, 692, 757 and 811. *High*

8. All rock outcroppings and lava pressure ridges found during unit layout would have directional felling and restrictions for mechanized equipment to protect potential bat roosting and maternity areas. Large areas near the east side of Davis Lake associated with special habitat would have up to a tree length for protection, determined by the District biologist.

9. Within and adjacent to units with rock outcroppings and/or lava pressure ridges, all prescribed burning would be seasonally restricted to the fall months when bats are more fit and able to survive potential disturbance associated with smoke. Buffers would range from 50-100 feet dependent upon the District wildlife biologist. *Moderate*

Water and Soil Quality

10. No mechanized equipment would be utilized within Riparian Reserves, except on hardened surfaces. Within Riparian Reserve in units 756 and 757, no off road travel is allowed. Commercial harvest activities would utilize line to pull material to road 4600-850. Also, all logs would be decked on the road or in a designated area directly above the road on a hardened surface. No landings would be located within the reserve. All post-sale activities would be accomplished by handpiling and disposal of piles. *High*

11. Within units 756 and 757, locate firelines outside of Riparian Reserve. Within the reserve, prescribed underburning would utilize a backing fire within the treeline. *High*

12. In units 756, 757, and 678, hand piling and pile burning of forest residue in Riparian Reserves would occur a minimum of 50 feet from the outer edge of riparian vegetation, but the actual distance may be greater depending on surrounding slope, existing ground cover, and soil type.

Placement of hand piles would focus on upslope areas outside of "washes" or depressions that may facilitate concentrations of upslope water run off (e.g., caused by heavy rain events) and hence, potential for sediment transport to water. *High*

13. Temporary roads would be located outside of Riparian Reserves and would meet BMPs for relief drainage. *High*

14. Reclaim all temporary roads by applying appropriate soil restoration treatments. Options for improving the hydrologic function and productivity on these disturbed sites include the use of subsoiling equipment to loosen compacted soils, redistribution of humus-enriched topsoil in areas of soil displacement damage, placing woody materials over treated soil surfaces, and planting shrubs and tree seedlings to establish effective ground cover protection. *High*

15. Advanced logging systems would be utilized in the following units:
    - Alternative B: 80, 345, 385, 410, 415, 540, 695, 790, 795, 800, 805, and 810.
    - Alternative C: 80, 345, 385, 410, 415, 540, 695, 790, 810.

Recreation and Scenery

16. Within Lava Flow Campground, the objective is to maintain a recreational experience of "roaded and natural." To achieve this, commercial harvest activities in units 756 and 757 would utilize seasonal restrictions, limiting operation to outside of the summer recreation season. The summer recreation season is considered to be from Memorial Day weekend through Labor Day weekend. *High*

17. Handpiling and disposal within one year on Highway 46, as well as marking guidelines, and measures to minimize evidence of management activities would compliment the designed activities within the campground. *High*

18. Timing of cleanup will be 2 years following activity in units 10, 75, 80, 85, and 460 within Partial Retention. *High*

19. Units 250, 265, and 785 lie within the scenic view corridors allocated to Retention Foreground and 10, 75, 80, 85, and 460 in Partial Retention. Large diameter trees (24 inches in diameter) or greater will not be harvested unless they meet the specific criteria listed on page 4-123 of the Forest Plan in Retention and Partial Retention. *High*

The following measures would address scenery and would be applied along Highway 46 and County Road 61 (Units 250, 265, 460 and 695):

20. Design skid trails and landings to minimize visibility. Landings closer than 200 feet would be approved on a case by case basis. *High*

21. Handpile and dispose of slash within 200 feet of Highway 46 within one year. *High*

22. The objective is to have no visible marking paint to visitors on the roadway. After activities are completed, remove tags, ribbons, boundary signs and other means of designating activity. *High*

23. Use 15 - 20% retention areas to maintain vegetative diversity and screen potential activity areas that may be visible from the roadway. *Moderate*

Air Quality

24. The objective is to minimize human-caused visual impacts to the Class 1 airshed (Diamond Peak Wilderness and Maiden Peak Inventoried Roadless Area). Prescribed burning operations would

be restricted during the period of July 1 – September. Also, prescribe burn operations to dissipate smoke away from the Class 1 airshed (i.e. burn during forecasted westerly winds). *High*

25. Warning signs will be posted at prominent road junctions to inform the public of prescribed burning operations, and will remain in place until there is no visible smoke. If feasible, roads may be temporarily closed for the protection of public safety. *Moderate*

26. As part of the plan to inform the public, notify local businesses prior to the burning season and on the day of planned prescribed burning operations. Also, notify adjacent landowners of burning operations conducted in units within ¼ mile of their property. *Moderate*

Botany

27. In unit 378 in Alternative C at Dell Springs, maintain a 100-foot buffer between activities and *Tritomaria exsectiformis*.

Monitoring

Invasive Plants

Objective: To determine the introduction of new infestations or expansion of existing infestations of invasive plant species.

Monitoring Elements: Area covered by infestations and their locations.

Area of Consideration: Five Buttes Project area.

Suggested Methodology: Inspect activity areas and travel routes annually during field season.

Cultural Resources

Site monitoring would occur for sites that are flagged for avoidance and excluded from units or treatments within them. Monitoring would also be scheduled following treatment activities. A list of all sites and their specific monitoring needs will be included in the SHPO consultation report (in preparation) for this project. Part of the monitoring would occur through coordination with other specialists and part will be accomplished by district Heritage Program personnel.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have duplicated the alternatives considered in detail or were determined to be unable to meet the project's Purpose and Need. Alternatives that were considered but dismissed from detailed consideration and the reasons for dismissal are summarized below.

Defer All Active Management from Nesting, Roosting, and Foraging Habitat for the Northern Spotted Owl

An alternative was proposed to address a key issue concerning loss of spotted owl habitat in the project area due to active management. This alternative would have used the same unit layout and fuels modification activities as in Alternative C, but would have maintained spotted owl habitat in the short-term by avoiding treatments in spotted owl nesting, roosting and foraging (NRF) habitat. Management activities would have taken place on about 3,900 acres. Activities would have been similar to those proposed in Alternative C, but all NRF habitat would have been avoided.

This alternative was eliminated from detailed study because many of the NRF stands are critical for the overall strategy for landscape scale protection. Fuels modification activities would not be as effective in reducing the risk of large-scale loss of forest due to wildfire. Also, long-term risk from a disturbance agent would remain at severe levels, with recovery of many elements of the ecosystem taking centuries to achieve.

Alternative C retains additional areas of Nesting, Roosing and Foraging habitat for the northern spotted owl that are proposed for active management in Alternative B. The Five Buttes project follows the Davis Late-Successional Reserve Assessment (2007 revision) strategy for potential spotted owl occupation over time.

Thinning Limited to Small Diameter (8-12 inches)
Some commenters suggested that the project area should be managed only through the thinning of small-diameter trees. An alternative was considered that used the same unit layout as Alternative C but only involved thinning trees that are 8 inches diameter at breast height (dbh) and smaller. Management activities would have taken place on about 7,798 acres.

This alternative was eliminated from detailed study because modeling of fire behavior and vegetation indicated that small diameter thinning by itself would not considerably change expected fire behavior on a landscape scale. Also, reintroduction of fire is not a viable option in most stands where only small-diameter thinning has occurred. In this scenario, fire would cause an undesired level of mortality to the overstory trees; retention of overstory trees is desirable and is part of the Purpose and Need of the Five Buttes project. Small tree thinning by itself would not move the project area towards the desired condition and would not meet the Purpose and Need of the project.

Figure 2-3 displays the results of modeling small-tree (trees 8 inches dbh and smaller and trees 12 inches dbh and smaller) thinning in 30 randomly selected stands within the Five Buttes project area. Points above the typical basal area line are where a stand (in general) is at risk to an uncharacteristic loss of large trees. Small diameter thinning by itself does not ameliorate the risk of uncharacteristic disturbance processes.

Figure 2-4 depicts crown bulk density and the threshold where active crown fires would not be expected to occur with 98th percentile weather[9] conditions or less on a typical stand in this analysis area. Small diameter thinning does not achieve the objective to lessen the risk of loss of multiple assets during a wildfire event.

Additional modeling was completed to determine the effects of thinning trees 15 inches dbh and smaller. The results were not appreciably different from those depicted in Figures 2-3 and 2-4.

[9] Please refer to the section titled "Fire and Fuels" in Chapter 3 of this EIS for a definition of "98th percentile weather" and other weather conditions associated with fire behavior analysis.

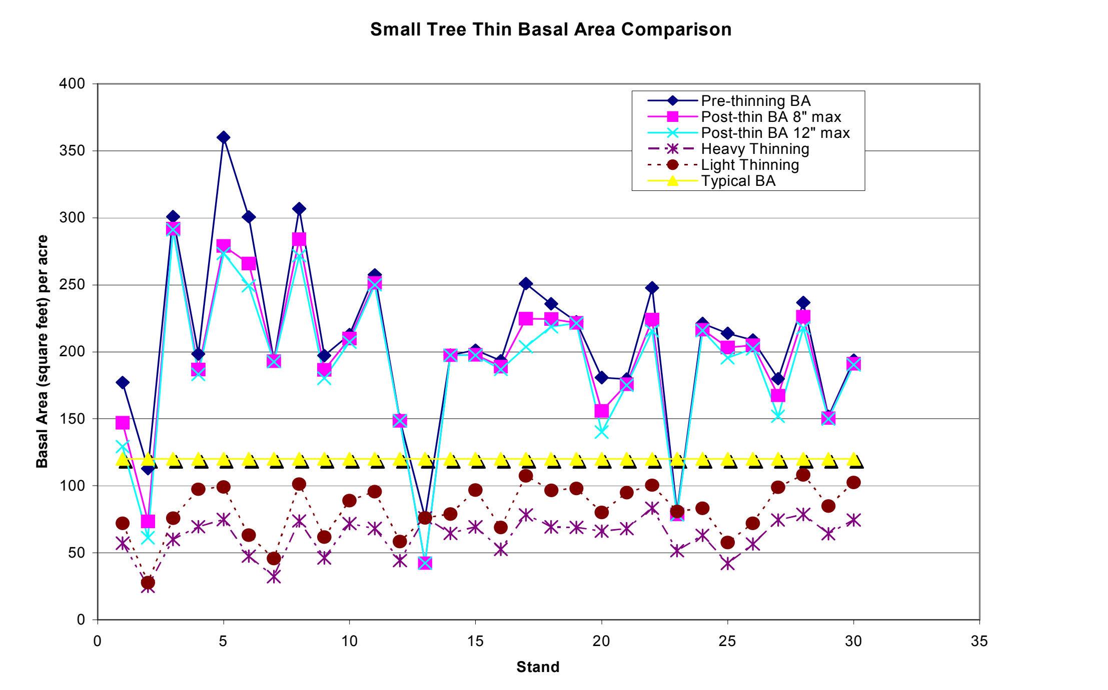


Figure 2-3. Comparison of anticipated effects of small-tree thinning on basal area in the Five Buttes project area.

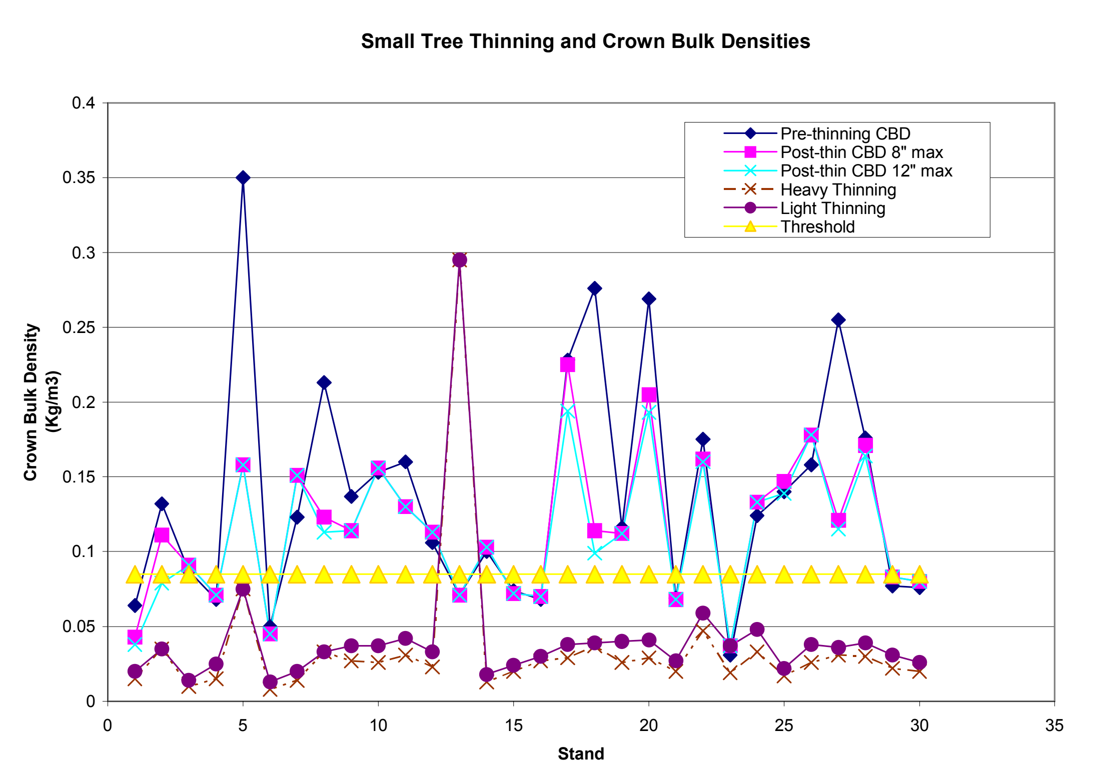


Figure 2-4. Comparison of expected effects of small-tree thinning on crown bulk density in the Five Buttes project area.

Sale Area Improvement Projects

Money may be collected from the timber sales to complete certain projects such as required reforestation, identified mitigation, and enhancement and restoration projects in the vicinity of the timber sale areas. Required reforestation items (R) and mitigation measures (M) have the highest priority for funding, but may be funded by other means such as appropriated funds to insure that requirements are accomplished. Items marked with an (E) are considered Enhancement.

This list is intended to serve as an overall guide for the analysis area. As timber sales are delineated within the project area, specific priorities may be adjusted to meet the needs for each sale area. This priority setting should be documented briefly in the implementation file for each timber sale.

Some projects listed here were not analyzed as part of this project and will require documentation through a separate NEPA process.

1. Subsoiling (M)
2. Invasive Plant Monitoring (M)
3. Prescribed Burning (E)
4. Planting fire resistant tree species wherever management emphasizes habitat for northern spotted owl and bald eagle and only where the selected species existed prior to project implementation (E)
5. Guzzler Replacement (E)
6. Snag Creation (E)
7. Small Diameter Thinning (E)
8. Fuels Hand Piling and Disposal (E)

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in Tables 2-3, 2-4 and 2-5 is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2-3. Comparison of the activities by alternative.

Activity	Alternative A	Alternative B	Alternative C
Commercial Harvest (acres)	0	5,522	4,235
Logging Systems (acres) Ground-based Cable or Helicopter	 0 0	 4,439 1,083	 3,452 782
Fuels Reduction (acres) Associated with commercial harvest Not associated with harvest	 0 0	 5,522 0	 4,235 3,563
Estimated volume (million board feet)	0	18.9	14.4
Temporary Road Construction (miles)	0	6.4	5.9

Table 2-4. Comparison of how Each Alternative Responds to the Purpose and Need.

Purpose and Need	Alternative A No Action	Alternative B Proposed Action	Alternative C
Strategically reduce fuel loadings and forest vegetation density so as to lessen the risk that disturbance events such as insect, disease, and wildfire will lead to large-scale loss of forest.			
Reduce risk of large scale loss of forests, especially the large tree components.	For wildlfire, in contrast to Alternative B and C within proposed activity units, a successful initial attack is probable on 101 days of a 161-day fire season. Large trees would remain at current risk to insect and disease	Within activity units, nearly all days in a fire season (160 out of 161), there would be high probability of a successful initial attack. Fire behavior would be modified on a landscape scale, though not as effectively as in Alt. C. This alternative would reduce imminent susceptibility of stands to insect and disease by 5,522 acres.	Within activity units, nearly all days in a fire season (160 out of 161), there would be high probability of a successful initial attack. This alternative affords the most effective landscape scale fire behavior modification, along with reducing imminent susceptibility of stands to insect and disease by 4,325 acres.
Contribute to the local and regional economies by providing timber and other wood fiber products.			
Contribute commercial-sized timber to local and regional economies.	There would be no commercial-sized timber provided to the local economy	Approximately 18.9 million board feet would be a byproduct of active management	Approximately 14.4 million board feet would be a byproduct of active management
Utilize smaller material in post and pole sales, firewood, biomass, or other ways.	No special products would be a result of active management	3,343 acres of special forest products have been identified, however, some form of biomass would be available on 5,522 acres dependent upon the market and method	4,936 acres of special forest products have been identified, however, some form of biomass would be available on 7,797 acres dependent upon the market and method

Table 2-5. Comparison of how Each Alternative Responds to the Key Issues.

Issue and Indicators	Alternative A	Alternative B	Alternative C
Key Issue 1: Spotted Owl Habitat			
Acres of Nesting, Roosting, and Foraging (NRF) habitat treated by alternative as compared to the existing condition.	No active management in any of the 19,038 acres of NRF in project area.	Active management in 2,822 acres (15%) of NRF in project area.	Active management in 3,254 acres (17%) of NRF in project area (1,231 treated acres would still be classifiable as NRF following treatment).
Acres of NRF habitat treated within the Davis Late-Successional Reserve and northern spotted owl Critical Habitat Unit CHU (OR-07)	No active management	648 acres (Davis LSRA) 286 acres (CHU)	936 acres (Davis LSRA), 318 acres remains NRF 522 acres (CHU), 264 acres remains NRF
Acres of northern spotted owl dispersal habitat actively managed in the project area	No active management	2,551 acres	4,429 acres
Acres of NRF affected by type of activity (commercial versus small tree thinning)	No active management	2,822 commercial harvest acres	2,023 commercial harvest acres 1,231 small tree thinning
Acres of activity within known spotted owl territory	No active management	89 acres	920 acres
Key Issue 2. Strategic Placement of Treatment Units			
Landscape scale burn probability of spotted owl home ranges, as indicated by computer modeling exercises	High	Moderate	Low
Protect and enhance existing late- and old-structured stands through risk reduction in and around these stands.	No change to existing late and old stands	Active management would protect and enhance late- and old-structured stands on 5,488 acres.	Active management would protect and enhance late- and old-structured stands on 4,291 acres.
Favor ponderosa pine and Douglas-fir.	No change: species shift from fire dependent species would continue	Ponderosa pine and Douglas-fir would be favored on 5,488 acres.	Ponderosa pine and Douglas-fir would be favored on 4,291 acres.
Additional acres on which prescribed fire is an option to maintain vegetative conditions that are resilient to wildfire, as indicated by computer modeling exercises	Prescribed fire would not be advisable in units identified for activity due to current vegetative conditions.	3,998 acres	3,939 acres

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction

This chapter summarizes the physical, biological, social, and economic environments of the project area and the anticipated effects of implementing each alternative on that environment.

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

The following discussion of effects follows CEQ guidance for scope (40 CFR 1508.25(c)) by categorizing them as direct, indirect, and cumulative. The focus is on cause and consequences. Effects exist in a chain of consequences and thus may be labeled "indirect" (occurring later in time or farther in distance, 40 CFR 1508.8(b)), rather than cumulative. 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).

There are basically two methodologies the individual resource subjects use in discussing cumulative actions and consequences. The first method would be to describe each individual past, present and reasonably foreseeable action – including mitigation (cataloging). The second would be to "lump" individual actions if the information regarding those actions would not be useful to illuminate or predict the effects of the proposed action and its alternatives. A mere "cataloging" of effects may not provide the most useful discussion. In some cases, lumping past actions and describing them in terms of "where we are today" can be the most informative. No matter which method is used, it will be formulated to provide the most relevant, useful, helpful, necessary and informative format for the public and deciding official.

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 EIS.

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 Five Buttes project area boundary is the focus of this EIS, but adjacent lands are considered in this analysis process.

Cumulative Effects of Past, Present and Reasonably Foreseeable Future Actions

The Environmental Consequences disclosures in this EIS include discussion of cumulative effects. Where there is an overlapping zone of influence, or an additive effect, this information is disclosed. In some cases where past actions such as timber sales have occurred, the actions are included under the heading "Existing Condition" and any effects associated with the Five Buttes project are disclosed under "Direct and Indirect Effects." In most cases, "Cumulative Effects" are discussed under their own heading; in some cases where no effects (and therefore no cumulative effects) were identified, direct, indirect, and cumulative effects are disclosed in the same section (typically titled "Direct, Indirect and Cumulative Effects). This type of disclosure is more informative to the reader and to the Decision Maker, as opposed to identifying incremental effects associated with cataloging each individual action that may or may not have associated additive effects.

The June 24, 2005, Council of Environmental Quality letter provides guidance on the consideration of past actions in cumulative effects analysis. It states review of past actions can occur in two ways:

1. Based on scoping, an agency has the discretion to determine whether and to what extent information about the specific nature, design, or present effects of a past action is useful for the agency's analysis of the effects of a proposal or agency action and its reasonable alternatives. An agency is not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effect of all past actions combined. Generally agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the details of individual past actions.

2. Experience with information about direct and indirect effects of individual past actions may also be useful in illuminating or predicting the direct and indirect effects of a proposed action. However, these effects of past actions may have no cumulative relationship to the effects of the proposed action. Therefore, agencies should clearly distinguish analysis of direct and indirect effects based on information about past actions from a cumulative effects analysis of past actions.

The Five Buttes project is one of several projects planned or ongoing within and adjacent to the project area. Table 3-1 includes those that are in the planning process and those that have been wholly or partially implemented, as well as other natural or human-caused events that have affected the landscape; effects of these projects are considered in the cumulative effects analysis disclosed in Chapter 3 of this EIS.

Table 3-1. Past, present and reasonably foreseeable future actions.

Project/Event Name	General Description of Activities	Status
Baja (2001)	Commercial thinning, small tree thinning, fuels treatments	Completed
BLT Vegetation Management EIS	Commercial thinning, small tree thinning, fuels treatments	Planning
Central Oregon Invasive Species EIS	Site-specific analysis for chemical, mechanical, cultural, manual, and biological treatments to control or eradicate invasive plants	Planning
Charlie Brown (2000)	Commercial thinning, small tree thinning, fuels treatments in Browns and Round Late Successional Reserves	Completed
Crescent Lake WUI (2004)	Small tree thinning and fuels treatments in the wildland-urban interface	Implementation
Davis Fire Restoration Projects	Salvage of burned trees; tree planting; road closures	Completed
Greater LaPine Community WUI	Small tree thinning and fuels treatments on 12,000 acres around the community of LaPine, Oregon	Completed
Hazard tree removal	Ongoing removal of identified hazard trees along roads and in recreation areas and parking lots	Ongoing
Lakeside WUI	Small tree thinning (to an upper diameter limit of 3 inches) and fuels treatments in the wildland-urban interface	Planning
Region 6 Invasive Plants EIS (ROD 2005)	Facilitates subsequent analyses to eliminate or control invasive plants; amends individual Forest Plans but does not approve site-specific projects	Implementation
Rosedell CE (2005)	Small tree thinning and fuels treatments in the wildland-urban interface around the town of Crescent and Odell Lake summer homes	Implementation
Seven Buttes (1996)	Commercial thinning, small tree thinning, fuels treatments	Completed
Seven Buttes Return (2001)	Commercial thinning, small tree thinning, fuels treatments	Implementation
Small Tree Thinning	Ongoing thinning of small trees in plantations and along roadways as needed	Ongoing on a yearly basis
Trapper Creek Restoration Project (2000)	Fish habitat enhancement and restoration of natural processes	Completed

Project/Event Name	General Description of Activities	Status
Wagontrail WUI	Small tree thinning and fuels treatments in the wildland-urban interface in LaPine Basin	Planning
Wickiup Acres WUI	Small tree thinning and fuels treatments in the wildland-urban interface in LaPine Basin (BLM project)	Planning

Changes between Draft and Final EIS

The following changes were made between the Five Buttes Project Draft and Final EIS. This list does not include minor grammatical corrections, editorial formatting, and clarification of data previously presented. The changes were driven by public comment and a comprehensive internal review.

- Unit 370 was initially identified as dispersal habitat for the northern spotted owl, but was misidentified. Further reconnaissance has determined this stand does not currently provide dispersal habitat. Proposed activities would accelerate attainment of dispersal habitat by allowing the understory to grow free of competition. It is estimated it would be 30 years before the stand would provide the necessary canopy structure. Without active management, this timeframe could be much longer. This does not change the effects disclosed regarding the capability for northern spotted owls to disperse within the project area, as well as to and from adjacent LSRs.

- An error was made in the calculation of sensitive soils and overlap with management activities. In Alternative B, the overlap is 887 acres, not 493. In Alternative C, the overlap is 684 acres, not 782. This correction has been made to the FEIS. The action alternatives remain consistent with regional policy and forest standard and guidelines due to the prescription for advanced harvest systems which protect soil quality. The effects remain as described in the DEIS. Sensitive soils are delineated on gross landtype acres and only portions of those landtypes are actually on sensitive soils. There will be no construction of temporary roads, primary skid trails or log landings on sensitive soils with slopes greater than 30 percent, soils with high hazard for surface erosion, or potentially wet soils with a seasonally high water table. Advanced harvest systems minimize mechanical disturbance in these areas.

- Cleanup of slash was mistakenly identified to be completed within two years in areas of scenery allocated to Retention Foreground. The change was made to complete cleanup within one year, with two years for areas allocated to Partial Retention.

- Project Design Features were added in Chapter 2. These are assumptions and rationale that frame the desired condition for every project design.

- Page 214 of the DEIS stated unit 610 is within the boundary of the Maklaks Old-Growth Management Area (OGMA) when it should have read unit 810.

- Text documenting consistency with the Deschutes Land and Resource Management Plan as amended by the Northwest Forest Plan Aquatic Conservation Strategy was added.

- A disclosure of carbon dioxide emissions by alternative was added to the Air Quality section.

- Additional discussion on the effects of West Nile Virus, Sudden Oak Death, and barred owl competition on northern spotted owls has been added.

- A commenter requested an alternative with an upper diameter limit of 15 inches. This, along with 8 and 12 inches, was modeled; the modeled did not considerably alter the stands to sufficiently reduce risk. This information was added to the section “Alternatives Considered but Eliminated from Detailed Study” in the FEIS.

- The Davis Lake Special Interest Area (SIA) overlaps activity at the lake, including emphasis for bald eagles, maintaining Riparian Reserves, reducing risk to the remaining uphill northern spotted owl habitat, and the recreational experience. A discussion on consistency with the SIA, and other overlapping values has been added to the FEIS.

- Consistency with the Maiden Peak Inventoried Roadless Area was expanded.

- The distance of activity within the Wild and Scenic River boundary was clarified to display avoidance of the Riparian Reserve.

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.

Forest soils are considered to be a non-renewable resource, as measured by human life spans, and 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.

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. For analysis of the soil resource, 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 4-70 and 71, Table 4-30, Footnote #1). For this project proposal, activity area boundaries are considered to be the smallest identified area where the potential effects and soil quality standards will be focused on the units proposed for silvicultural and fuel reduction treatments. The activity areas range in size from about 6 acres to 459 acres.

Quantitative analyses and professional judgment were used to evaluate the proposed alternatives by comparing existing conditions to the anticipated conditions which would result from implementing the proposed actions. The temporal scope of the analysis is defined as short-term effects being changes to soil properties that would generally revert to pre-existing conditions within 5 years or less, and long-term effects as those that would substantially remain for 5 years or longer. This analysis also considered the effectiveness and probable success in project design and implementation of the management requirements, mitigation measures, and Best Management Practices (BMPs) that are designed to avoid, minimize or reduce potentially adverse impacts to soil productivity.

The following indicators are used to compare the alternatives:

1) Change in the extent of detrimental soil conditions following proposed harvest and mitigation treatments within individual harvest units or other activity areas proposed for vegetation and fuel treatments.

2) Amount of coarse woody debris (CWD) and surface organic matter that would likely be retained to protect mineral soils from erosion and provide short and long-term nutrient supplies for maintaining soil productivity on treated sites.

3) The probable success in project design and implementation of management requirements and mitigation measures that would be applied to minimize adverse effects to soil productivity in the activity areas. Unit specific mitigation measure and BMPs can be found in the appendix.

Management Direction

The Deschutes Land and Resource Management Plan (LRMP) specifies that management activities be prescribed to promote maintenance or enhancement of soil productivity by leaving a minimum of 80 percent of an activity area in a condition of acceptable productivity potential following land management activities (Forest Plan page 4-70, SL-1 and SL-3). This is accomplished by following Forest-wide standards and guidelines to ensure that soils are managed to provide sustained yields of managed vegetation without impairment of the productivity of the land. Applicable Standards and Guidelines include:

- **SL-1** Soil Productivity "Land management activities shall be planned and conducted to maintain or enhance soil productivity and stability."
- **SL-3** Leave a minimum of 80 percent of an activity area in a condition of acceptable productivity potential for trees and other managed vegetation following land management activities. Including all system roads, landing, spur roads, and skid roads.
- **SL-4** Any sites where this direction cannot be met will require rehabilitation. Applicable Best Management Practices include T-9 and T-11.
- **SL-5** The use of mechanical equipment in sensitive soil areas will be regulated to protect the soil resource. Operations will be restricted to existing trails and roads when feasible.
- **SL-6**, which provides ground cover objectives to minimize accelerated erosion rates on disturbed sites with unprotected soils.

Guidelines (FSM 2500, R-6 supplement 2500-98-1) describe conditions detrimental to soil productivity and outlines Soil Quality Standards to limit the extent of these conditions to less than 20% of an activity area. Detrimental soil conditions are described in the Soil Quality Standards as follows:

- Detrimental soil compaction in volcanic ash/pumice soils is an increase in soil bulk density of 20 percent or greater over the undisturbed level.
- Detrimental puddling occurs when the depth of ruts or imprints is six inches or greater.
- Detrimental displacement is the removal of more than 50 percent of the A horizon from an area greater than 100 (10' x 10') square feet and at least 5 feet in width.
- Detrimental burn damage requires significant color change of the mineral soil surface in an area greater than 100 (10' x 10') square feet to an oxidized reddish color, with the next one-half inch below blackened from organic matter charring as a result of heat conducted from the fire.
- Detrimental erosion requires visual evidence of surface loss over an area greater than 100 (10' x 10') square feet, rills or gullies, and/or water quality degradation from sediment or nutrient enrichment.

The Forest Service Region 6 Supplement also includes policy direction for designing and implementing management practices which maintain or improve soil and water quality. An emphasis is placed on protection over restoration. Specifically, under 2520.3 – Policy, the narrative reads:
"When initiating new activities:

- Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area. (This includes the permanent transportation system).
- In areas where less than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 20 percent.
- In 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 toward a net improvement in soil quality."

This Regional policy is consistent with the LRMP interpretation of Forest-wide standards and guidelines SL-3 and SL-4, on file at the Crescent Ranger district office (Final Interpretations, Document 96-01, Soil Productivity, 1996).

Target Landscape Condition

The primary goal for managing the soil resource is to maintain or enhance soil conditions at acceptable levels without impairment of the productivity of the land. The extent of detrimental soil disturbances is minimized through the application of project design criteria, management requirements and mitigation measures designed to minimize, avoid or eliminate potentially significant effects, or rectifying effects 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.

Affected Environment and Existing Condition

The Five Buttes project area covers approximately 160,000 acres in the La Pine Basin physiographic area, where essentially all landforms, rocks, and soil are products from volcanic events that occurred over various time periods. The landscape is generally characterized by gentle to uneven lava plains with a few cinder cones and buttes. Hamner Butte and Davis Mountain are strato volcanoes and Ranger Butte is a cinder cone; these are areas of relief on which a few slopes are 45 percent. The majority of the slopes in the project area range between 5 and 25 percent.

The eruption of Mt. Mazama 7,700 years ago covered the area with ash and pumice to depths up to ten feet (Larsen 1976). The rhyolitic Mazama ash and pumice fall is relatively coarse textured and undeveloped due to a young age of 7,600 years. Surface and subsurface textures range from coarse sand to small gravel sized material. Surface mineral A horizons are generally less than 2 inches thick, with a shallow A/C horizon of less than 10 inches in thickness. C horizon material varies from 20 to 40 inches thick before the slightly more developed buried soil is reached. Higher bulk densities and coarse fragment contents are the most distinguished features of the residual buried soils. Soil moisture regimes are xeric in the basin and the eastern edges of the area and ustic in the higher elevation sections. Soil temperature regimes range from frigid to cryic.

The Soil Resource Inventory (SRI, 1976) is the only mapped coverage of soils within the project area. This survey was conducted as a broad scale mapping of soil types across the Deschutes National Forest and includes basic soil information and interpretations for the soils included in the survey. The Five Buttes project area contains 77 landtype units based on similarities in landforms, geology, and climatic conditions that influence defined patterns of soil and vegetation. The biophysical characteristics of these landtype units can be interpreted to identify hazards, suitabilities, and productivity potentials for natural resource planning and management (see Table 3-2 for specific characteristics of each soil type and percentage of each type in the Five Buttes project area).

Soils within the project area have developed under the influence of local geologic parent materials, topography, annual precipitation, and associated vegetative communities. Soil types within the project area located on the slopes of the larger buttes are primarily composed of a deep mantle of ash and pumice fall from Mt. Mazama over an older paleosol derived of airfall ash and basaltic residuum (weathered in place). A deep mantle of ash and pumice fall also overlies an older soil located above glacial outwash within the Davis Lake basin.

Soils derived from Mazama ash tend to be non-cohesive (loose) and have very little structural development due to their young geologic age. Dominant soils in the project area have naturally low bulk densities and low compaction potential. However, mechanical disturbances can reduce soil porosity to levels that limit vegetative growth, especially where there is a lack of woody debris and surface organic matter to help cushion the weight distribution of ground-based equipment. Dominant soils in the project area are not susceptible to soil puddling damage due to their lack of plasticity and cohesion.

Soil displacement is one of the most readily recognized problems associated with pumice soils. The surface layers are easily removed by mechanical activity exposing light-colored material in a 100 square foot area. The maneuvering of equipment is most likely to cause soil displacement damage on the steeper landforms. On gentle to moderately sloping terrain, moving of equipment generally does not detrimentally remove soil surface layers.

Due to the absence of rock fragments on the surface and within soil profiles, these soils are well suited for tillage treatments (subsoiling) that loosen compacted soil layers and improve the soil's ability to supply nutrients, moisture, and air that support vegetative growth and biotic habitat for soil organisms.

The dominant landtypes within the project area exhibit high water infiltration rates and are classified as well to excessively drained. Surface soils are pumiceous loamy sands and sands. Permeability is very rapid in surface soils and moderate to rapid in the buried soils. Some of theses soils have a water table that can be encountered within two to five feet from the surface. Underlined bedrock in the planning area is mostly basalts and andesites that have a high to moderate capacity to store water and a low to moderate rate of water transmission unless storage capacity is exceeded. Table 3-2 displays the SRI polygons that occur in the Five Buttes project area and their key interpretation. * Denotes sensitive soils.

Table 3-2. SRI Mapping Unit interpretations and amounts of each soil type in the Five Buttes project area.

Mapping Unit*	% Slope	Natural Stability	Surface Erosion Potential	Compaction Potential	Displacement Potential	Sediment Yield Potential	Acres	Percent of Landscape
01	0-30	Very Stable	N/A	N/A	N/A	N/A	3,021	1.9
02*	0-50	Occasional small slumps	Moderate	Moderate	Moderate	Moderate to Low	143.3	.09
03	40-100	Stable	Moderate	N/A	NA	Moderate to Low	683	.43
05	0-10	Very Stable	Low	Moderate	Low	Low-Moderate	116.49	1.04
07	0-10	Very Stable	Low	Moderate	Low	Low	38.9	.02
08*	0-30	Stable	Low-High	Moderate	High	Variable	282.3	.18
09*	25-70	Stable	Low	Low	High	Low	237.4	.15
10*	20-100	Stable-Moderately Stable	Moderate	Low	Moderate to High	Moderate	143.9	.09
12*	20-70	Stable	Moderate	Low	High to Moderate	Moderate	336.6	.21
13*	30-80	Stable	Low-Moderate	N/A	Unsuited	Low	2,324.8	1.5
14*	25-80	Stable	Moderate	Low	High	Low-Moderate	35.7	.02
15	0-10	Very Stable	Low	Low to Moderate	Low to Moderate	Low	233.1	.15
16	5-40	Stable	Low	Low-Moderate	Low-Moderate	Low	3,818.6	2.4
17	0-30	Stable	Low-Moderate	Low-Moderate	Low-Moderate	Low	436.2	.27
18*	30-80	Stable	High-Moderate	Low	High	Moderate	289.1	.18
19	0-30	Stable	Low-Moderate	Low-Moderate	Low-Moderate	Low	1,017.9	.64
20	0-50	Stable	Low-Moderate	Low	Low	Low-Moderate	1,356.1	.86
25	10-40	Stable	Low	Low-Moderate	Moderate	Low	3,232.5	2.0
2B	0-30	Very Stable	Low-Moderate	Low-Moderate	Low-Moderate	Low	447.1	.28
30	0-15	Stable	Low	Low-Moderate	Low	Low-Moderate	270.2	.17
31*	25-70	Moderately Stable-Stable	Moderate	Low	High	Low	1,301.1	.86
43*	0-5	Very stable	Low	High	Low	Low-Moderate	1,365.1	.86
44	0-5	Very stable	Low	Low-Moderate	Low-Moderate	Low	334.3	.21
46	0-15	Very Stable	Low	Low-Moderate	Low-Moderate	Low	1,138.6	.72

Mapping Unit*	% Slope	Natural Stability	Surface Erosion Potential	Compaction Potential	Displacement Potential	Sediment Yield Potential	Acres	Percent of Landscape
5A*	30-80	Stable	High	Low	High	Moderate	1,290.6	.82
65	0-30	Very Stable	Low-Moderate	Low	Moderate	Low	5,675.8	3.6
68*	30-60	Very Stable	Moderate	Low	Moderate	Low-Moderate	92.9	.06
69*	30-60	Very Stable	Moderate	Low	High	Low-Moderate	84.8	.05
6H	0-30	Very Stable	Low-Moderate	Low	Low-Moderate	Low	1,776.2	1.1
70	0-30	Very Stable	Low	Low-Moderate	Low-Moderate	Low	1,069.3	.68
73	0-3-	Very Stable	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	2,471.8	1.6
7E	0-3-	Very Stable	Low-Moderate	Low	Moderate	Low	2,471.6	1.6
81*	25-70	Stable	Moderate	Low	High	Low-Moderate	83.2	.05
82*	25-70	Stable	Moderate	Low	High	Low-Moderate	87.9	.06
83*	25-70	Stable	Moderate	Low	High	Low-Moderate	389.9	.24
84*	30-8-	Stable	Low-Moderate	Low	High	Low-Moderate	2,868.3	1.8
85	0-30	Very Stable	Low	Low	Moderate	Low	1,311.2	.82
8A*	30-70	Stable	Low-Moderate	Low	High	Moderate	480.3	.30
8B	0-30	Very stable	Low-Moderate	Low	Moderate	Low-Moderate	1,018.1	.64
96	0-30	Very Stable	Low	Low	Low-Moderate	Low	8,377.4	5.3
97	0-30	Very stable	Low	Low	Moderate	Low	8,086.4	5.1
98	0-30	Very Stable	Low	Low	Moderate	Low	36,716.6	23.2
9A*	30-70	Stable	Moderate-High	Low	High	Low-Moderate	1,278.5	.80
9C*	30-70	Stable	Moderate-High	Low	High	Low-Moderate	314.6	.19
9F	0-30	Very Stable	Low-Moderate	Low-Moderate	Low-Moderate	Low	2,280.6	1.4
9G	0-30	Very stable	Low-Moderate	Low	Moderate	Low	1,304.2	.82
9J*	30-60	Stable	Moderate	Low	High	Low-Moderate	760.6	.48
9M	0-30	Very Stable	Low-Moderate	Low	Moderate	Low	318.2	.20
9N*	30-70	Stable	Moderate-High	Low	High	Low-Moderate	19.8	.01
9T*	25-60	Moderately Stable	Moderate-High	Low	High	Low-Moderate	33.4	.02
9Z*	30-70	Stable	Moderate	Low	High	Low-Moderate	3,633.6	2.3
GF*	10-60	Moderately Stable-Stable	Low-Moderate	Low-Moderate	Moderate-High	Low-Moderate	329.0	.20

Mapping Unit*	% Slope	Natural Stability	Surface Erosion Potential	Compaction Potential	Displacement Potential	Sediment Yield Potential	Acres	Percent of Landscape
GH	0-40	Very Stable	Moderate	Low-Moderate	Moderate	Low-Moderate	232.6	.15
GK	0-40	Stable	Low	Low-Moderate	Low-Moderate	Low	254.3	.16
HG	0-50	Stable	Low-Moderate	Moderate-Low	Low-Moderate	Low	3,386.3	2.13
HM*	0-80	Stable	Low-Moderate	Low-Moderate	Moderate-Hugh	Low-Moderate	9,366.9	5.9
HN*	0-80	Stable	High-Moderate	Low	High	Low-Moderate	2,626.8	1.7
LL	0-30	Very Stable	Low-Moderate	Low-Moderate	Low-Moderate	Low	1,182.9	.74
MD*	0-70	Stable	Low-Moderate	Low-Moderate	Moderate-High	Low-Moderate	647.6	.41
ME*	0-70	Stable	Low-Moderate	Moderate-Low	High-Moderate	Moderate-Low	516.1	.33
MR	0-30	Very Stable	Low-Moderate	Low-Moderate	Low-Moderate	Low	841.1	.53
MV*	0-40	Stable	Low	Moderate-Low	Low-Moderate	Low	4,117.5	2.6
PA*	0-70	Stable	Low-Moderate	Low-Moderate	Low-Moderate	Low-Moderate	1,858.6	1.17
PD*	0-60	Stable	Low-Moderate	Low-Moderate	Moderate-High	Low-Moderate	743.3	.50
PF	0-30	Very Stable	Low-Moderate	Low	Low-moderate	Moderate-Low	967.5	.61
PG	0-30	Very Stable	Low-Moderate	Low-Moderate	Low-Moderate	Low	3,369.2	2.1
PJ	0-30	Very Stable	Low	Low	Low-Moderate	Low	973.8	.62
PK	0-30	Very Stable	Low	Low	Low-Moderate	Low	695.3	.44
PM	0-30	Very Stable	Low	Low	Moderate	Low	2,926.2	1.8
PN*	0-70	Stable	Low-High	Low	Moderate-High	Low-Moderate	3,554.9	2.24
WB*	20-70	Stable	Moderate	Low-Moderate	Low-High	Moderate-Low	507.86	.32
WC*	0-50	Stable	Low-Moderate	Moderate-Low	Low-Moderate	Moderate-Low	421.5	.26
WH	0-10	Very Stable	Low-Moderate	Moderate-Low	Low-Moderate	Low-Moderate	575.4	.36
WE*	0-5	Very Stable	Low-Moderate	Low-High	Low-Moderate	Low	679.4	.43
WF*	0-10	Very Stable	Low-Moderate	Low-High	Low-Moderate	Low-Moderate	766.03	.48
WG*	0-30	Very Stable	Low-Moderate	Low-High	Low-Moderate	Low	860.2	.54
XH	0-10	Very Stable	Low	Low-Moderate	Low-Moderate	Low	29.1	.01

*Denotes soils classified as "sensitive."

Erosional Processes

Erosion is a function of many soil and environmental factors that affect soil particle detachment and movement by runoff water. The severity of soil erosion depends on many factors, including slope gradient, inherent soil erodability, the amount of bare ground, and the intensity of precipitation events. All soils are susceptible to soil movement whenever rainfall intensities or snowmelts are great enough to cause overland flow. On undisturbed sites with gentle slopes, surface erosion occurs at naturally low rates because soils are protected by vegetation and organic litter layers. Accelerated erosion occurs at a rate greater than natural, which is usually associated with disturbances that reduce vegetative cover, displace organic surface layers, or reduce soil porosity through compaction. Steep slopes with sparse vegetation generally have greater amounts of surface runoff which increases the erosion potential. Due to the lack of structural development, volcanic ash-influenced soils are easily eroded where water becomes channeled on disturbed sites such as road surfaces, skid trails, water-bar outlets, and road drainage structures.

Inherent erosion hazard is a relative rating for surface erosion based on the ability of the soil to take in water, resistance of the soil surface to the effect of rainfall and water movement, and the effect of topography or slope gradient. The rating for surface erosion potential assumes that the surface cover of vegetation or litter has been disturbed or destroyed and bare surface soils are exposed to the elements of erosion. The following ratings are intended for planning purposes to indicate relative potential erosion hazards.

Low: Soils are generally on gentle to moderate slopes with no appreciable hazard for erosion.

Moderate: Some loss of surface materials can be expected, but soils are sufficiently resistant to erosion to permit limited and temporary exposure of bare soil during development or use.

High: Considerable loss of surface materials can be expected. Unprotected soils will erode sufficiently to severely damage productivity.

Severe: Large loss of surface soil material can be expected, with severe damage to soil productivity.

There are sensitive soils with high erosion hazards within the project unit areas. Dominant soils consist of moderately deep and deep pumice soils on slopes greater than 30 percent. There are also soils in landtypes that have moderate erosion hazard ratings. Both of these areas are much more susceptible to accelerated soil erosion during high-intensity rainfall events. Identified in Table B-2 (Appendix B of this EIS) for advanced logging systems, these areas would also have restrictions on mechanized equipment.

LRMP Standard and Guideline SL-6 (page 4-70 and 4-71) provides ground cover objectives to minimize accelerated erosion rates on disturbed sites with unprotected soils (Table 3-3). Effective ground cover includes all living or dead herbaceous or woody materials and rock fragments greater than three-fourths (3/4) of an inch in diameter in contact with the ground surface, including tree or shrub seedlings, grass, forbs, litter, and woody biomass. Effective ground cover is measured as a percent of natural conditions for representative soils and landtypes. In order to minimize soil erosion by water or wind, the following ground cover objectives should be met within the first two years after completion of ground-disturbing management activities.

Table 3-3. Minimum ground cover objectives to minimize soil erosion by water and wind.

Surface Soil Erosion Potential (Deschutes Soil Resource Inventory)	Minimum Effective Ground Cover (Percent of Natural)	
	1st Year	2nd Year
Low	20 - 30	31 – 45
Moderate	31 – 45	46 – 60
High	46 – 60	61 – 75
Severe	61 - 75	76 – 90

At the present time, adequate soil cover exists to control erosion on the dominant soils and landforms that potentially would be affected in the Five Buttes project area. Therefore, accelerated erosion is not expected to have any long-term adverse effects to soil productivity or water quality during the recovery period.

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). This data was developed to designate a broad-scale timber base area for forest-wide planning purposes. Project level planning requires that lands proposed for harvest have their suitability verified based on the criteria outlined in the Forest Service Handbook (FSH 1909.12). Lands that do not meet these criteria are considered unsuitable or partially suitable for timber harvest due to regeneration difficulties or the potential for irreversible damage to resource values from management activities.

The productivity of forest soils can be measured as the Cubic Foot Site Class (Mean Annual Increment in cubic feet/year) for primary tree species growing on undisturbed or minimally disturbed sites. These volume indices provide valuable baseline information regarding soil productivity potential for each soil type in the Deschutes Soil Resource Inventory (SRI, 1976). Site classes on the Deschutes National Forest range from Very Low (Site Class 7) to High (Site Class 4). Soil types having Site Class 7 are considered unsuited for forest production because the mean annual increment is generally less than 20 cubic feet per year. All lands proposed for active management in the Five Buttes Project area are classified "suitable."

Sensitive Soil Types
slopes over 30%, frost pockets, fine sandy loam or year-long high water tables, extremely rocky or high or extreme hazard ratings.
Criteria for identifying sensitive soils to management are listed in the Deschutes LRMP (Appendix 14, Objective 5). Sensitive soil types include:

- Soils on slopes over 30%,
- Slopes with a high hazard rating for surface erosion,
- Potentially wet soils with seasonal or year-long high water tables,
- Soils associated with frost pockets in cold air drainages and basins, and
- Soils that occur in localized areas of rocky lava flows.

Approximately 39 percent (61,718 ac) of the project area contains landtypes with localized areas of sensitive soils (Table 3-4). Lava flows occupy approximately 2.5 percent of the total project area (3,732 acres), mostly around Davis Lake and high elevation rock outcrops. Areas of sensitive soils are typically confined to specific segments of the dominant landform and they are generally too small to delineate on maps. **It is emphasized that only portions of these total landtype acres actually contain sensitive soils.**

Table 3-4. Landtype acres that contain localized areas of sensitive soils within the Five Buttes Project Area (Soil Resource Inventory, Deschutes National Forest, 1976).

SRI Map Unit Symbol	Geomorphology (Representative landforms)	Type of Concern**	Landtype Acres
02, 09, 10, 12, 13, 14, 18, 31, 5A, 68, 69, 81, 82, 83, 84, 8A, 9A, 9C, 9J, 9N, 9T, 9Z, GF, HM, LG, MD, ME, PD, WB	Cinder cones, high elevation rock outcrops, composite volcanoes (30% slope), high or extreme erosion hazard.	1, 4	33,434
15, 70, 73, 96, LL, PF, PG, PJ,	Depressions or flats	2	19,840
02, 05, 08, 15, 43, 44, 96, PF, PG, PJ, WC, WE, WF, WG, WH, XH	Seasonal high water table	3	1,663

****Management Concerns**
1) On slopes greater than 30 percent, loose sandy soils are susceptible to soil displacement.
2) Very low productivity due to frost heaving, low fertility, and temperature extremes.
3) Seasonal high water tables.
4) High or extreme erosion hazard.

See Figures 3-1 and 3-2, which display sensitive soils overlaid by units proposed for activity in each action alternative. Tables 3-5 and 3-6 display the acres of sensitive soils in each unit where they occur. In order to address the potential for effects to steep slopes (over 30%) and sensitive soils, the project was designed to include advanced logging systems such as helicopter or cable logging. Sensitive soil areas that occur within the proposed activity areas are discussed under the direct and indirect effects of implementing the action alternatives.

Table 3-5. Sensitive soils acres by unit in Alternative B.

Unit	Soil Code	Acres of Sensitive Soil
80	9C	20.2
345	84	20.7
	8A	253.7
	9Z	83.6
385	84	2.9
	9Z	5.2
410	84	30.2
	9Z	5.8
415	9Z	3.5
440	84	27.6
	9Z	2.9
	HM	21.0
540	84	14.8
	9Z	15.3
695	9Z	18.8
790	84	4.5
	9Z	19.1
795	9Z	97.3
800	9Z	101.4
805	9A	7.7
	9Z	85.3
810	9Z	45.7
TOTAL ACRES		**887.2**

Table 3-6. Sensitive soil acres by unit in Alternative C.

Unit	Soil Code	Acres of Sensitive Soil
80	9C	20.2
345	84	20.7
	8A	253.7
	9Z	83.6
385	84	2.9
	9Z	5.2
410	84	30.2
	9Z	5.8
415	9Z	3.5
540	84	14.8
	9Z	15.3
691	9A	71.7
692	9A	18.5
693	9A	49.7
695	9Z	18.8
790	84	4.5
	9Z	19.1
810	9Z	45.7
TOTAL ACRES		**683.9**

Detrimental Soil Disturbance

To estimate soil conditions within the project area, the following resources were utilized: Geographical Information System (GIS), aerial photos, field reconnaissance, best available research, past monitoring of logging systems on the Deschutes National Forest, and personal communication with Timber Sale Administrators and other district personnel. GIS analysis utilized the soil resource inventory and past harvest data to determine the location and extent of soil effects and existing conditions.

Natural Events

Mass movements, or landslides, occur when earthen materials become unstable and slide downslope in response to gravity. There are no natural or management-related landslides known to exist within the project area. The high permeability of the pumice and ash-influenced soil materials generally precludes the buildup of hydraulic pressures that could trigger landslides.

Natural soil disturbances were not included as existing sources of detrimental soil conditions within any activity area proposed for the Five Buttes project (see Tables 3-10 and 3-13).

Management-Related Disturbances

Timber Management

Based on harvest history, various silvicultural prescriptions including thinning treatments, intermediate harvest, and regeneration harvest have occurred within the project area between 1950 and the present. Temporary roads, log landings, and primary skid trails were constructed and used to access individual harvest units of past timber sales. Research studies and local soil monitoring have shown that soil compaction and soil displacement account for the majority of detrimental soil conditions resulting from ground-based logging operations (Craigg, 2000; Page-Dumroese, 1993). Some long-term adverse effects to soil productivity still exist where surface organic layers were displaced and/or multiple equipment passes caused deep compaction.

Ground-based logging equipment disturbed soils in portions of approximately 43,122 acres that occur within the project area. 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 and 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. It is expected that soils in these areas have returned to undisturbed density levels in the short-term (less than 5 years) through natural processes (i.e., root penetration, frost heave, rodent activity, freeze-thaw and wetting drying cycles). The establishment of ground cover vegetation and accumulation of organic matter has been improving areas of past soil displacement.

Roads

GIS information was used to estimate the current road densities to assess the amount of soil compaction as a result of roads in the planning area. Roads are grouped into three categories by size and maintenance level. Average road widths were determined after personal communication with the District Road Maintenance Engineer. Table 3-7 summarizes road types and contains the equations that were used to estimate acres of road per mile.

Table 3-7. Road categories and determination of respective detrimental soil condition.

Road Type	Equation Used to Determine Amount of Detrimental Soil Condition
Arterial	1 mi. (5280 ft) x 20 ft. wide / 43,560 sq. ft./ac.
Collector	1 mi. (5280 ft) x 14 ft wide / 43,560 sq. ft. /ac
Local	1mi (5280 ft) x 12 ft/ 43,560 sq. ft. /ac

The planning area contains approximately 699 miles (1,063 acres) of system roads. Segments of these existing roads cross through portions of activity areas proposed for treatment. Existing roads classify the area of disturbance as non-productive. 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 amount of detrimentally disturbed soil committed to existing roads is included in the estimated percentages displayed in Tables 3-10 and 3-13.

Recreation Activities
The extent of detrimental soil conditions associated with recreation use is relatively minor in comparison to existing roads and past logging disturbances. There are 39 developed recreation sites (336 acres), 38 dispersed recreation sites (266 acres), and 165,000 feet of recreation trails (19 acres), which altogether represent less than 0.5 percent of the Five Buttes project area[10]. Estimates for recreation ground disturbance have been factored into the estimates of detrimental soil conditions in Tables 3-10 and 3-13.

Effects from dispersed recreation activities are usually found along existing roads and trails and near lakes and rivers. Field observations indicate little or no evidence of dispersed campsites within the proposed activity areas. User-created trails typically occur where vegetation has been cleared on or adjacent to old skid trail networks of past harvest areas. Therefore, dispersed recreational use does not have an additive effect on overall site productivity within the individual activity areas proposed for this project, and effects of dispersed recreation will not be discussed in the Environmental Consequences section.

Livestock Grazing
There has been no grazing in the planning area for two to three decades. Effects from livestock grazing to the soil resource are mainly in localized areas of concentrated use, such as around cattle watering developments. Detrimental soil conditions from grazing have been reduced and likely eliminated by natural processes such as frost heaving. Therefore, effects of past grazing allotments have not been included in Tables 3-10 and 3-13.

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 soil's ability to retain moisture and provide both short and long-term nutrient supplies for the growth of vegetation. Mycorrhizal fungi and soil organisms depend upon the continuing input of woody debris and fine organic matter.

Summary
The existing condition of the soil resource mainly has been influenced by the transportation system and ground-based logging facilities used for past timber sales. Most project-related impacts to soils occurred on and adjacent to heavy-use areas such as skid trail systems, log landings, and roads that were used for access in past timber sale units. The extent of detrimentally disturbed soil associated with other land uses is relatively minor in comparison.

In activity areas (units) proposed in Alternative B, there are 271 acres (4.9%) of soil classified as detrimental. There are 525 acres (6.7 %) of classified detrimental soils in Alternative C units. Roads, trails, recreation and past harvest activities are included in these totals. Existing detrimental soil conditions within proposed activity units in the Five Buttes project area are summarized in Table 3-10 (Alternative B units) and Table 3-13 (Alternative C units).

[10] The spatial extent for analysis was on a watershed basis. Therefore, number of sites and acre figures do not match the recreation discussion, which was analyzed at a project level.

Environmental Consequences

Alternative A

Under Alternative A (No Action), the management activities proposed in this document would not take place. Vegetation management and fuels reduction activities would be deferred.

Indicator #1: Detrimental Soil Disturbance

Under Alternative A, no additional land would be removed from production. There would be no cumulative increase in detrimental soil conditions above current levels. Implementation of project design criteria and mitigation measures would not be necessary.

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 future stand-replacing wildfires cause intense ground-level heating that results in severely burned soils. Detrimental changes to soil properties typically result from extreme surface temperatures of long duration, such as the consumption of 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 project area (see sections titled "Forested Vegetation" and "Fire and Fuels" in Chapter 3 of this EIS). If a large amount of fuel is present during a wildfire, soil temperatures can remain high for an extended period of time. Excessive soil heating would be expected to produce detrimental changes in the chemical, physical and biological properties of burned soils. Severe burning may cause soils to repel water, thereby increasing surface runoff and subsequent erosion. The loss of protective ground cover would increase the risk for accelerated wind erosion on the loose, sandy-textured soils found throughout the project area.

Indicator #2: Coarse Woody Debris and Surface Organic Matter

In the short term, the amount of coarse woody debris (CWD) and surface litter would gradually increase or remain the same. In forested areas, coarse woody materials will continue to increase through natural mortality, windfall, and recruitment of fallen snags over time. Short-term nutrient sources will 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 materials.

In the long term, the accumulation of CWD and forest litter would increase the potential for intense wildland fires which may completely consume heavy concentrations of fuel and ground cover vegetation. High to extreme fire hazard and potential for excessive soil heating exists when downed woody debris exceeds 30 to 40 tons per acre (Brown et al., 2003). Intense ground-level fire would likely create areas of severely burned soil and increase the potential for accelerated wind erosion. The loss of organic matter would adversely affect ground cover conditions and the nutrient supply of affected sites.

Indicator #3: Project Design, Management Requirements and Mitigation Measures

Under Alternative A, no Project Design Features or Mitigation Measures would be necessary. This indicator is not applicable to Alternative A.

Effects Common to Both Action Alternatives (Alternatives B and C)

The following section provides a discussion of the potential effects on soil physical properties and biological conditions from implementing the various vegetation and fuel reduction treatments proposed under the action alternatives.

Proposed units for each alternative in the current project were overlaid to identify areas of potentially unacceptable effects to soils. Aerial photos, scale 1:12000, were used to refine the location of overlap between past and proposed treatment units. Research by Froelich (1981) and Garland (1983) was used to estimate soil compacted areas on flat ground, in small timbered stands using tractor logging systems. Communication with District Sale Administrators was used to validate this research and insure site-specific conditions were considered. Other district personnel that had information about historical and current logging activities were also consulted. Past monitoring and field reconnaissance were used to insure assumptions made were within acceptable limits. This analysis also considered the effectiveness and probable success of implementing the management requirements, mitigation measures, and Best Management Practices (BMPs) which are designed to avoid, minimize or reduce potentially adverse effects to soil productivity.

Forest monitoring has shown that soil disturbance increases with each management entry that is accomplished using mechanical equipment. The amount of additional soil disturbance depends on existing soil condition and how much of the previous logging systems can be utilized (landings and skid trails), type of equipment used, and type of management activity. The proposed activities that would be applied to treatment areas are commercial thinning, selective tree removal, utilization of forest products (post and pole, biomass) and machine piling or burning of slash. These activities would utilize machine equipment.

For this analysis, it is assumed post sale activities such as fuels reduction and disposal activities would occur on existing detrimentally affected areas. Other post-sale activities that have a potential effect to soil productivity, such as disposal of handpiles and prescribed underburning will be disclosed where relevant. 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. Factors used to evaluate changes to soil productivity include amount and composition of coarse woody debris, surface cover from organic matter, habitat for soil biological activity, and nutrient reservoirs.

Ground-based Logging

Froelich (1981) and Garland (1983) suggest that the area of a unit with compacted soils is in direct relation to the skid trail spacing. On flat ground, patterns of skid trails are generally parallel, with the exception of landings where skid trails come together. Spacing of skid trails corresponds to the year the logging activity occurred. Logging activities that occurred prior to 1990 had closer spacing because logging contractors had fewer restrictions on their activity. These are estimated to be 50 feet apart and 12 feet wide (personal communication timber sale administrator). This results in an estimated 20 percent of the total unit area. In the early 1990s, with the establishment of Forest Plan Standards and Guidelines that improved management practices, skid trail spacing increased to 75 feet. This skid trail spacing corresponds to an estimated 14 percent soil compaction in the unit area. Since 1994, main skid trails have typically been spaced 100 feet apart, which represents an average of 11 percent compacted area in the harvest unit. Where slopes are less than 30 percent, the development and use of new logging facilities would result in compaction of approximately 13 percent of the harvest unit area (11 percent in skid trials plus 2 percent in log landing). This amount was used to analyze the proportionate extent of detrimental soil conditions which are expected to occur in unmanaged portions of the activity areas proposed for mechanical harvest treatments displayed in Tables 3-10 and 3-13.

Cable or Helicopter Logging

Research has shown that approximately 4 to 9 percent of an activity area will have detrimental soil effects (compaction or displacement) when skyline or helicopter logging is implemented (Dryness, 1967a; Clayton, 1990). A skyline or helicopter logging system that can achieve partial to full suspension of logs during inhaul yarding operations would minimize soil disturbance on units that have slopes greater than 30%. To be conservative, estimates of soil disturbance assume 8% of each unit that is skyline or helicopter logged will have detrimental disturbance; this disturbance area includes landings and temporary roads. This amount is included in the estimates of detrimental soil conditions displayed in Tables 3-10 and 3-13.

Landings

Based on communication with the District Timber Sale Administrator, landings for ground based tractor logging usually measure 100’ by 100’ and density is one landing for ten acres. This equates to approximately 2 percent of the harvest unit. This amount is included in the estimates of detrimental soil conditions displayed in Tables 3-10 and 3-13.

Thinning and Selective Tree Harvest

In each thinning unit the existing landings and skid trail would be utilized when possible. Based on soil monitoring, utilization of existing landing and skid trails is not always possible. As a result, there are anticipated increases in soil disturbance of 5 to 10 percent (Craigg, 2000). Where proposed harvest treatments overlap previously managed areas on slopes less than 30 percent, it is predicted that soil disturbance would increase by 7 percent[11] above existing conditions. This amount is included in the estimates of detrimental soil conditions displayed in Tables 3-1 and 3-13.

Forest Product Removal

Monitoring and professional experience were the bases for estimating the percent of the area for additional soil disturbance associated with removal of forest products. Post-harvest fuel treatment may be accomplished using some type of machinery or burning operation to dispose of unwanted slash.

Removal of special forest products such as firewood, post and pole, or some form of biomass usually requires equipment that results in a greater footprint on the ground than large commercial operations. Existing skid trails would be utilized where possible. Skid trails remain 100 feet apart; however, more off-trail travel is required because of the number of pieces to be picked up. To be conservative in this estimate, it is assumed 10 percent of the area being treated will have additional detrimental soil disturbance, in order to allow for a range of methods and equipment (such as pickup trucks and home-made skidders). This amount is included in the estimates of detrimental soil conditions displayed in Tables 3-10 and 3-13.

Grapple Piling

The action alternatives include grapple piling (4,439 acres in Alternative B and 5,577 acres in Alternative C). Grapple skidders would be restricted to existing roads, landings and skid trails (see "Project Design Features" in Chapter 2 of this EIS). For this reason, grapple piling has not been included in the estimates of detrimental soil conditions displayed in Tables 3-10 and 3-13.

Prescribed Underburning

Pumice soils do not transfer heat to depths in the soil as readily as more dense sand and clay soils (Fire Effect on Pacific Northwest Forest Soils, USDA, 1980). Under typical conditions underburning has no effect to the productivity of soils. Typical prescribed burn conditions that protect soil productivity are:

- Prescribed underburns occur in the early spring or late fall when air temperatures are cool and when fuels have sufficient moisture to burn under relatively cool conditions. These types of burns can be categorized as light to moderate burns.
- In light to moderate burns, the surface duff layer is charred and partially consumed.
- Large logs may be deeply charred but mineral soil under the ash is not appreciably changed in color.
- Flame lengths are usually no higher than 2 to 4 feet.
- Underburning is accomplished using very careful, controlled methods with specific prescriptive conditions and without mechanized equipment.
- Duff, organic matter and large logs are retained to the greatest extent possible.
- If natural barriers are not available, a handline is sometimes utilized to protect some resources; this causes some soil displacement, but not enough to be considered detrimental.

For these reasons, prescribed burn acreage has not been included in the estimates of detrimental soil conditions displayed in Tables 3-10 and 3-13.

Soil Restoration

Extensive areas of soils within the project area are covered by loose, non-cohesive ash deposits that consist of sandy textured soils with little or no structural development. Mechanized equipment has the potential to decrease soil porosity; however, compacted sites can be mitigated by tillage with a winged subsoiler (Powers, 1999). Dominant soils within the proposed activity areas are well suited for tillage treatments due to their naturally low bulk densities and the absence of rock fragments within soil profiles.

[11] Seven percent is the average of the range (5 to 10 percent) suggested by Craigg (2000).

Soil restoration has been implemented with good success due to the absence of rock fragments on the surface and within soil profiles. Although rock fragments can limit subsoiling opportunities on some landtypes, hydraulic ripping mechanisms on this specialized equipment help reduce the amount of subsurface rock that could potentially be brought to the surface by other tillage implements. Most surface organic matter remains in place because the equipment is designed to allow adequate clearance between the tool bar and the ground, thereby allowing smaller slash materials to pass through without building up. Mixing of soil and organic matter does not cause detrimental soil displacement because these materials are not removed off site. Restoration treatments likely improve subsurface habitat by restoring the soils ability to supply nutrients, moisture, and air that support soil microorganisms. Since the winged subsoiler produces nearly complete loosening of compacted soil layers without causing substantial displacement, subsoiled areas are expected to reach full recovery within the short-term (less than 5 years) through natural recovery processes.

Research studies on the Deschutes National Forest have shown that the composition of the soil biota populations and distribution rebounds back toward pre-impact conditions following subsoiling treatments on compacted skid trail and landings (Craigg, 2000)

The winged subsoiling equipment used on the Deschutes National Forest lifts and fractures compacted sub-surface soil layers in greater than 90 percent of the compacted zone with one equipment pass (Craigg, 2000). Subsoiling directly fractures compacted soil particles and increases macro pore space within the soil profile, both of which contribute to increased water infiltration and enhanced vegetative root development. Although subsoiling does not completely return these areas to pre-impact conditions, it does significantly rectify physical properties to a condition where other soil processes can recover on site. Subsoiling is very effective in reducing soil strengths incurred by the compression and vibration effects of machine traffic. Soil probes taken before and after subsoiling operations show reductions to or below natural levels after a single pass of the implement. Following subsoiling, soils can be very fluffed but return to natural bulk density levels after a year or two of physical settling and moisture percolation through the soil profile (Deschutes Soil Monitoring, 1995 - 2001).

Alternative B

Indicator #1: Detrimental Soil Disturbance

Alternative B proposes the removal by commercial harvest an estimated 18.9 million board feet of trees on portions of approximately 5,522 acres. Mechanical harvest methods would be used on about 4,439 acres and advanced logging systems such as skyline or helicopter would be used on 1,083 acres (Table 3-6). Logging operations would occur on relatively gentle to moderately sloping lava plains. The development and use of temporary roads, log landings, and skid trail systems are the primary sources of direct physical disturbance that would result in adverse changes to soil productivity. Mechanical harvest and yarding systems would likely be accomplished using ground-based machines equipped with a felling head (harvester shear). Feller bunchers with a 24 ft. boom (17 ft. effective reach) are one of the most common harvester machines used in this geographic area. Similar equipment would be used in proposed activity areas for this project. Felled 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. Mechanical harvesters would be allowed to make a limited number of equipment passes (2) on any site-specific area between skid trails or away from log landings[12]. Skidding equipment would be restricted to designated skid trails. The majority of soil effects would be confined to known locations in heavy use areas that would be rehabilitated when logging transportation systems are no longer needed for future management.

Cable or aerial harvest systems are proposed where steeper slopes are found on Davis Mountain, Hamner Butte, Royce Mountain, Odell Butte, and Maklaks Mountain (See Table B-2 in Appendix B of this EIS). Fuel treatment would consist of whole tree yarding with tops attached, thinning of trees up to either 3

[12] For the purposes of this project and analysis, “pass” is defined as a single movement of the equipment to or from a trail or landing. Therefore, movement of a machine out into the unit and back to the skid trail or landing would equal two passes.

inches diameter 6 inches diameter depending on management objectives, hand piling, pile disposal or underburning.

Access Management (Roads)
There would be no construction of permanent transportation system roads. Commercial activities would require the use of 145 miles of system roads under USDA Forest Service jurisdiction. Approximately 34 miles of roads that are currently closed in Level 1 status would need to be re-opened. To facilitate harvest activities, maintenance activities on 110 miles of roads would be needed. Road maintenance activities includes roadside brushing, removal of hazard trees, blading and shaping of travel way, restoring existing surface drainage, cleaning culverts and ditches, and installing water bars after periods of haul. There would be 5.94 miles of temporary road construction to access harvest units. All temporary roads would be subsoiled after activities are completed.

Table 3-8 displays a summary of the proposed activities in Alternative B. Measurements (acres and miles) are approximate.

Table 3-8. Alternative B summary.

Commercial Harvest (acres)	
Ground-based	4,439
Skyline or Helicopter	1,083
Total	**5,522**
Additional Fuels Activities outside of harvest units (acres)	0
Road Management (miles)	
Road Maintenance	110
Road Re-opening	34
Commercial Hauling	145
Temporary Road Development	5.94
Soils Resources (acres)	
Current Detrimental Soil Condition	271.3
Detrimental Soil Condition Post-Treatment	937.4
Soil Restoration (subsoiling)	240.1
Activities on Sensitive Soils	887

Units for which temporary road construction would be needed: 10, 25, 75, 155, 225, 370, 380, 435, 475, 550, 670, 690, and 695.

Ground Disturbing Management Activities

> **Actions proposed in Alternative B comply with LRMP standards and guidelines SL-3 and SL-4, and Regional policy (FSM 2520, R-6 Supplement No. 2500-98-1) for maintaining soil productivity.**

Ground-disturbing management activities vary in their intensity of site disturbance. Of the action alternatives, implementation of Alternative B would result in the least extent of physical soil effects due to logging facilities.

The following conclusions summarize the potential increases in detrimental soil conditions associated with temporary roads and logging transportation system needed to facilitate yarding operations in each of the activity areas.

Under implementation of Alternative B, an estimated 271 (5%) acres of soil are currently in a detrimental soil condition including existing roads and management facilities within the proposed activity areas. There would be an increase of 666 (12%) acres of soils classified as detrimental condition. Soil compaction would account for the majority of these effects and the total amount of detrimental soil conditions would be approximately 1178 acres prior to soil restoration activities. Subsoiling treatments would be applied to rehabilitate approximately 240 acres of detrimentally compacted soil within portions of the activity areas (Table 3-8).

Based on these disturbed area estimates, the percentages of detrimental soil conditions following implementation of project and restoration activities would increase above existing conditions by approximately 12% for a total of 17% in the proposed activity areas. All activity areas have been designed to be consistent with Regional and Deschutes National Forest LRMP standards and guidelines after subsoiling.

Project design criteria, including operational guidelines for equipment use are incorporated into the following discussion and are assumed to minimize the extent of detrimentally disturbed soil from harvest activities between main skid trails and away from log landings.

The primary factor that affects soil compaction off designated skid trails is the amount of equipment traffic. Research has shown that the first one or two equipment passes over an area compact the upper few inches of the soil. Additional passes cause greater increases in bulk density and compact the soil to greater depths. The detrimental effects of soil compaction generally require more than 3 to 5 equipment passes (McNabb, Froehlich, 1983). Therefore, on ground-based logging systems only, the effects of only two passes by harvester machines on any site-specific area are not expected to qualify as a detrimental soil condition. Frost heaving and freeze-thaw cycles can generally offset soil compaction near the soil surface. Other natural processes that help restore soil porosity in soil surface layers include root penetration, rodent activity, wetting and drying cycles, and the accumulation of organic matter. On gentle to moderately sloping terrain, the maneuvering of equipment generally does not remove soil surface layers in large enough areas (at least 5 feet in width) to qualify as detrimental displacement (FSM 2520, R-6 Supplement). Smaller areas of gouging or the mixing of soil and organic matter would not constitute detrimental soil displacement. Conservative estimates were used to predict amounts of detrimental soil conditions associated with logging activities, and the incidental soil disturbances is accounted for in these estimates.

Sensitive Soils

Under Alternative B, there would be activity on 887 acres of landtypes that contain sensitive soils (Table 3-9). **It is emphasized that only portions these landtypes actually contain sensitive soils.** Development and use of log landings and skid trail systems are the primary sources of physical disturbance. The majority of effects would occur on and adjacent to sensitive soils areas where multiple equipment passes typically cause detrimental soil compaction. Project design criteria such as advanced logging systems in units with a high erosion hazard and over 30 percent slopes include units: 80, 345, 385, 410, 415, 440, 540, 690, 695, 790, 795, 800, 805, and 810. In unit 415 there is a 3.46-acre area with a slope greater than 30%. In this unit, ground-based logging systems can get access with one or two passes up and down the slope (Project Design Feature, Chapter 2) or can pull harvested trees with cables; another option is to designate the steep slope as part of the 15-20% retention area. The following units have a small amount of sensitive soils (less than 10 % of the unit area) 85 (.27%), 520 (<1%), 690 (4%), and 765 (1.5%), and would be treated with one of the options described for unit 415. Unit 290 is classified sensitive due to frost pockets; since no tree planting has been proposed, frost pockets are not an issue and therefore advanced harvest systems are not necessary to protect the soil resource in this unit. Logging slash and fallen dead trees would provide additional ground cover that would improve the soil's ability to resist surface erosion. SRI has identified Units, 85, 370, and 825 as having seasonal high water tables or displacement. These units were field checked and no high water tables were found; therefore ground-based logging systems are acceptable on these units.

Table 3-9. Activity areas proposed for mechanical vegetation treatments on landtypes that contain sensitive soils in Alternative B of the Five Buttes project.

Management Concern	Total Acres	Alternative B Units
Slopes greater than 30 percent, High Erosion Hazard	887	80, 345, 385, 410, 415, 440, 540, 690, 695, 790, 795, 800, 805, and 810
Low productivity sites limited by frost heaving, low fertility and climatic factors, or displacement	160	85, 370, 825

Fuels Reduction Activities

With the implementation of Alternative B, fuel reduction would be accomplished by whole tree yarding, prescribed underburning, hand piling, and grapple piling. Much of the unusable stemwood and tops would likely be machine piled and burned on log landings. There would be no mechanized equipment associated with post-sale activities off existing skid trails and logging slash would be piled in skid trails and landings, not in random locations. Although this method removes potential sources of woody debris off-site, it would not cause additional soil effects because burning would occur on disturbed soils that already have detrimental conditions. Restoration treatments to restore natural soil processes would be implemented to reduce the amount of detrimentally disturbed soil committed to log landings following these post-harvest activities. Grapple piling machines would stay on designated skid trail and landings and would not cause any additional effects to soils. Potential for prescribed underburning would occur on 3,998 acres. Detrimental burn damage requires significant color change of the mineral soil surface in a 100 square feet (10’ x 10’) area or larger to an oxidized reddish color, with the next one-half inch below blackened from organic matter charring as a result of heat conducted from the fire. Since underburns occur in early spring or late fall when weather conditions are cool and moist, detrimental effects to soils would not occur.

Table 3-10 displays quantitative unit-specific information that shows the predicted amounts of detrimental soil conditions before and after implementation of project activities. 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 subsoiling acres shown in column (7) are calculated by multiplying the estimated percentage after soil restoration shown in column (6) by the total unit acres in column (2) and subtracting this amount from the disturbed acres in column (5). Column (8) displays increase in acres of detrimental soil conditions after all activities are completed; values in column (8) are calculated by subtracting the numbers in column (4) from those in column (6). Surface calculation of designated areas such as roads, main skid trails and log landings determine how much area need to be subsoiled within the activity areas.

Table 3-10. Estimated effects to soil productivity for Alternative B.

(1) Unit Number[1]	(2) Unit Acres	(3) Proposed Mechanical Activities[2]	(4) Existing Detrimental Soil Conditions		(5) Detrimental Soil Disturbance Associated with Management Activities[3]		(6) Detrimental Soil Conditions After Soil Restoration		(7) Restored Acres	(8) Increase in Detrimental Soil Conditions after Activity is Completed
			Percent	Acres	Percent	Acres	Percent	Acres	Acres	Acres
10	138	HTH, GP, SDT	0%	0.0	23%	31.7	20%	27.6	4.1	27.6
25	56	HTH, GP, SDT	10%	5.6	27%	15.1	20%	11.2	3.9	5.6
75	194	HTH, GP, SDT	3%	5.8	26%	50.4	20%	38.8	11.6	33.0
80*	77	HTH	0%	0.0	8%	6.2	8%	6.2	0.0	6.2
85	175	HTH, GP, SDT	4%	7.0	17%	29.8	17%	29.8	0.0	22.8
105	22	HTH, GP, SDT	0%	0.0	23%	5.1	20%	4.4	0.7	4.4
120	130	HTH, GP, SDT	17%	22.1	34%	44.2	20%	26.0	18.2	3.9
125	111	HTH, GP, SDT	11%	12.2	28%	31.1	20%	22.2	8.9	10.0
130	102	HTH, GP, SDT	0%	0.0	23%	23.5	20%	20.4	3.1	20.4
155	459	HTH, GP, SDT	12%	55.1	29%	133.1	20%	91.8	41.3	36.7
225	40	HTH, GP, SDT	2%	0.8	25%	10.0	20%	8.0	2.0	7.2
250	11	HTH, GP, SDT	0%	0.0	23%	2.5	20%	2.2	0.3	2.2
265	81	HTH, GP, SDT	0%	0.0	23%	18.6	20%	16.2	2.4	16.2
290	57	HTH, GP, SDT	0%	0.0	23%	13.1	20%	11.4	1.7	11.4
345*	366	HTH	2%	7.3	10%	36.6	10%	36.6	0.0	29.3
370	115	HTH, GP, SDT	0%	0.0	23%	26.5	20%	23.0	3.5	23.0
380	70	HTH	1%	0.7	13%	9.1	13%	9.1	0.0	8.4
385*	8	HTH	0%	0.0	8%	0.6	8%	0.6	0.0	0.6
410*	36	HTH	0%	0.0	8%	2.9	8%	2.9	0.0	2.9
415*	23	HTH	0%	0.0	8%	1.8	8%	1.8	0.0	1.8
420	60	HTH, GP, SDT	21%	12.6	38%	22.8	21%	12.6	10.2	0.0
430	177	HTH, GP, SDT	4 %	7.1	27%	47.8	20%	35.4	12.4	28.3
435	368	HTH, GP, SDT	5%	18.4	28%	103.0	20%	73.6	29.4	55.2
440	55	HSL, GP	12%	6.6	25%	13.8	20%	11.0	2.8	4.4
445	28	HTH, GP, SDT	17 %	4.8	34%	9.5	20%	5.6	3.9	0.8
460	174	HTH	4%	7.0	17%	29.6	17%	29.6	0.0	22.6
475	74	HTH, GP, SDT	2%	1.5	25%	18.5	20%	14.8	3.7	13.3
505	76	HTH, GP, SDT	7%	5.3	30%	22.8	20%	15.2	7.6	9.9
520	102	HSL	5%	5.1	18%	18.4	18%	18.4	0.0	13.3
525	54	HSL	3%	1.6	16%	8.6	16%	8.6	0.0	7.0
540*	30	HSL	11%	3.3	18%	5.4	18%	5.4	0.0	2.1
550	413	HTH	2%	8.3	15%	62.0	15%	62.0	0.0	53.7
565	27	HSL	11%	3.0	24%	6.5	20%	5.4	1.1	2.4
570	47	HSL	10%	4.7	23%	10.8	20%	9.4	1.4	4.7
605	17	HSL	4%	0.7	17%	2.9	17%	2.9	0.0	2.2

(1) Unit Number[1]	(2) Unit Acres	(3) Proposed Mechanical Activities[2]	(4) Existing Detrimental Soil Conditions		(5) Detrimental Soil Disturbance Associated with Management Activities[3]		(6) Detrimental Soil Conditions After Soil Restoration		(7) Restored Acres	(8) Increase in Detrimental Soil Conditions after Activity is Completed
			Percent	Acres	Percent	Acres	Percent	Acres	Acres	Acres
610	220	HTH, GP, SDT	1%	2.2	24%	52.8	20%	44.0	8.8	41.8
620	190	HTH, GP, SDT	2%	3.8	25%	47.5	20%	38.0	9.5	34.2
650	88	HTH, GP, SDT	23%	20.2	40%	35.2	23%	20.2	15.0	0.0
670	37	HTH, GP, SDT	0%	0.0	23%	8.5	20%	7.4	1.1	7.4
675	10	HTH, GP, SDT	4%	0.4	27%	2.7	20%	2.0	0.7	1.6
690	85	HTH, GP	0%	0.0	13%	11.1	13%	11.1	0.0	11.1
695*	49	HTH, GP	0%	0.0	8%	3.9	8%	3.9	0.0	3.9
740	41	HTH, GP, SDT	0%	0.0	23%	9.4	20%	8.2	1.2	8.2
755	15	HTH, GP	0%	0.0	13%	2.0	13%	2.0	0.0	2.0
756**	16	HTH, SDT	0%	0.0	13%	2.1	13%	2.1	0.0	2.1
757**	42	HTH, SDT	0%	0.0	13%	5.5	13%	5.5	0.0	5.5
765	190	HTH, GP, SDT	18%	34.2	35%	66.5	20%	38.0	28.5	3.8
785	35	HTH, GP, SDT	0%	0.0	23%	8.1	20%	7.0	1.1	7.0
790*	49	HSL, GP	0%	0.0	8%	3.9	8%	3.9	0.0	3.9
795*	103	HTH	1%	1.0	9%	9.3	9%	9.3	0.0	8.2
800*	102	HTH	0%	0.0	8%	8.2	8%	8.2	0.0	8.2
805*	96	HSL	0%	0.0	8%	7.7	8%	7.7	0.0	7.7
810*	144	HSL	2%	2.9	10%	14.4	10%	14.4	0.0	11.5
825	34	HSV, GP	0%	0.0	13%	4.4	13%	4.4	0.0	4.4
Totals Acres	**5522**			**271.3**		**1177.5**		**937.4**	**240.1**	**666**

* Denotes Cable or Helicopter Logging unit; **Denotes Partially within riparian resources; [2] HTH = Commercial Thin, GP = Grapple Piling of Fuels, HSV = Salvage, HSL = Individual Tree Selection (uneven-aged management), SDT= Small Diameter thin with Special Forest Products Opportunities; [3] Values in column 5 include total detrimental soil condition (existing condition plus result of planned activity before restoration).

Indicator #2: Coarse Woody Debris and Surface Organic Matter

Coarse Woody Debris (CWD) and Surface Organic Matter

Coarse woody debris (greater than 3 inches in diameter) is needed for biological activity and long-term nutrient cycling. Small woody material and surface litter (i.e., leaves, twigs, and branches less than 3 inches in diameter) are needed for erosion control and short-term nutrient cycling.

Commercial harvest and whole-tree yarding can affect soil productivity through the removal of nutrients in the form of tree boles, limbs and branches. Although these forest management practices remove potential sources of future CWD, ground-based harvest activities also recruit CWD to the forest floor through breakage of limbs and tops and toppling of some trees during felling and skidding operations.

In Alternative B, the removal of tree boles would have little or no effect on nutrient cycling processes during the short term. Most of the tree's short-term nutrient supply is stored in the leaves (needles), branches, and roots, and much of this would remain on-site. In the longer term, unit prescriptions, project design measures (15-25% retention) and standards and guidelines for retention of coarse woody debris (NWFP ROD C-15 and Eastside Screens) for wildlife will also provide sufficient habitat for biological activity and long-term nutrient recycling.

Indicator #3: Project Design, Management Requirements and Mitigation Measures

Project design features, management requirements and mitigation measures to protect the soil resource are identified in Chapter 2 of this EIS. All requirements would be met to ensure compliance with applicable Standards and Guidelines.

Under implementation of Alternative B, there would be 240.1 acres of soil restoration treatments that would be applied to specific units using a self-drafting winged subsoiler to loosen and stabilize detrimentally compacted soil (Table 3-8). This would be required to comply with Regional policy and Forest Plan Standards (SL-3, SL-4, and SL-6) for soil productivity.

Alternative C

Although the area to be commercially harvested in Alternative C is 1,287 acres smaller than in Alternative B, Alternative C has an additional footprint of 3,563 acres of fuel reduction activities that may include post and pole harvest of trees >6 inches diameter or slash piling using a track excavator. Use of the track excavator for slash piling may cause Alternative C to have a greater footprint on soils than Alternative B. Logging systems proposed in Alternative C are identical to Alternative B where proposed units overlap.

Access Management (Roads)
There would be no construction of permanent transportation system roads. Commercial activities would require the use of 153 miles of system roads under USDA-Forest Service jurisdiction. Approximately 44 miles of roads that are currently closed in Level 1 status would need to be re-opened. To facilitate harvest activities, maintenance activities on 136 miles of roads would be needed. Road maintenance activities includes roadside brushing, removal of hazard trees, blading and shaping of travel way, restoring existing surface drainage, cleaning culverts and ditches, and installing water bars after periods of haul. Alternative C would require approximately 6.36 miles of temporary road construction. All temporary roads would be subsoiled and restored to proper hydrologic function after the activities are completed.

Table 3-11 displays a summary of the proposed activities in Alternative C. Measurements (acres and miles) are approximate.

Table 3-11. Alternative C summary.

Commercial Harvest (acres)	
Ground-based	3,453
Skyline or Helicopter	782
Total	**4,235**
Additional Fuels Activities outside of harvest units (acres)	**3,563**
Road Management (miles)	
Temporary Roads construction	6.36
Commercial Haul	153
Road Maintenance	136
Road Re-opening	44
Soils Resources (acres)	
Current Detrimental Soil Condition	525
Detrimental Soil Condition Post-Treatment	1,294.5
Soil Restoration (subsoiling)	187.1
All activities on Sensitive Soils	684

Units where temporary road construction is needed: 75, 155, 225, 345, 370, 380, 475, 550, 670, 690, 691, 692, and 695.

Ground Disturbing Management Activities
Alternative C proposes the removal of an estimated 14.4 million board feet of trees on portions of approximately 4,235 acres. As in Alternative B, operations would also occur on relatively gentle to

moderately sloping lava plains. Mechanical harvest and yarding systems would likely be accomplished using ground-based machines equipped with a felling head (harvester shear) on 3,453 acres. Project Design Criteria are the same as discussed for Alternative B. In addition to mechanical thinning, Alternative C would accomplish 3,563 acres of fuels reduction activities in strategically placed units to coordinate with past fuel treatments. Activities would include whole-tree yarding, prescribed underburning, grapple piling, hand piling, and disposal of piles.

Currently, detrimental soil exists on an estimated 525 (6.7%) acres in the proposed activity units. There would be an increase to the total acres of detrimental soils of 769.5 (9.9%) acres. Soil compaction would account for the majority of these effects and the total amount of detrimental soil conditions would be approximately 1,482 acres prior to soil restoration activities. Subsoiling treatments would be applied to rehabilitate approximately 187 acres of detrimentally compacted soil within portions of the activity areas that will bring activity areas into with compliance regional and forest guidelines (Table 3-11).

Based on these estimates, the percentages of detrimental soil conditions following implementation of project and restoration activities would increase soil detrimental conditions above existing conditions by approximately 3.2% for a total of 9.9% in the proposed activity areas. Activities in all areas (including restoration activities) have been designed to be consistent with Regional and Deschutes LRMP standards and guidelines.

Existing skid trails and landings would be utilized to the extent possible within the commercial harvest areas, but it is expected that the creation of additional skid trails and log landings would likely cause a 7 percent increase in detrimental soil conditions. Under Alternative C, estimates of existing and predicted amounts of detrimental soil conditions associated with temporary roads and logging facilities are included in the percentages displayed for each of the proposed activity areas in Table 3-13.

Sensitive Soils

Under Alternative C, there would be activity on 684 acres of sensitive soils. As described in Alternative B, project design criteria such as advanced logging systems in units over 30 percent slope include: 80, 345, 385, 410, 415, 540, 691, 692, 693, 695, 790, and 810. In unit 415, there is a 3.46-acre area that is over 30% slope. In this unit ground-based logging systems can access this area with one or two passes up and down the slope. The following units have a small amount of sensitive soils (less than 10% of the unit area): 74 (1.8%), 85 (.27%) 371 (2.6%), 520 (<1%), 690 (4%) and 765 (1.5%). Unit 290 is classified sensitive due to frost pockets; since no tree planting has been proposed, frost pockets are not an issue and therefore advanced harvest systems are not necessary to protect the soil resource in this unit. Logging slash and fallen dead trees would provide additional ground cover that would improve the soil's ability to resist surface erosion. SRI has identified Units, 85, 370, and 691 as having seasonal high water tables or displacement. These units were field checked and no high water tables were found; therefore ground-based logging systems are acceptable on these units.

Table 3-12. Activity Areas proposed for mechanical vegetation treatments on landtypes that contain sensitive soils in Alternative C of the Five Buttes Project.

Management Concern	Total Acres	Alternatives C Units
Slopes greater than 30 percent, High Erosion Hazard	684 acres	80, 345, 385, 410, 415, 540, 691, 692, 693, 695, 765, 790, 810, 811
Low productivity sites limited by frost heaving, low fertility and climatic factors, or displacement	246 acres	65, 72, 85, 370, 371, 691, and 692

Table 3-13. Estimated effects to soil productivity for Alternative C.

(1) Unit Number[1]	(2) Unit Acres	(3) Proposed Mechanical Activities[2]	(4) Existing Detrimental Soil Conditions		(5) Detrimental Soil Disturbance Associated with Management Activities[3]		(6) Detrimental Soil Conditions After Soil Restoration		(7) Restored Acres	(8) Increase in Detrimental Soil Conditions after Activity is Completed
			Percent	Acres	Percent	Acres	Percent	Acres	Acres	Acres
5	313	SDT	20%	62.6	20%	62.6	20%	62.6	0.0	0.0
65	186	SDT	10%	18.6	20%	37.2	20%	37.2	0.0	18.6
72	45	SDT	2%	0.9	12%	5.4	12%	5.4	0.0	4.5
74	308	SDT	13%	40.0	23%	70.8	20%	61.6	9.2	21.6
75	194	HTH, GP, SDT	4%	7.8	23%	44.6	20%	38.8	5.8	31.0
76	47	SDT	25%	11.8	35%	16.5	25%	11.8	4.7	0.0
80*	77	HTH, GP	0%	0.0	8%	6.2	8%	6.2	0.0	6.2
85	175	HTH, GP	4%	7.0	17%	29.8	17%	29.8	0.0	22.8
120	130	HTH, GP, SDT	17%	22.1	34%	44.2	20%	26.0	18.2	3.9
135	168	SDT	0%	0.0	10%	16.8	10%	16.8	0.0	16.8
145	6	SDT	0%	0.0	10%	0.6	10%	0.6	0.0	0.6
155	459	HTH, GP, SDT	12%	55.1	29%	133.1	20%	91.8	41.3	36.7
225	40	HTH, GP, SDT	2%	0.8	25%	10.0	20%	8.0	2.0	7.2
226	197	GP, SDT	3%	5.9	13%	25.6	13%	25.6	0.0	19.7
227	353	GP, SDT	4%	14.1	14%	49.4	14%	49.4	0.0	35.3
250	11	HTH, GP, SDT	0%	0.0	23%	2.5	20%	2.2	0.3	2.2
265	81	HTH, GP, SDT	0%	0.0	23%	18.6	20%	16.2	2.4	16.2
345*	366	HTH	2%	7.3	15%	54.9	15%	54.9	0.0	47.6
370	115	HTH, GP, SDT	0%	0.0	23%	26.5	20%	23.0	3.5	23.0
371	76	SDT	15%	11.4	25%	19.0	20%	15.2	3.8	3.8
380	70	HTH	1%	0.7	14%	9.8	14%	9.8	0.0	9.1
385*	8	HTH	0%	0.0	8%	0.6	8%	0.6	0.0	0.6
410*	36	HTH	0%	0.0	8%	2.9	8%	2.9	0.0	2.9
415*	23	HTH	0%	0.0	8%	1.8	8%	1.8	0.0	1.8
420	60	HTH, GP, SDT	21%	12.6	38%	22.8	21%	12.6	10.2	0.0
430	177	HTH, GP, SDT	4 %	7.1	27%	47.8	20%	35.4	12.4	28.3
445	28	HTH, GP, SDT	17%	4.8	34%	9.5	20%	5.6	3.9	0.8
460	174	HTH, GP	4%	7.0	17%	29.6	17%	29.6	0.0	22.6
475	74	HTH, GP, SDT	2%	1.5	25%	18.5	20%	14.8	3.7	13.3
505	76	HSL, STD, GP	7%	5.3	30%	22.8	20%	15.2	7.6	9.9
520	102	HSL, GP, SDT	5%	5.1	18%	18.4	18%	18.4	0.0	13.3
525	54	HSL, GP, SDT	3%	1.6	26%	14.0	20%	10.8	3.2	9.2
540*	30	HSL	11%	3.3	19%	5.7	19%	5.7	0.0	2.4
550	413	HTH, GP	2%	8.3	15%	62.0	15%	62.0	0.0	53.7
565	27	HSL, GP	11%	3.0	24%	6.5	20%	5.4	1.1	2.4
570	47	HSL, GP	10%	4.7	23%	10.8	20%	9.4	1.4	4.7
605	17	HSL, GP	4%	0.7	17%	2.9	17%	2.9	0.0	2.2
610	220	HTH, GP, SDT	4%	8.8	17%	37.4	17%	37.4	0.0	28.6
620	190	HTH, GP, SDT	2%	3.8	15%	28.5	15%	28.5	0.0	24.7
650	88	HTH, GP, SDT	23%	20.2	30%	26.4	23%	20.2	6.2	0.0
670	37	HTH, GP, SDT	0%	0.0	13%	4.8	13%	4.8	0.0	4.8
671	81	HTH, GP, SDT	0%	0.0	13%	10.5	13%	10.5	0.0	10.5
675	10	HTH, GP, SDT	4%	0.4	17%	1.7	17%	1.7	0.0	1.3
676	82	SDT, GP	17%	13.9	27%	22.1	20%	16.4	5.7	2.5
677	254	SDT, GP	9%	22.9	19%	48.3	19%	48.3	0.0	25.4
678	453	SDT	8%	36.2	18%	81.5	18%	81.5	0.0	45.3
679	402	SDT	2%	8.0	12%	48.2	12%	48.2	0.0	40.2
690	85	HTH, GP	0%	0.0	13%	11.1	13%	11.1	0.0	11.1
691*	225	SDT	5%	11.3	5%	11.3	5%	11.3	0.0	0.0
692*	104	SDT	6%	6.2	6%	6.2	6%	6.2	0.0	0.0
693*	50	SDT	16%	8.0	16%	8.0	16%	8.0	0.0	0.0
695*	49	HTH	0%	0.0	8%	3.9	8%	3.9	0.0	3.9
755	15	HTH, GP, SDT	0%	0.0	23%	3.5	20%	3.0	0.5	3.0
756**	16	HTH, SDT	0%	0.0	23%	3.7	20%	3.2	0.5	3.2
757**	42	HTH, SDT	0%	0.0	23%	9.7	20%	8.4	1.3	8.4
765	190	HTH, GP, SDT	18%	34.2	35%	66.5	20%	38.0	28.5	3.8

(1) Unit Number[1]	(2) Unit Acres	(3) Proposed Mechanical Activities[2]	(4) Existing Detrimental Soil Conditions		(5) Detrimental Soil Disturbance Associated with Management Activities[3]		(6) Detrimental Soil Conditions After Soil Restoration		(7) Restored Acres	(8) Increase in Detrimental Soil Conditions after Activity is Completed
			Percent	Acres	Percent	Acres	Percent	Acres	Acres	Acres
785	35	HTH, GP, SDT	0%	0.0	23%	8.1	20%	7.0	1.1	7.0
790*	49	HSL, GP	9%	4.4	17%	8.3	17%	8.3	0.0	3.9
810*	144	HSL, GP, SDT	2%	2.9	26%	37.4	20%	28.8	8.6	25.9
811	211	GP, SDT	6%	12.7	16%	33.8	16	33.8	0.0	21.1
Totals	**7798**			**525.0**		**1481.6**		**1294.5**	**187.1**	**769.5**

* Denotes Cable or Helicopter Logging unit; **Denotes Partially within riparian resources; [2] HTH = Commercial Thin, GP = Grapple Piling of Fuels, HSV = Salvage, HSL = Individual Tree Selection (uneven-aged management), SDT= Small Diameter thin with Special Forest Products Opportunities; [3] Includes post-sale activities such as fuels management.

Cumulative Effects

This analysis has disclosed effects to the soil resource as it relates to past and present actions. In summary, 666.0 acres in Alternative B and 769.5 acres in Alternative C are the total of soils that remain in a detrimental state after soil restoration measures have been applied. These totals account for past timber harvest, access (roads), recreation trails, and proposed activities, including post-sale activities such as fuels reduction, and construction and rehabilitation of temporary roads. Effects from dispersed recreation and livestock grazing from 20-30 years ago are confined to small concentrated areas with no overlap of activity areas and therefore do not have an additive effect. There are no foreseeable future actions with potential for causing detrimental soil conditions that overlap units of activity in the Five Buttes Project area.

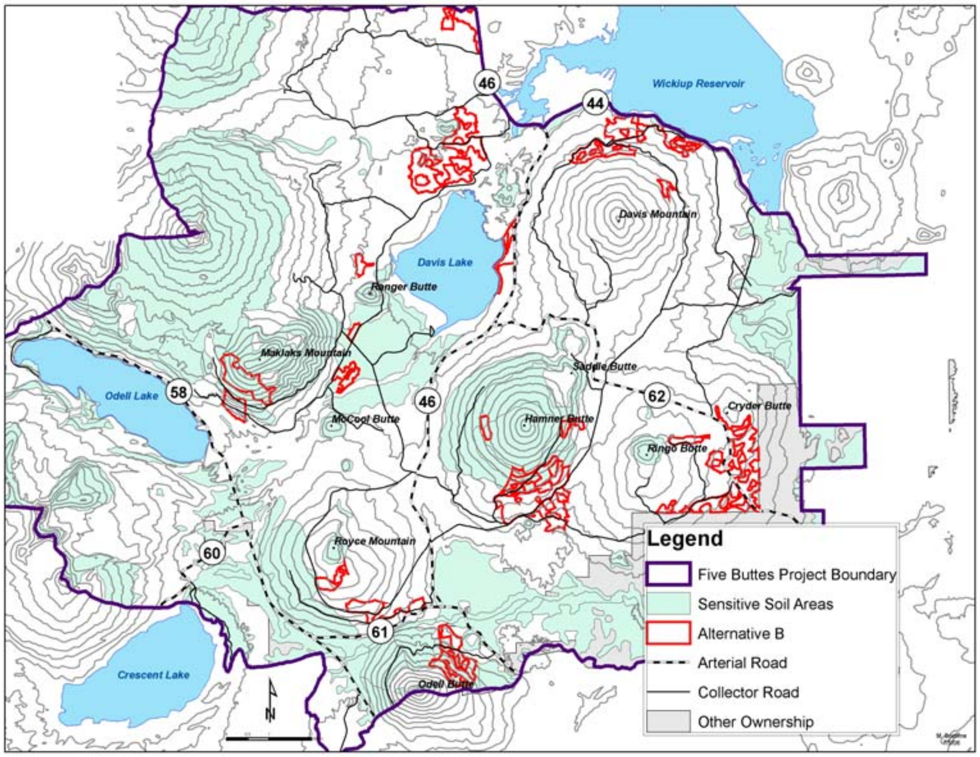


Figure 3-1. Sensitive soil areas overlaid with Alternative B.

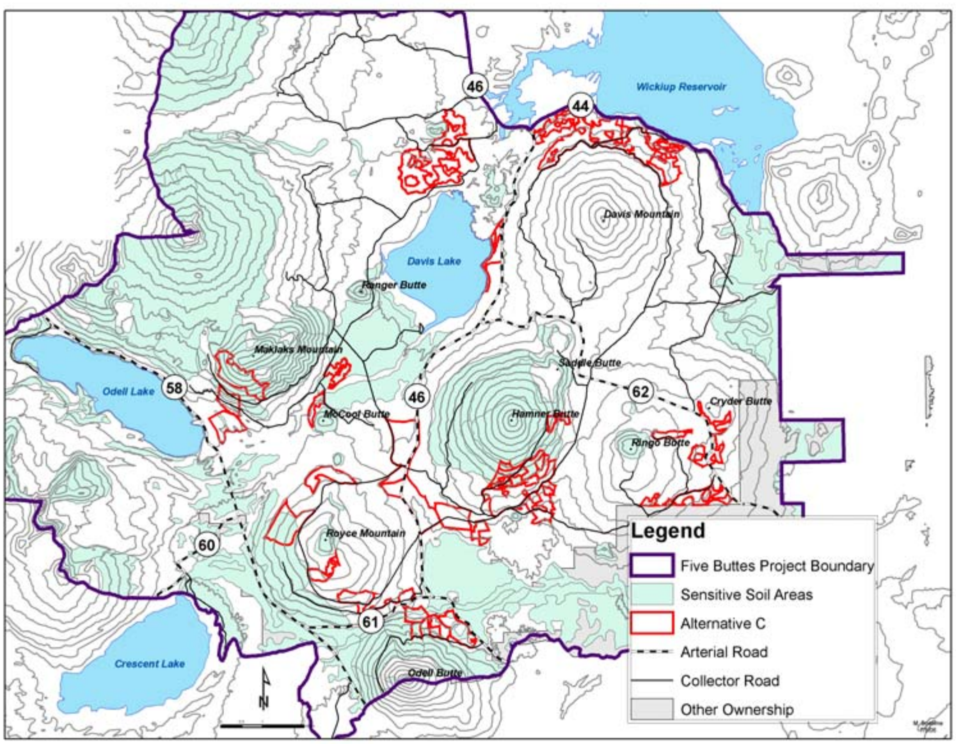


Figure 3-2. Sensitive soils overlaid with Alternative C.

Forested Vegetation

History of the Project Area

The Seven Buttes Environmental Assessment (EA) was signed on December 5, 1996, which initiated activities intended to maintain large trees and reduce the severity of loss from insects, disease, and wildfire.

The Seven Buttes Return EA was signed on July 23, 2001, and work continued towards the broad goal of maintaining/enhancing large trees and improving vegetative resilience to stand replacement events on the landscape, such as those caused by insect, disease, and wildfire. Portions of the selected alternative that had northern spotted owl nesting, roosting and foraging (NRF) habitat were deferred from a decision to allow for the US Fish and Wildlife Service to address litigation issues concerning NRF and allow time for re-consultation.

The Davis Fire started on June 28, 2003, and consumed 21,000 acres in the previous analysis areas. Activites associated with the Davis Fire Recovery Project are designed to accelerate ecosystem restoration, and timely commodity extraction.

The 2003 Davis Fire changed the conditions within the project area significantly (see the Davis Fire Recovery EIS and the updated Davis Late Successional Reserve Assessment). This analysis incorporates the changed conditions. New modeling tools enabled the interdisciplinary team to evaluate treatment effectiveness for wildfires at the landscape level.

Desired Future Condition

The Desired Future Condition (DFC) of the Forested Vegetation resource in the Five Buttes project area includes large trees dominating the landscape with adequate replacement trees of the same species growing into a large tree condition. Figure 3-3 is a post-harvest picture of a stand that has large ponderosa pine and Douglas-fir. Following management activities, this site is expected to be able to retain these trees indefinitely with the reduced competition from the understory trees. This picture illustrates the desired future conditions being targeted in the mixed conifer dry areas in the Five Buttes project area.

Figure 3-3. Typical post-harvest and post-sale vegetative structure where low intensity thinning is the goal (Goose Timber Sale).

Existing Condition

The vegetation on this basin and butte dominated landscape varies considerably with elevation and topographic features. Generally, the buttes are stratovolcanos and cindercones. Vegetative types are described in Table 3-14.

Table 3-14. Landforms and vegetation types in the Five Buttes project area.

LANDFORM	VEGETATIVE DESCRIPTION
Flat basins	Lodgepole pine dominates these landscapes. If moisture is available on or near the surface, Engelmann spruce may also be present.
Ridges and uplifts of just a few feet on drier sites	Ponderosa pine dominates this portion of the landscape. Lodgepole pine and occasional Douglas-fir or true fir are often present in varying amounts.
Slopes of taller ridges and the sides of the buttes below about 5500 feet in elevation.	Overstories are dominated by ponderosa pine and, in some areas, Douglas-fir. Other species that may be present in these overstories, but at lower frequencies are the true firs, sugar pine and western white pine. Understories are dominated by true firs and lodgepole pine. The overstory species are usually quite infrequent or are very suppressed in these understories.
Sides of buttes above about 5500 feet in elevation.	Shasta fir, mountain hemlock, and western white pine dominate the overstories of these stands. Other species, such as ponderosa pine, sugar pine, and occasional Douglas-fir may also be present in these overstories. Lodgepole pine, mountain hemlock, and western white pine dominate these understories. Drier south-facing slopes and disturbed areas may be dominated by lodgepole pine in the overstories.
Tops of buttes and areas over about 6000 feet in elevation.	Mountain hemlock, western white pine, and lodgepole pine dominate these overstories. Subalpine fir may also be present in some areas, especially near timberline. Large areas of root rot (*Fomes annosus*, annosus root rot) are commonly present in stands dominated by mountain hemlock. Lodgepole pine and western white pine are the primary pioneer species in disturbed areas and root rot pockets in this landform.

Descriptions of the current vegetative condition are grouped by plant association groups, or PAGs. The plant associations have been evaluated for common characteristics and grouped together to form the PAGs (Deschutes National Forest Silviculture Meeting, February 22, 1996). A very brief description of each PAG begins each section.

LPD – Lodgepole pine dry (30,307 acres and 19% of area); characterized by stands dominated by lodgepole pine in some of the dryer, lower productivity plant associations. These are by far the majority of lodgepole pine stands on the project area. This also includes some areas, usually over 6,000’ in elevation, which are characterized by short, cool growing seasons where other species have difficulty becoming established.

- Vegetation is characterized by lodgepole pine dominating the conifer component, and bitterbrush, ceanothus, and/or greenleaf manzanita dominating the shrub component.
- The regenerated stands tend to be very dense with natural regeneration often supplementing any planted trees to the point where several thousand trees per acre may be found.
- During the decade of the 1980s the western pine beetle (*Dendroctonus ponderosae*) outbreak killed most of the LPD overstories throughout much of Central Oregon. Thousands of acres of salvage activities in these stands have been completed since then, but some areas in the project area remain in a passive management scenario to benefit wildlife or where fuels reduction activities are not needed or feasible. These areas are characterized by “jackstrawed” remains of

the fallen overstory trees, remaining overstory trees usually less than 8" dbh and most often with very poor crowns, and by dense natural regeneration from the residual overstory trees.

- In areas where salvage activities have been implemented, remaining overstory trees are usually less than 8" dbh, most often with very poor crowns, and dense natural regeneration from the residual overstory trees. Less of the down dead material remains on these sites.

LPW – Lodgepole pine wet (5,588 acres and 4% of area); characterized by stands dominated by lodgepole pine in some of the moister, higher productivity plant associations, typically near streams or wet areas.

- Vegetation is characterized by lodgepole pine dominating the conifer component, often with Engelmann spruce present in areas with surface moisture or readily available sub-surface moisture.
- Ground vegetation is characterized by sedges, grouse huckleberry, and various herbs and forbs associated with wetter sites.
- The regenerated stands tend to be very dense with natural regeneration to the point where several thousand trees per acre may be found.
- As in the lodgepole dry, western pine beetle (*Dendroctonus ponderosae*) outbreak killed most of the overstory. Most of the wet lodgepole pine areas in the project area remain in a decadent condition to provide for riparian-dependent resources, and where few practical methods exist to actively manage the site. These areas are frequently characterized by "jackstrawed" remains of the fallen overstory trees, remaining overstory trees usually less than 12" dbh, most often with very poor crowns, some areas with Engelmann spruce of 14-30" dbh, and dense natural regeneration from the residual overstory trees.
- In the very few areas where salvage activities have been done, remaining overstory trees are usually less than 12" dbh, most often with very poor crowns, and dense natural regeneration from the residual overstory trees. Less of the down dead material remains on these sites.

MCD – Mixed conifer dry (60,971 acres and 39% of area); these stands are typically located on the slopes of ridges and buttes ranging from about 4500 feet to over 6000 feet in elevation. Stands are dominated by a variety of conifer species, but in untreated areas generally ponderosa pine and sometimes Douglas-fir are the dominant, oldest overstory species. Prior to fire exclusion in the project area, these stands appeared to have frequent fire regimes.

- Ponderosa pine and, in some areas, Douglas-fir and in other areas sugar pine, comprise the oldest and usually the largest trees in the overstories of these stands. Fire scars, scorched bark, and scattered charcoal on the ground are very common on these sites.
- Mid and understories are dominated by lodgepole pine and/or true firs with only isolated/occasional viable other species. Most of these trees range from several decades to about 120 years old.
- Few healthy or viable ponderosa pine or Douglas-fir are found in the understories of these stands.
- Down and dead lodgepole pine is a common component of these stands.
- These are typically the stands that provide the bulk of the current and potential Nesting, Roosting and Foraging habitat for the Northern spotted owl in this project area.
- Typically, the fire return interval has most often missed several cycles.

MCW – Mixed conifer wet (1,301 acres and <1% of area); these stands are typically located on the slopes of ridges and buttes ranging from about 4500 feet to over 6000 feet in elevation and where moisture is more readily available to the trees. Stands are dominated by a variety of conifer species. Prior to fire exclusion in the project area, these stands appeared to have less frequent fire regimes than the mixed conifer dry.

- Ponderosa pine and Douglas-fir are common, but the true firs are among the oldest and usually the largest trees in the overstories of these stands. Fire scars, scorched bark, and scattered charcoal on the ground are occasionally evident on these sites.
- Mid and understories are usually dominated by the true fir in dense, pole-sized thickets. Lodgepole pine is a common component of the mid and understories of these stands as well.

- At the higher elevations, the true firs are dominated by Shasta red fir. Grand fir/white fir dominates the mid and lower elevations. Douglas-fir is common as is ponderosa pine, but both are definitely subordinate in number of trees to the other species. Isolated mountain hemlock is also present in many of these stands.
- No activities are proposed in any portions of this PAG.

MHD – Mountain hemlock dry (31,651 acres and 20% of area); most often found above about 6,000 feet in elevation, these stands are characterized by common presence of mountain hemlock with Shasta fir, western white pine, and lodgepole pine intermixed.

- Root rot pockets (laminated root rot, *Phellinus weirii*) are common in these stands. Where such pockets have existed for more than a couple of decades they are characterized by western white pine, lodgepole pine, and dense mountain hemlock regeneration. The pines are more resistant to the root rot than the mountain hemlock. The mountain hemlock tends to grow two or three decades, then succumbs to the root rot. These pockets tend towards increasingly heavy fuel loads as the trees die and fall over.
- Areas outside of root rot pockets tend to be dominated by mountain hemlock or lodgepole pine. Mountain hemlock is usually of similar age, since these areas have a fire regime of several centuries without fire followed by large scale stand replacement fires (Agee, p.253-254, 1993, Dickman and Cook, Can. J. Bot Vol 67, p.2005-2016, 1989). Lodgepole pine is an aggressive invader in disturbed areas and may dominate near a lodgepole pine seed source.
- The smaller mountain hemlock areas on the tops of buttes tend to be more mixed with other species than those larger stands along the crest of the Cascade Range.

PPD – Ponderosa pine dry (9,577 acres and 6% of area); these stands tend to be on the lower slopes of both the Cascade Range and the stratovolcanic buttes in the area. At the present time, few of these stands consist of purely ponderosa pine since the lodgepole pine has aggressively invaded many of these stands since fire exclusion so lodgepole pine regeneration outnumbers the ponderosa pine. Most of these stands are in close proximity to lodgepole pine stands.

- Overstory trees in these stands are 200 to 400 years old, and are generally ponderosa pine but may also include Douglas-fir. Fire scars are common. Dwarf-mistletoe, western pine beetle, and wildfires are the common disturbance agents affecting these trees.
- Understory trees are ponderosa pine, with lodgepole pine often outnumbering them. The dense stands of ponderosa pine regeneration can often stagnate rather than show much competition-induced mortality. Personal observation in these areas show individual trees five to ten feet tall may have only a few tufts of needles on the ends of branches, be one inch or less in diameter at the base, and be 80 to 100 years old.

PPW – Ponderosa pine wet (5,806 acres and 4% of area); ponderosa pine stands with higher levels of woody biomass growth per acre distinguish these stands from the dry group, probably due to higher available moisture levels. These are very similar to the PPD but tend to have denser ponderosa regeneration than the ponderosa pine dry areas. These stands also tend to have more intermediate trees in the canopy and more healthy trees in the regeneration.

- Overstory trees in these stands are 200 to 400 years old and are generally ponderosa pine but may also include Douglas-fir. Fire scars are common. Dwarf-mistletoe, western pine beetle, and fires are the common disturbance agents affecting these trees.
- Understory trees are most often dominated by ponderosa pine, with lodgepole pine and isolated other species often present. The dense stands of ponderosa pine regeneration can often stagnate rather than show much competition-induced mortality, but usually have more frequency of mid and understory ponderosa pine that is healthy and growing well.
- Typically, the fire return interval has most often missed several cycles.

Conditions common to all PAGs are as follows:

- Clearcuts and shelterwood regeneration cuts are common in all but the high elevation PAGs of MH and LPD. These are typically stocked with ponderosa pine in PP and MC PAGs, with lodgepole pine in the LP PAGs, and are mostly twenty years old or more.
- Many of the regenerated stands have thinned small trees with varying degrees of slash removal or piling completed. The common approach to these treatments is to retain at least 5% in an unthinned condition for wildlife purposes.
- Stumps of trees cut in the 1950s are common on most PP and MC areas that didn't have regeneration cuts. Generally, these were ponderosa pine cut to meet the Keen's Risk Tree Classification (Miller and Keen 1960) based on age and vigor, to remove the trees most highly susceptible to western pine beetle (*Dendroctonus occidentalis*).
- During the 1970s it was common in this area to fall large dead trees (snags) and leave them lay. This was done to reduce the potential for lightning-caused fires since the thinking of the day was that these large snags could attract lightning similar to a lightning rod. This most often was done to the largest and oldest snags since they could be spotted from a distance and generally were the taller trees in the stands; such trees were the result of endemic bark beetle activity in these stands as they rapidly became overstocked. These downed logs are often still in place as category 3 and 4 logs.
- Shrubs are common in disturbed areas on most of the sites. In the dry lodgepole pine and ponderosa pine, bitterbrush is a common shrub that can eventually dominate the ground vegetation until shaded out by a closed canopy of conifers. Snowbrush ceanothus and greenleaf manzanita are common in the mixed conifer dry and ponderosa pine wet stands. Golden chinquapin is also a common shrub in some of the higher productivity areas. Upland willow can be found in some mixed conifer areas, especially on north slopes of the buttes. Competition of shrubs with conifer regeneration is generally not of concern since as the conifers grow, they tend to shade out the brush. The biggest concern for conifers in brushy areas is from fire since the conifers typically grow right up through the canopies of the brush.
- Most bark beetles attack trees that are larger than 6" dbh and more than 80 years old, especially in dense stands. "…occasionally, beetle populations become so large that an epidemic results. This is especially common in large areas of mature trees in overdense stands. By controlling tree density, trees and stands become less susceptible to beetle attack." Historic outbreaks of bark beetles have killed lodgepole and ponderosa pine on hundreds of thousands of acres; this occurred in central and southern Oregon in the 1980s. For several forest management objectives, bark beetle outbreaks should be prevented (Emmingham et al, 2005).
- Conifer diseases are endemic on the landscape and include dwarf mistletoes, root rots, and rusts. These do not currently pose significant threats of epidemic (broad scale) problems with the exception of the white pine blister rust *(Cronartium ribicola)* which has significantly affected the five-needled pines throughout the western states. The five needled pines in this project area include western white pine, sugar pine, and some white bark pine at higher elevations.
    - The dwarf mistletoe species *(Arceuthobium spp)* infect the ponderosa and lodgepole pines, Douglas-fir, and the true fir species. At higher elevations, mountain hemlock is also infected. For all species, the infection centers tend to vary in intensity and all but the most heavily infected areas can usually be effectively managed to meet objectives by thinning and favoring non-host species.
    - Armillaria root rot *(Armillaria ostoyae)* is present in portions of the mixed conifer and ponderosa pine stands scattered around the project area. Pines and Douglas-fir tend to be more resistant to this root rot than the other species and can continue to survive in the presence of the disease if water and nutritional needs are being met.
    - Laminated root rot *(Phellinus weirii)* is present on significant portions of the higher elevation mountain hemlock forests. Management activities in these areas would exacerbate the problems there, but no management activities are planned for these areas.
    - Needle blight *(Elytroderma deformans)* is common in moist areas such as the shorelines of Davis Lake. Needle blight results in needle loss and death of branch cambium. Severe

infections result in growth loss and potentially deformation of the entire tree canopy. The infection at these levels may weaken the trees, predisposing them to attack by bark beetles or may kill the tree outright (Goheen et al, 2006).

Current Vegetative Trends

Vegetative structure is very dynamic. A given piece of ground, or site, will steadily keep growing a certain amount of vegetation each growing season. This is referred to as site potential. One way site potential is measured is in cubic feet of woody material (biomass) of growth per year. The amount varies from site to site due to differences in the ability to provide the nutrients, water, light, and temperatures needed for productive growth of woody vegetation.

While the amount of growth may vary from site to site, the structural development, called forest stand dynamics, is fairly predictable. Empirical measurements of vegetative growth and structure (stand exams) are used in combination with personal knowledge of stand dynamics and current vegetative conditions to assess the trends in vegetative structure and species composition.

The dynamics of forest stands include a variety of disturbance agents such as fire, insects, floods, and human management activities. These agents can alter the structure of the vegetation by changing the mix of sizes and/or the species present on the site. Such events may have both short and long-term effects to the vegetation and its function/role in the ecosystem.

The trends in vegetative structure in the project area were identified and addressed in both the Odell Watershed Assessment (revised in 1999) and the Davis Late Successional Reserve Assessment (Davis LSRA) 2006. The three primary areas of concern for the conifer vegetation are:

- *Retention of large trees on the landscape.*
- *Development of replacement trees as large trees inevitably are lost from the landscape.*
- *Resilience of forest stands to disturbance agents (insects and fire).*

In general, the areas of concern focus on the mixed conifer and ponderosa pine PAGs. The other PAGs in the project area are typically within the fire condition class for their relevant fire regimes and the trend is not towards uncharacteristic loss of large trees. However, the mixed conifer and ponderosa pine PAGs have reached conditions well outside of their historic fire condition class where we expect they will continue to see increasing uncharacteristic losses of the large tree components. Table 3-15 summarizes the conditions of PAGs in the project area.

Many floral and faunal species depend on late and old forested conditions, which include large trees. Once the large trees are gone, it may take several centuries to replace them.

Table 3-15. Summary of PAG condition in the Five Buttes Project area.

PAG	Large Tree Retention	Large Tree Replacements	Resilience to Disturbance	Time Period of Relevance
LPD	Not applicable - normal cycle is for overstory replacement to occur as overstory trees reach 8" dbh and larger and begin to experience competition-induced mortality from mountain pine beetle.	Replacements of lodgepole pine overstory are common in most stands unless disturbance agents persist.	This PAG is characterized by disturbance, often at moderate stand replacement levels. Rapid and dense regeneration often follows disturbance.	• This PAG can cycle from stand replacement disturbance through regeneration, development, maturation and back to stand replacement in 60-80 years (Agee 1993). • High elevation areas may have longer fire cycles than basin areas (Dickman and Cook, Can. J. Bot Vol 67, p.2005-2016, 1989).
LPW	Stands in this PAG are often associated with riparian areas; large trees in this association are typically Engelmann spruce.	Currently not lacking in mid and understory spruce trees on these sites.	Similar to LPD but with the spruce component.	Similar to LPD but cycles are potentially longer due to the moister environment.
MCD	• Fire suppression combined with little or no management activity has put the large trees at risk. • Overstory trees are predominantly ponderosa pine with some Douglas-fir and sugar pine in portions of the landscape. • Severe competition with understory true fir and lodgepole pine has made the overstory trees highly susceptible to bark beetles.	• The extremely dense mid and understories of these stands are almost exclusively composed of true fir and lodgepole pine. • The few ponderosa pine and Douglas-fir in the mid and understories are severely suppressed with little potential to respond to release from competition and grow to dominant overstory size.	• Without replacement trees of the same species these overstory trees could not be replaced for several centuries. • With such high mid and understory densities these stands will lose the overstory trees in the event of fire or insect infestations greater than endemic proportions. • Three centuries or more would be required for these stands to return to their present condition and structure after a disturbance event.	• **Short term (Now-20 yrs):** These stands provide important wildlife habitat but the critical components of that habitat could be lost in a very short time period, i.e. one fire event. • **Long term (20 yrs plus):** These stands will lose most or all of their large tree components and will continue to move to small tree dominated stands at least until a stand replacement event occurs. Loss of large trees will continue at random levels ranging from few to most or all of the trees.
MCW	The very few stands of MCW in this project area are on the dryer end of the MCW spectrum and are very similar in characteristics and risks as the MCD stands. These do tend to have a few more true fir in the overstory than the MCD.	Same as MCD.	Same as MCD.	Same as MCD but may have a slightly longer short-term period by a decade or so.
MH	Not really a factor in this PAG as the normal cycle is for overstory replacement events from fires every few-to-many centuries. This PAG is well within its normal fire regime.	The stands in this PAG tend to be single cohort stands dominated by mountain hemlock, so replacements are common. Fire events tend to be stand replacing events, so the cycle just starts over again.	While lodgepole pine and western white pine are common invaders on disturbed sites, the mountain hemlock usually begins to dominate again after a century or so.	While the next disturbance event is not predictable in time, it is predictable in fact. The cycle for these stands seems to range from 200 to 1000 years or more (Dickman and Cook, 1989).

PAG	Large Tree Retention	Large Tree Replacements	Resilience to Disturbance	Time Period of Relevance
PPD	Fire exclusion and minimal management activity has allowed for heavy in-growth of midstory and understory trees. The increased competition is making bark beetle-killed overstory trees more and more common. Conditions are becoming favorable to allow increasingly severe overstory loss to insects.	Although some stands have very high levels of lodgepole pine in them, most stands have adequate numbers of replacement trees of the same species. However, many of these replacements are suppressed enough to impair their ability to respond to release.	• Loss of the large trees to bark beetles is stochastic. Replacements of the large trees could take centuries. • Fire events would most likely be moderate to severe due to the density of the stands and the propensity to crown fires.	• **Short term (Now-20 yrs):** These stands provide important wildlife habitat, but the critical components of that habitat could be lost in a very short time period, i.e. one fire event. • **Long term (20 yrs plus):** These stands will lose most or all of their large tree components and will continue to move to small tree dominated stands at least until a stand replacement event occurs. Loss of large trees will continue at somewhat random levels ranging from few to most or all of the trees.
PPW	Same as PPD.	Same as PPD but with more ponderosa pine available in mid and understories.	Same as PPD.	Same as PPD.

Historic Range of Variability

Current thinking on historic range of variability is that it might more appropriately be called natural range of variability or reference condition. For this project, it will be referred to as reference condition; vegetation, disturbance regimes, and environmental conditions that are minimally altered by 20th century management activities, but may reflect patterns or conditions resulting from interactions of aboriginal peoples with their environments (Hessburg, Smith and Salter, 1999).

It is important to assess reference conditions to help define appropriate baselines for vegetative conditions on the landscape. While in most cases we may not desire to “go back” to those reference conditions, they are useful to help evaluate conditions that are assumed to be sustainable, given minimal climate and geologic changes. In an ecosystem, the potential for survival of any given species may be diminished if temporal and spatial patterns of their habitats shift outside a natural range of variation, especially if shifts occur too quickly to allow adaptation or migration. Managing ecosystems within a reference condition has been forwarded with appropriate caution as a scientifically defensible approach to conserving native species diversity and ecosystem processes (Hessburg, Smith and Salter, 1999).

Long Term Climate Changes

> **This project is designed with the intent of keeping portions of all of the current species and structures on this landscape.**

A brief discussion of the effects of long term climate changes is beneficial only from the perspective of this project area. 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), the vegetation would still continue normal respiration processes and effects to CO_2 would be expected to be inestimable on a local, regional, national, and global scale.

Stand examinations of the proposed units in the project area indicate some of the oldest trees are 250-500+ years old. The range of species 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). Even though speculations of significant global warming exist and have been a common media topic of late, the current climate limits what can be done with forest trees at this 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 project area. Some of the species in the project area, such as the pines, are well adapted to warm dry growing seasons, while other species do well in cool wet conditions. Hence, regardless of the climatic changes, a full suite of species remaining on the project 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 don't know the direction, effects, and magnitude of the climatic changes of the future as they pertain to this project 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).

Environmental Consequences

Discussion of effects of proposed management activities will be by alternative and will be in the context of the proposed activities as they relate/pertain to the items associated with conifer vegetation as presented in the purpose and need stated in Chapter 1 of this EIS. Specifically, the alternatives will be discussed from the following perspectives with relevant time periods and/or special bounds addressed:

- **Large scale loss** of forests, especially the **large tree** components.
- Use of silvicultural treatments to **maintain and reduce risk of loss of existing late and old structured** stands.
- Apply vegetative treatments that **favor pines and Douglas-fir** to reflect historic resiliency to disturbance events.

A table summarizing this information follows the discussion by alternative.

Alternative A (No Action) Description: This alternative would have no change from current direction and activities in the project area. No new thinning or harvest activities would be proposed with this analysis, and no change from current activities would be considered. Conifer vegetation trends would be expected to continue with stand replacement events expected to increase in potential to become more frequent and larger in scope than at present.

- A passive management scenario would be implemented and fire suppression associated successional processes would continue.
- Dense, multistoried late successional and old forest that used to exist in spatial isolation would continue to exist in a condition of continuous multistoried and densely stocked patches, and thus wildfires, insects, and pathogens can spread quickly and easily.
- In the absence of fire, most mid-elevation, dry, mixed-coniferous forests would continue to develop into densely stocked, multistoried forests that provide spotted owl habitat. However, as the density of the stands increases, the risk of bark beetles killing the large trees suitable for nesting would also increase to the point where suitable nest trees could become very rare on the landscape.
- **Large scale loss of forested stands, including the large trees** would be expected to continue with this alternative in areas without thinning activities. Large areas of dense, contiguous stands would remain susceptible to large tree loss from bark beetles and/or fire. Replacement trees for the overstory species would continue to be uncommon and replacement trees existing now would become increasingly limited in ability to respond to release as time goes by. As evidenced by the 21,000 acre Davis Fire in 2003, approximately 75% of the area experienced a moderate to high intensity burn resulting in a stand replacement event. Most of the highest effect to vegetation occurred in the mixed conifer. High intensity burn areas are considered 100% mortality and revert to stand initiation stage. Within moderate intensity burn areas, the same is considered true except for the ponderosa pine vegetation type where there are large trees in the overstory. After three years of monitoring, many of the few surviving overstory trees in these stands that experienced a moderate intensity burn, have died.
- **Maintenance of late and old structured stands** would not occur since large trees would continue to be lost to beetles and/or fire, replacements would be few, and stands would transition towards

pole-sized stands dominated by true fir and lodgepole pine. Only stands that have had active management would have some level of large tree resilience and fire resistance. Because of the continuity of fuels, under problem fire conditions, wildfire would likely be uncharacteristically severe, stand replacement, and would probably affect large areas of several thousand acres or more like the Davis Fire did.

- Application of vegetative treatments that **favor pines and Douglas-fir** to reflect historic resiliency to disturbance events would not be met with this alternative. Stands currently dominated by pines and Douglas-fir in the overstory would continue to see development of true fir and lodgepole pine in the understories contributing to competition and mortality of the overstory trees.

Alternative B (Proposed Action) Description: This alternative proposes stands that were originally proposed in the Seven Buttes Return Environmental Assessment Decision B records. These were mostly units that contained a predominance of nesting, roosting, and foraging (NRF) habitat suitable for the northern spotted owl. The Davis Fire changed the conditions of the analysis before a decision was formalized, so the proposed units became the basis for the proposed action for this analysis. The intent of the management actions associated with these units was to set the "successional clock" back in time to the point where, although no longer considered suitable as NRF, the overstory in these stands would be somewhat fire and insect resilient and would be anticipated to still provide at least dispersal structure, along with some areas still providing foraging as well.

While fire was considered in the development of this alternative, the Davis Fire had not yet happened, so a fire on such a scale was not seriously considered. Hence, as analysis of this alternative began, and as the project was chosen as one of the national fuels pilot (SPOT) projects, additional strategies were employed to improve the influences of management of fuels on the potential fire dynamics of this landscape.

- **Risk of large scale loss** of forests, especially the **large tree** components would be second lowest with this alternative as measured by acres thinned and with fuels reduction activities (also see the section titled "Fire and Fuels" in Chapter 3 of this EIS).
- The acres thinned with a merchantable (8" and larger) component would be highest with this alternative (5,522 acres) resulting in large trees retained on the sites that are more resistant to insect attack.
- Use silvicultural treatments to **maintain and enhance existing late and old structured stands**. Since this alternative has the most acreage (5,522 acres) with vegetative changes with thinning and fuels treatments, this alternative would enhance the second most acres directly. Maintenance of existing conditions, though immeasurable at this time, is intuitively second highest with this alternative.
- Apply vegetative treatments that **favor pines and Douglas-fir to reflect historic resiliency** to disturbance events. This alternative has the most acres of comprehensive vegetative and fuels treatments (5,522 acres), so it ranks first among all alternatives for meeting this purpose.

Alternative C Description: This alternative was developed after a careful, strategic look at the proposed action from the perspective of the dynamics of a problem fire on the landscape and its effect on critical areas of interest, most notably the home ranges of northern spotted owls on the landscape. Hence, additional areas of fuels treatment were added to address ground and ladder fuels, and other areas were dropped that were considered strategically insignificant to meeting the purpose and need.

- **Risk of large scale loss** of forests, especially the **large tree** components would be lowest with this alternative as measured by acres thinned and with fuels reduction activities (also see the section titled "Fire and Fuels" in Chapter 3 of this EIS).
- The acres thinned with a merchantable (8" and larger) component would be second highest with this alternative (4,234 acres) resulting in large trees left on the sites that are more resistant to insect attack and more effectively protected from wildfire events. Dropping some of the areas with NRF that were proposed for commercial entry proposed in Alt B potentially affects the ability to retain large trees on those sites in the event of bark beetle activity, even though the strategic placement of fuels treatments would reduce the risk of loss to fire from adjacent areas.

- Use silvicultural treatments to **maintain and enhance existing late and old structured stands**. Since this alternative has the most acreage (7,798 acres) with vegetative changes with thinning and fuels treatments, this alternative would enhance the most acres directly. More strategic placement of the fuels associated vegetation treatments in this alternative has the most potential to effectively protect/isolate additional areas of untreated vegetation. Maintenance of existing conditions, though immeasurable at this time, is intuitively highest with this alternative. By not thinning and treating some of the key NRF that was included in Alternative B, this alternative leaves more large trees at risk to insect attack than Alternative B.
- Apply vegetative treatments that **favor pines and Douglas-fir to reflect historic resiliency** to disturbance events. This alternative has the second most acres of comprehensive vegetative and fuels treatments (4,234 acres), hence it ranks second among all alternatives for meeting this purpose.

One method of determining whether vegetative thinning is adequate for reducing risk to insect problems is by using basal area of stems as an indicator of the density of the forested stands. Figures 3-4 and 3-5 show the results of modeling current condition and post treatment basal areas for stands in each alternative. The evaluation target is the basal area above which we seek to find the factors why the basal area is higher with ponderosa pine as the target species. In Alternative B, the stands that are higher have a target species mix more of Douglas-fir or true firs. In Alternative C, there are also stands with no commercial harvest, so they remain at higher basal areas as well. Hence, proposed basal areas after harvest will have commercially thinned stands at low risk of large scale insect attack. The exceptions noted for Alternative C will still be at risk.

Summary of all alternatives (see Table 3-16. Also see Figures 3-7 - 3-9 for "before" and "after" photographs of stands similar to those in the project area):

- Areas with commercial thinning and follow-up activities would be thinned to densities that are deemed to be resistant to large-scale loss of large trees to insects and disease. Hence, the more acres thinned, the more resistant areas on the landscape.
- Areas with only fuels treatments and/or small tree thinning/removal would remain at densities that are susceptible to large scale loss of large trees to insects and disease. Hence, the increase in fuels treatments is expected to change the risk of loss to wildfire, but the risk of loss to insects and disease remains unchanged with these treatments.
- Unlike predicting fire risk, severity of the large-scale loss of large trees is impossible to predict for insects in overstocked stands. Infestations are very stochastic in nature with a wide variety of climatic and other environmental conditions that can alter the intensity of the insect outbreaks.
- There is no strategic landscape-level effectiveness to minimize spread of insect activity. Even isolated stands of susceptible densities can be severely impacted by beetles because of their mobility. Hence, only acres where densities are considered below UMZ are considered to be resistant to large scale loss to insect activity.
- Loss of late and old structures (LOS) differs from the loss of large trees in that it also includes the loss of intermediate and small trees that can contribute to a multi-storied condition favorable to some floral and faunal species. Loss of large trees remains a concern here, but so does the loss of the intermediate and lower canopy structural elements. Selective thinning in these stands can effectively favor the right species and size classes to contribute to these structures in the long term. Hence, the stands planned for multi-storied thinning objectives currently have the right species components in the structure and would remain as LOS after thinning. They would be expected to continue as LOS until future natural or human-induced vegetative changes occur.
- The emphasis of concern on loss of large trees in any of these discussions is due to the very long amount of time it takes to replace these components, usually several centuries. Hence, for the short and long term, these could not contribute to the live tree structural elements of habitat if lost in the short term.
- Maintenance/enhancement of ponderosa pine and Douglas-fir would require disturbance agents to provide opportunity for overstory replacement trees to establish. Hence, some form of reduction in the mid and understory canopy components would be needed to allow for establishment and growth of these early seral species.

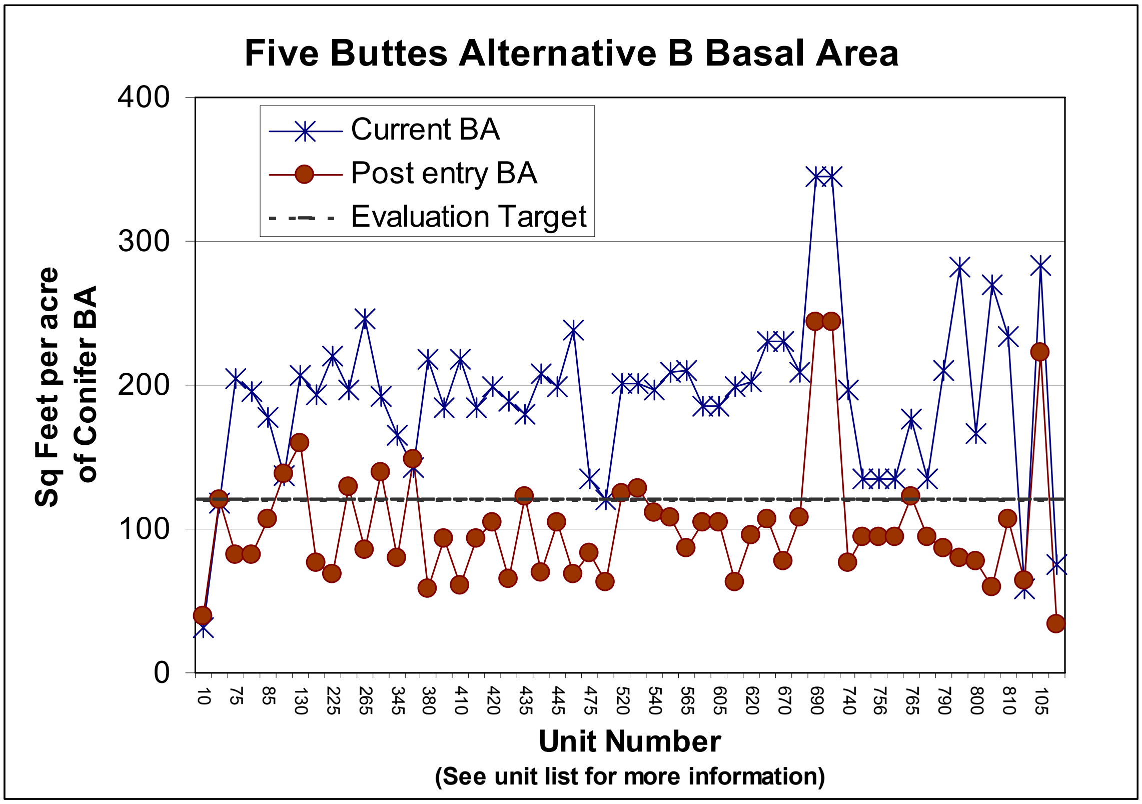


Figure 3-4. Comparison of post-treatment basal area in Alternative B with existing condition.

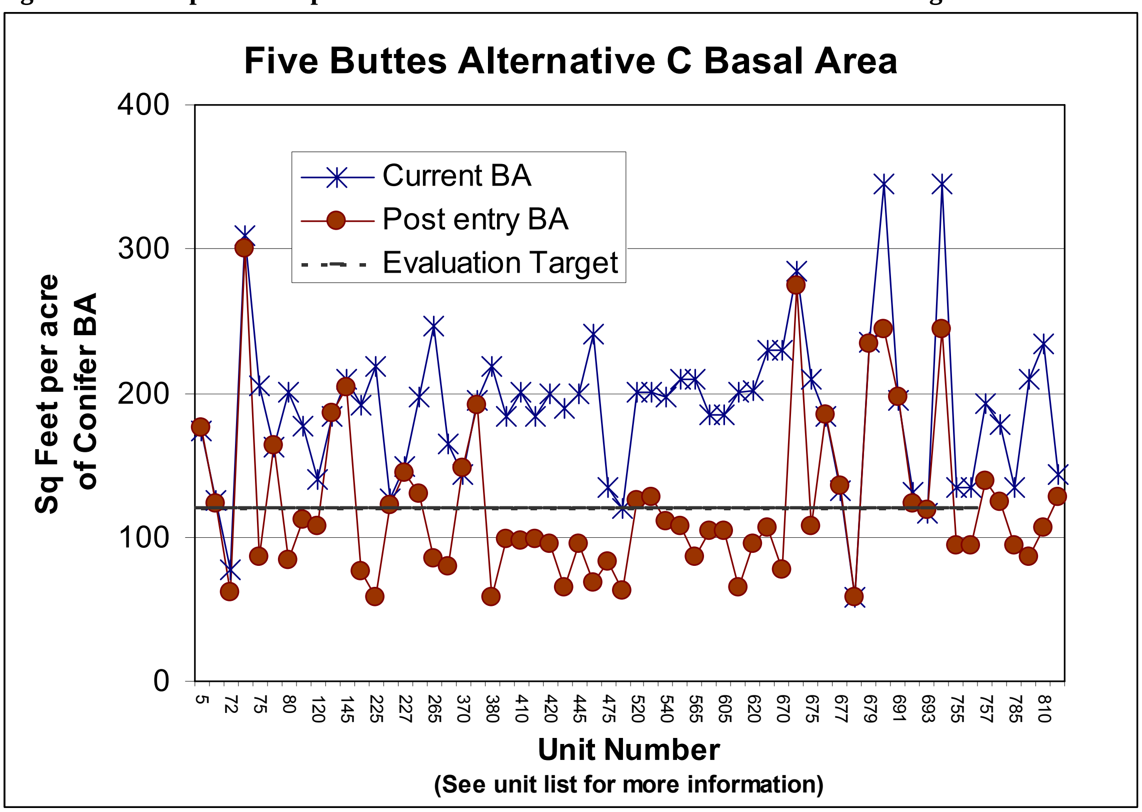


Figure 3-5. Comparison of post-treatment basal area in Alternative C with existing condition.

Table 3-16. Effects on vegetative components of the Five Buttes project area.

Vegetative Component	Alternative A	Alternative B	Alternative C
Loss of large trees	• No change from present risk of loss.	• 5,522 acres would be at reduced risk to insects and disease.	• 4,234 acres would be at reduced risk to insects and disease.
Loss of late and old structured stands.	• No change from present risk of loss.	• 4,311 acres would be thinned with risk of loss reduced.	• 3,546 acres would be thinned with risk of loss reduced.
Maintenance/enhancement of ponderosa pine and Douglas-fir	• No change from present risk of loss.	• 5,522 acres would be in conditions favorable for the establishment and maintenance of these species.	• 4,234 acres would be in conditions favorable for the establishment and maintenance of these species.

Cumulative Effects

Past and present actions were included in the discussion of direct and indirect effects to forested vegetation. The zone of influence is the 160,000-acre Five Buttes project area. There are no foreseeable future actions that overlap this zone in space or time, so there is no potential for additive effects to forested vegetation. For a discussion of the cumulative effects to Nesting, Roosting and Foraging habitat on the Forest level, reference the section titled "Threatened and Endangered Species: Northern Spotted Owl" in this EIS.

Figure 3-6. A mixed conifer dry stand suitable for nesting, roosting, and foraging. No human-caused vegetative changes have happened here for decades. Note that the small tree in the lower right corner is estimated at about 100 years of age.

Figure 3-7. A mixed conifer dry stand after completion of the low intensity commercial and small-tree thinning activities. The residual crowns indicate that this stand should increase canopy cover about 5% per decade.

Figure 3-8. A ponderosa pine dry stand with sugar pine also in this area. These are expected to burn readily under problem fire conditions.

Figure 3-9. A ponderosa pine dry stand after completion of the low intensity commercial and small-tree thinning activities and underburning. This stand would be expected to be resistant to insect outbreaks and development of active crown fires for 20-30 years.

Fire and Fuels

It is commonly recognized that wildfires are a natural and desirable characteristic of forested landscapes, especially on the east slope of the Cascade Range. However, the current condition of eastside forests is markedly different from the historic condition of the landscape (reference the Forested Vegetation section in Chapter 3 of this EIS), and recent wildfires are showing an increasing tendency to become "problem fires."

Problem Fires
Problem fires are wildfires that, because of extreme fire behavior, present a high risk to human safety and loss of forest resources.

The fire behavior on problem fires includes:
- Rates of spread greater than 12 chains/hour (800 ft/hour);
- Active crown fire; and
- Flame lengths greater than 8 feet.

Problem fires limit suppression strategy and tactic options because:
- Rates of spread are so high that the fire cannot be contained by initial attack suppression personnel.
- Crown fires cannot be attacked directly; suppression personnel must use indirect tactics with burnout operations or wait until the crown fire drops back to the ground and meets appropriate flame length and rate of spread criteria before direct attack can be initiated.
- Flame lengths greater than 4' are too intense for direct attack and handlines cannot be relied on to hold fire.
- Flame lengths greater than 8' may present serious control problems so that control efforts at the head of the fire will probably be ineffective.

Other management issues associated with problem fire:
- Problem fires pose a high risk to public and firefighter safety.
- Problem fires have the potential to create extensive resource damage.
- Problem fires require multiple days and/or months to contain and control and are very expensive to manage.

The 2003 Davis Fire (see Figure 3-10) is a recent example of a problem fire on the Crescent Ranger District. Situated in the middle of the Five Buttes project, it was fueled by vegetative conditions that are present over much of the project area. It was human-caused; the ignition location was in the West Davis Lake dispersed camping area, and it started relatively early in the fire season (June 28). It nearly burned into the community of La Pine, Oregon, and was essentially stopped by Wickiup Reservoir and actions by firefighters at the edge of Wickiup Acres, a small community. Suppression costs on the Davis Fire were in excess of eight million dollars.

It is estimated that at its most extreme, the Davis Fire had flame lengths of up to 50' and burned several miles in length in less than an hour. Suppression activities went on for 12 weeks before firefighters could contain the Davis Fire, and continued for another two weeks before control could be declared. The fire burned about 21,000 acres with complete mortality of vegetation over approximately 80% of the fire area. Table 3-17 shows a comparison of the effects of the Davis Fire on different timber types within the fire perimeter compared to the anticipated effects of a fire burning under historical conditions. While hemlock burned within historic conditions during the Davis Fire, ponderosa pine and Douglas-fir (typically fire-resistant species) and lodgepole pine stands in the fire area experienced much higher mortality than is typical under historic conditions.

Table 3-17. Stand Replacement Fire under Historic and Problem Fire Conditions

Vegetation Type	Historical Fire Stand Replacement %	Davis Fire Stand Replacement %
Ponderosa pine	10%-24%	63%
Douglas-fir	5-30%	59%
Hemlock	85%	15%
Lodgepole	25%	76%

Fire Behavior

Fire behavior is governed by weather, topography, and fuels. Topography generally remains constant on a landscape. Weather is variable, but can be predicted to some extent during a fire season, and fire behavior under different weather conditions can also be predicted. Fuels are a variable that can be manipulated to change the risk of a problem fire on a landscape. The following is a general discussion of fire weather, fuels, and other terminology that will be used in the discussion of current condition and environmental effects.

Fire Weather

For the purposes of this analysis, typical weather that can be experienced in the Five Buttes analysis area and its vicinity during a fire season has been divided into three categories, based on the average percentage of each fire season that such conditions are present. The categories are 98th percentile weather (problem fire weather), 90-97th percentile weather, and 16-89th percentile weather. Fire weather conditions are described in Table 3-18.

Table 3-18. Fire Weather Conditions in the Five Buttes Project Area

Fire Weather	Description	1 hr. Fuel Moisture %	10 hr. Fuel Moisture %	100 hr. Fuel Moisture %	1000 hr. Fuel Moisture %	Herbaceous Fuel Moisture %	Woody Fuel Moisture %	Midflame Wind Speed mph
98th Percentile (Problem Fire Weather)	The extreme fire season weather recorded by Remote Automated Weather System (RAWS) from 1995 to 2005, and weather taken on the Davis Fire during its major burning on June 29th from weather observers on the fire.	2%	3%	7%	9%	33%*	70%	17 mph*
90 - 97th Percentile	The high summer fire season weather recorded by RAWS from 1995 to 2005.	3%	4%	8%	9%	33%	70%	2 mph
16 - 89th Percentile	The average summer fire season weather recorded by RAWS from 1995 to 2005.	5%	6%	12%	13%	45%	89%	2 mph

*Herbaceous fuel moisture and wind speed recorded on the Davis Fire.

Fuels

The term “fuels” refers to the vegetative material, both living and dead, that is capable of carrying a fire across a landscape. Fuels can include conifer needles, fallen limbs, slash remaining after timber harvest, living trees with crowns that are close to the ground, and standing dead or fallen trees.

The following are definitions of some terms used during discussion of fuels and suppression.

Canopy Base Height: The height above the ground of the first canopy layer where the density of the crown mass within the layer is high enough to support vertical movement of a fire. Low canopy base heights have been shown to initiate crown fire behavior (Alexander, 1988). The average crown base height of pine stands in the project area is 3 feet; in mixed conifer, crowns tend to be lower and even touch the ground under current conditions.

Crown Bulk Density: the mass of crown fuel per unit of crown volume. A crown bulk density of 0.00069 pounds per cubic foot (lb/ft^3) can sustain a crown fire (Sando and Wick, 1972) in any species.

Extended Attack: When a fire has not been contained by the initial attack resources dispatched to the fire, will not have been contained within the management objectives that are established for that zone or area, and has not been contained within the first operational period.

Initial Attack: Initial attack is the fire suppression effort that takes place as soon as possible following a wildland fire report. Initial attack is conducted by preplanned suppression resources; the type and number of available resources change depending on the fire danger of the day. More information on initial attack resources can be found in the *Wildland and Prescribed Fire Management Policy-Implementation Procedures Reference Guide (Run Cards).*

Ladder Fuels: Any vegetation that provides the continuous vertical fuel arrangement that encourages crown fire initiation. Ladder fuels can include small understory trees (6 inches diameter and less) growing beneath larger trees as well as low canopy base heights.

Trees per Acre: The amount of trees of a specific diameter on an acre of land. Small diameter trees have similar fire characteristics; therefore, species was not a consideration for trees less than 6 inches in diameter.

Fuel Models: Fuel models are a tool used to standardize discussion of fuel conditions on a landscape. Fuel conditions, defined by quantity and arrangement, have been categorized into 40 standard descriptive fuel models (Scott and Burgan, 2005). Table 3-19 describes the fuel models found within the Five Buttes project area. Fuel models were selected by onsite photo series interpretation.

Table 3-19. Fuel Models for the Five Buttes project area.

Fuel Model	Description
TL3	The primary carrier of fire in TL3 is **moderate load conifer litter**, light load of coarse fuels. Spread rate is very low (0-2 ch/hr; flame length low (1-4’).
TU5	The primary carrier of fire in TU5 is **heavy forest litter**; with shrub or small tree understory. rate is low (2-5 ch/hr); flame length low (1-4’).
TL8	The primary carrier of fire in TL8 is **moderate load long needle pine litter**, may include small amount of herbaceous load. Spread rate is moderate; flame length low.
TL9	The primary carrier of fire in TL9 is **very high load, fluffy ponderosa pine litter**. TL9 can also be used to represent heavy **needle-drape**. Spread rate is moderate (5-20 ch/hr); flame length moderate (4 – 8’).

In reducing the risk of problem fire within the Five Buttes project area landscape, it is desirable to have more of the landscape condition in Fuel Models TL3 and TL8 than other more flammable fuel models.

Predicting Fire Behavior

Given information on fuel models and weather conditions, fire behavior can be predicted. If the canopy base height is 1 foot or lower, the assumption is flame lengths of 1 foot or greater from surface fire will initiate crown fire. Table 3-20 displays predicted fire behavior in the fuel models found in the Five Buttes project area in the three weather conditions described.

Table 3-20. Predicted Fire Behavior Associated with Fuel Models and Weather Typical of the Five Buttes project area.

	16 - 89th Percentile Weather			90- 97th Percentile Weather			98th Percentile (Problem Fire) Weather		
Fuel Model	**Flame Length (ft)**	**Rate of Spread (chains/hour)**	**Fire Type**	**Flame Length (ft)**	**Rate of Spread (chains/hour)**	**Fire Type**	**Flame Length (ft)**	**Rate of Spread (chains/hour)**	**Fire Type**
TL3	<1	<1	Surface	1.0	<1	Passive Crown	2.1	6.4	Active Crown
TU5	4.9	3.7	Active Crown	5.7	4.5	Active Crown	16	42.7	Active Crown
TL8	1.5	2.2	Active Crown	2.0	3	Active Crown	7.5	47	Active Crown
TL9	3.2	3.6	Active Crown	4.4	3.7	Active Crown	13.6	68	Active Crown

Fire Regime

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but including the influence of aboriginal burning (Agee 1993, Brown 1995). Coarse scale definitions for natural (historical) fire regimes have been developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The five natural (historical) fire regimes are classified based on average number of years between fires (fire frequency) combined with the severity (amount of replacement) of the fire on the dominant overstory vegetation.

These five regimes include:
I – 0-35 year frequency and low (surface fires most common) to mixed severity;
II – 0-35 year frequency and high (stand replacement) severity;
III – 35-100+ year frequency and mixed severity;
IV – 35-100+ year frequency and high (stand replacement) severity; and
V – 200+ year frequency and high (stand replacement) severity.

Fire Regime Condition Class

A Fire Regime Condition Class (FRCC) is a landscape classification that describes the amount of departure from the natural (historical) fire regime. They include three condition classes for each fire regime. This departure results in changes to one (or more) of the following ecological components:

- vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern);
- fuel composition;
- fire frequency, severity, and pattern; and
- other associated disturbances (e.g. insect and disease mortality, grazing, and drought).

All vegetation and fuel conditions or wildland fire situations fit within one of the three classes. The three classes are based on low (FRCC 1), moderate (FRCC 2), and high (FRCC 3) departure from the central tendency of the natural regime. Low departure is considered to be within the natural range of variability, while moderate and high departures are outside. Characteristic vegetation and fuel conditions are considered to be those that occurred within the natural fire regime. Uncharacteristic conditions are considered to be those that did not occur within the natural fire regime. Determination of amount of departure is based on comparison of a composite measure of fire regime attributes, as listed above. Table 3-21 displays the Fire Regime Condition Classes, their descriptions, and the risk potential associated with each condition.

Table 3-21. Fire Regime Condition Classes.

Fire Regime Condition Class	Description	Potential Risk
Condition Class 1	Within the natural (historical) range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	• Fire behavior, effects, and other associated disturbances are similar to those that occurred prior to fire exclusion (suppression) and other types of management that do not mimic the natural fire regime and associated vegetation and fuel characteristics. • Composition and structure of vegetation and fuels are similar to the natural (historical) regime. • Risk of loss of key ecosystem components (e.g. native species, large trees, and soil) is low. • Fire behavior, effects, and other associated disturbances are moderately departed (more or less severe).
Condition Class 2	Moderate departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	• Fire behavior, effects, and other associated disturbances are moderately departed (more or less severe). • Composition and structure of vegetation and fuel are moderately altered. • Uncharacteristic conditions range from low to moderate. • Risk of loss of key ecosystem components is moderate. • Fire behavior, effects, and other associated disturbances are highly departed (more or less severe).
Condition Class 3	High departure from the natural (historical) regime of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and other associated disturbances	• Composition and structure of vegetation and fuel are highly altered. • Uncharacteristic conditions range from moderate to high. • Risk of loss of key ecosystem components is high

Desired Condition

"Fireproofing" the project area is not reasonable and is not an objective of this project. It is acknowledged that the desired condition for some wildlife species that are dependent on late and old forested habitat conditions require some areas of high fuel loading and that management to retain habitat for these species results in high wildfire risk remaining on the landscape. However, the desired condition from a fuels standpoint is for the landscape to be as close to a characteristic level of disturbance as possible in order to create a safe environment for the public, including surrounding communities. Also, should fire suppression action be necessary, the fire behavior would allow a safe and successful initial attack during the first burning period. This desired condition would be achieved while continuing to provide habitat for wildlife species that are dependent upon late and old forest by creating areas of low fuel loadings (Fuel Models TL3 and TL8) and Condition Class 1 in strategic areas to break up fire pathways. The main fuels objectives are to:

- improve firefighter and public safety in the event of wildfire by creating and maintaining conditions that allow flexibility in firefighting strategies;
- reduce the risk that fires that start outside of late and old forest (LOS) areas will burn into the LOS, become crown fires, and eliminate important characteristics of the LOS habitat;
- reduce the risk that fires that start inside of LOS will burn into adjacent areas; and
- increase the likelihood of retaining large trees on the landscape in the event of wildfire.

Existing Condition

Due to current fuel loadings and Fire Regime Condition Classes throughout the Five Buttes project area, much of the landscape is classified as moderate to high risk of experiencing a Problem Fire similar to the Davis Fire.

Timber Stand Characteristics and Fuels Conditions

Table 3-22 displays the current condition of fuels in the plant association groups (PAGs) most found in the Five Buttes analysis area. For a detailed description of the species and plant association groups present in the Five Buttes project area, refer to the "Forested Vegetation" section of this EIS.

Table 3-22. Summary of existing forest structure in the Five Buttes project area.

	Mixed Conifer	Lodgepole Pine	Mountain Hemlock	Ponderosa Pine
Total Acres	35,209	67,218	32,008	16,000
Fuel Model	TU5	TU5	TU5	TL9
Crown Bulk Density	~ 0.0083 lb/ft3	~ 0.0154 lb/ft3	~ 0.0205 lb/ft3	~ 0.0154 lb/ft3
Fire Regime /Condition Class	IV/3	III/3	V/1	I/3
Fire Behavior	Active Crown	Active Crown	Passive Crown	Active Crown
Canopy Base Height	<1ft.	1ft.	4ft	1ft.
Trees Per Acre <6" DBH(average)	5,000	12,500	93	8,400

Prevailing Wind Direction and Typical Fire Movement

Winds on the Crescent District typically originate from the southwest, so wind-driven fires move toward the northeast, with a roughly oval or cigar-shaped perimeter. For an illustration of this, refer to the Davis Fire Map (Figure 3-3) in this section of the EIS; the eastern flank of the fire was wind-driven and burned in the typical direction and shape, while the western flank was fuels driven and burned in an atypical direction.

Sources of Ignition

Wildfires have either natural or human-related causes. Historically 62% of the fires in the vicinity of the project area are caused by lightning; there has been no discernable pattern to these lightning strikes.

Human-caused fire ignitions are also impossible to predict. The Davis Fire was human-caused, although it is unknown at this time if the ignition was accidental or intentional. Areas of concentrated recreational use in the project area are of concern; despite fire prevention education and the good intentions of most forest visitors, accidents happen and campfires escape every year. Two developed campgrounds at Davis Lake sustained a great deal of damage during the Davis Fire; Lava Flow campground on the east side of Davis Lake is the only developed camping area at the lake that was not touched by the fire (see the Recreation section in Chapter 3 of this EIS). Due to the dense understories and high fuel loads in timbered stands adjacent to Lava Flow campground, there is a high risk that an escaped fire that started in or near the campground would burn uphill and likely damage or destroy the last of the unburned forest near Davis Lake.

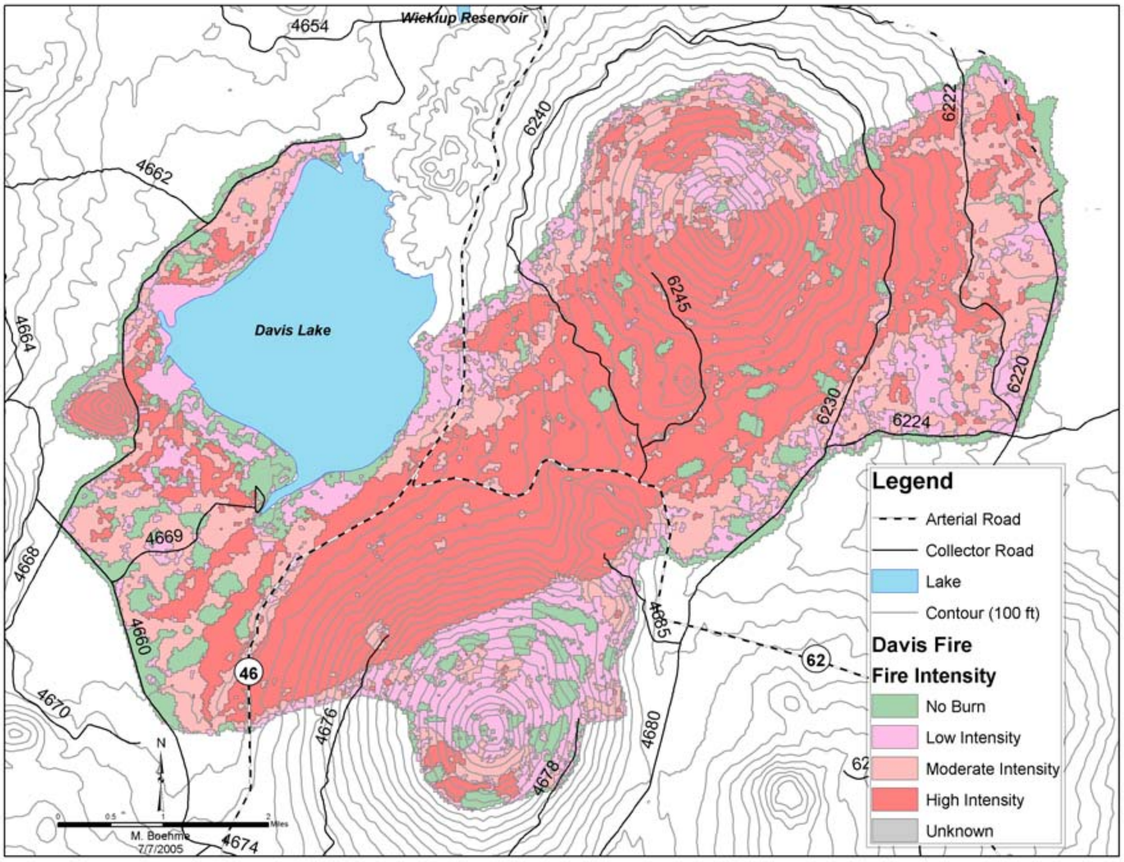


Figure 3-10. Davis Fire of 2003.

Environmental Effects

Effects of the alternatives were analyzed using several modeling tools, including:

- Forest Vegetation Simulator (FVS-FFE) fire and fuels extension
- Flammap
- Farsite
- Integrated Forest Management System (INFORMS)

An explanation of these models can be found in the cumulative effects section of this section. To compare the response of the Five Buttes project area's landscape to the actions proposed, each alternative was modeled on a weather day of 98% (problem fire), 90-97% and 16-89%. From this, each scenario was mapped to display minimum travel times (MTT) for fires under various conditions through time.

For this analysis, outputs from Flammap were used to describe three different kinds of wildfire behavior that will be used as evaluation criteria:
1- Surface fire - carried primarily by surface fuels and remains on the ground
2- Passive crown fire - torches individual or small groups of trees, but is driven by a surface fire
3- Active crown fire - produces a solid flaming front in the crowns of trees and can be independent of a surface fire.

Alternative A

Under Alternative A, no commercial harvest or fuels reduction activities would take place in the Five Buttes project area. Custodial activities would continue, such as routine maintenance and response to emergencies – such as wildfire suppression.

In this alternative, geographic features and fuels continuity would facilitate transition to an active crown fire over much of the landscape. This alternative would maintain a high potential for a problem fire on the landscape, presenting a high risk to suppression personnel, loss of multiple owl home ranges, and an elevated threat to the communities of La Pine and Gilchrist/Crescent, Oregon, especially during problem fire weather conditions. Identified human-caused ignition sources, such as recreation around Davis Lake, would have a direct pathway to Davis Mountain (Figures 3-11 and 3-14). A successful initial attack is probable on 101 days of a 161-day fire season.

Wildfire Behavior: For all three weather conditions, wildfire behavior would be the same as that just described under Existing Condition (Table 3-22). Over time, wildfire behavior is expected to become more severe as forest fuels continue to build up. Moderate to high-intensity wildfires are also expected to occur, depending on the weather conditions. The time of year, weather, and location would dictate the size and severity of a wildfire and its subsequent effects.

Fuel Models: Over time, all three major stand types would shift toward fuel model TU5. Trees would age, die, and fall; down woody material would exceed Deschutes LRMP guidelines[13].

Crown Fire Indices: For all three weather conditions, crowning indices would be the same as that just described in the Existing Condition section.

Surface Fuels: Surface fuels would increase over time. Litter, duff, twigs, and small branches would continue to accumulate. In addition, large surface fuels (greater than 3 inches in diameter) would increase.

Forest Structure: The canopy bulk density in the forest would remain about the same over time. Dead and fallen trees would reduce the mass of canopy, but would be offset by the regeneration of young trees. Canopy cover is expected to remain about the same over time because fallen trees would create openings in the overstory, but younger trees would replace them. Canopy base heights would not change from the existing condition because the main changes in the stands would be that trees would die and fall over.

Problem Fire Behavior: Using Flammap 3, wildfire scenarios were run for all three weather conditions; wildfire behavior would be considered high intensity and high severity. This means that most trees and shrubs in the wildfire's path would be killed, as witnessed in the Davis Fire.

Fuel Models: In the project area, ceanothus, a volatile component during fire season conditions, would be one of the first pioneer herbaceous species as seen in the Davis Fire. For the first 5 to 10 years following a fire, the fuel model would be either a shrub or timber litter model, dependent on presence of ceanothus. Between 10 and 20 years post-fire, when dead trees begin falling over, the fuel model would become a slash-blowdown fuel model.

Crown Fire: In this alternative crown fire would remain well above the historical levels for Fire Regime I, III, and IV. All three weather conditions would be enough to cause crown fire.

Surface Fuels: As seen in other high-severity wildfires, few surface fuels would exist immediately following the event, because it would be consumed in the fire. After about 5 to 10 years, surface fuels would be composed of large down wood, tree regeneration, and shrubs.

Forest Structure/Species Composition: After a high intensity wildfire, the stands in the forest would be set back to an earlier successional stage. In all stand types under existing conditions, a wildfire would kill most of the trees. FMA plus3 shows that all existing trees would be killed in the 90th percentile weather conditions; vegetative recovery largely depends upon the stand and the location of potential seed sources nearby in unburned stands. In ponderosa pine, one study showed that stands returned as grass or shrub communities, or else as unnaturally dense ponderosa pine (Savage et al 2005).

[13] The Deschutes LRMP provides guidelines for retention of down wood in forest stands. For example, the Plan recommends a fuel loading of 4.4 tons/acre to 36.4 tons/acre in mixed conifer stands.

The canopy bulk density immediately after a wildfire would be close to zero because few, if any, live trees would remain. It would take 15 to 30 years to have a measurable canopy bulk density. Likewise, canopy closure would be almost zero after a wildfire until replaced by a new stand. Much of the basal area would be lost, replaced by standing dead trees. Since there would be no canopy, there would be no canopy base height.

Effects Common to All Action Alternatives
Within the action alternative treatment units fire behavior is expected to be reduced. If an ignition occurs outside an activity unit in either action alternative and is not contained within the unit, predicted fire effects would be similar to those experienced in the Davis Fire. Although there may be a slight reduction in fire behavior immediately after the wildfire passes through the unit (due to the "shading effect"), the fire would return to an uncontrollable condition very soon after.

Alternative B
Alternative B would implement activities that are designed to reduce the probability of a problem fire on 5,522 acres (see Table B-2, Appendix B). Following the understory thinning and salvage operation, fuels treatments would include felling of residual small trees less than 6 inches in diameter, limbing (pruning) of lower limbs, and disposal of excess material in the form of biomass or burning of piles. In addition, approximately 4,998 acres would be available for returning an appropriate interval of prescribed fire. The objective of small tree thinning and pruning is to increase average crown base height to 8 feet and remove ladder fuels in order to delay the transition from ground fire to a crown fire.

Alternative B would reduce the fire behavior in activity units by changing the fuel model, raising the canopy base height, and reducing crown bulk density. These activities in turn would lower the Fire Regime Condition Class (Table 3-23). Activities proposed in Alternative B would reduce the severity of fire behavior within the activity units, and also may lower the fire behavior in another 5 to 15 percent of the area downwind of activity units (Table 3-24). Alternative B would not be as effective in protecting land and old structured forest as would Alternative C.

Within the activity units, fire models have predicted a spread rate of approximately 13 feet per minute and flame lengths four feet or less. This provides a better chance of a successful initial attack with fewer suppression resources. Within activity units, a successful initial attack is probable on nearly all 161 days of a fire season. This equates to a considerable increase of firefighter and public safety as fire is more likely to remain on the ground and can be directly attacked with handline. Alternative B would create conditions within activity areas that provide more suppression options, including use of water to establish fireline, backfiring from control lines, or using natural barriers. As evidenced by the Davis Fire, activity units provide an opportunity for placement and control of fireline along the edge of a wildfire suppression effort. They would not provide this opportunity in a flaming front, or the head of a wildfire.

Because the risk of crown fire would be reduced in Alternative B units, the chance of large trees surviving wildfire would increase. Risk of wildfire spreading from Alternative B units to adjacent stands would be reduced because altered fuel profiles would slow fire spread and allow firefighters additional time to implement a successful initial attack. Alternative B alters the fuels profiles on large enough blocks to reduce fire travel pathways on the landscape, but not as well as Alternative C. From a landscape perspective Alternative B does more than Alternative A but less than Alternative C in reducing the extent of a problem fire (Figures 3-12 and 3-15).

Prescribed fire would be applied to a range of 40% to 80% of each activity unit. The benefit of using prescribed fire is that it can reduce and maintain dead and down fuel loadings to sustainable levels through time, and also can have the effect of diversifying the vegetation which in turn provides habitat for fungi and prey species (see Northern Spotted Owl discussion in the section titled "Threatened and Endangered Species" in Chapter 3 of this EIS).

Alternative C
Alternative C was developed to respond to both Key Issues identified in Chapter 2 of this EIS; the issues include a concern for retaining as much spotted owl habitat on the landscape as possible through time and

better protecting that habitat through strategic placement of areas that are most effective to interrupt fire travel routes. Strategically Placed Landscape-area Treatments (SPOTS) is the concept used to optimize fuels reduction on the landscape. The SPOT concept stresses that the placement and type of fuels reduction is much more important than the amount of fuels treatment.

Using a problem fire scenario on similar fuels and topography in the analysis area, key locations on the landscape were identified where fuels modification and maintenance activities could be applied to reduce the risk of loss of LOS habitat and also reduce risk to surrounding communities.

Alternative C strategically places activity units to create large “blocks” where the fuel profile is modified. This alternative reduces the amount of commercial harvest, but includes additional fuels reduction (2,276 acres) adjacent to many of the units identified for thinning in Alternative B in order to influence fire behavior on a landscape scale. In addition, approximately 7,502 acres (2,504 acres greater than Alternative B) would be available for returning an appropriate interval of prescribed fire.

Within activity units, the effects are similar to those described for Alternative B (Tables 3-23 and 3-24). However, from a landscape perspective, this alternative is the best at interrupting travel routes of fire. The placement of active management blocks are such that containment of a fire in one area of LOS is more likely before the fire can spread to the next downwind LOS stand.

Firefighter and public safety is the highest in this alternative because it creates fire areas that afford more options for initial attack resources, safe anchor points to attack the fire, and contingency areas. Once a fire is established under “problem fire” conditions, very few suppression actions are effective. Under this scenario, if a wildfire burns into an activity unit and is not contained, predicted fire effects would be similar to those experienced in the Davis Fire. Although there may be a slight reduction in fire behavior immediately after the wildfire passes through the unit (called the “shading effect”), it would return to an uncontrollable condition very soon after. However, areas where modified fuels are maintained provide opportunities to alter fire characteristics once the fire burns through them, affording a chance to stop or slow a fire down before it can reach the next asset (communities or home ranges) to protect.

Table 3-23. Summary of forest structure for Alternatives B and C in activity units compared to Alternative A (in parentheses).

	Mixed conifer	Lodgepole Pine	Ponderosa Pine
Fuel Model	TL3 (TU5)	TL3 (TU5)	TL8 (TL9)
Crown Bulk Density	<0.00069 lb/ft3 (~ 0.0083 lb/ft3)	<0.00069 lb/ft3 (~ 0.0154 lb/ft3)	<0.00069 lb/ft3 (~ 0.0154 lb/ft3)
Fire Regime /Condition Class	IV/1 (IV/3)	III/1 (III/3)	I/1 (I/3)
Average Canopy Base Height	8ft. (<1 ft.)	8ft. (1 ft.)	8ft. (3 ft.)
Trees per acre <6”DBH(average)	110-190 (5,000)	110-190 (12,500)	110-190 (8,400)

Table 3-24. Summary of fire behavior for Alternatives B and C activity units by fuel model and percentile weather compared to Alternative A (in parentheses).

	16%-89% weather		90%-97% weather		98% (Problem Fire) Weather	
	TL3 (TU5)	TL8 (TL9)	TL3 (TU5)	TL8 (TL9)	TL3 (TU5)	TL8 (TL9)
Flame Length1	0.5 ft (4.9 ft)	1.5 ft (3.2 ft)	1.0 ft (5.7 ft)	2.0 ft (4.4 ft)	2.1 ft 16.0 ft)	7.5 ft (13.6 ft)
Rate of Spread2	1 ch/hr (3.7 ch/hr)	2.2ch/hr (3.6ch/hr)	1.0 ch/hr (4.5 ch/hr)	3.0 ch/hr (3.7 ch/hr)	6.4 ch/hr (42.7 ch/hr)	47 ch/hr (68 ch/hr)
Fire Behavior	Surface Fire (Active Crown)	Surface Fire (Active Crown)	Surface Fire (Active Crown)	Surface Fire (Active Crown)	Surface Fire (Active Crown)	Passive Crown (Active Crown)

[1]Measured in feet (ft).
[2]Chains per hour = ch/hr (one chain equals 66 feet).

Cumulative Effects and Modeling

The following information is provided in a format that is most informative for the decision maker and public understanding, rather than cataloging of individual past activities. The modeling and related discussions include data imputed for private land ownership and all past and present activities. The zone of influence is the 160,000-acre analysis area plus surrounding communities and private lands down wind. The probability of an uncontrollable fire originating in the Five Buttes project area and burning into the La Pine basin and surrounding private lands and communities is visually displayed for each alternative. A reduction in risk to downwind communities is shown when complementary fuels-related actions are implemented in adjacent areas around the La Pine community. In conjunction with foreseeable actions of the Greater La Pine Community Wildland Urban Interface and the Wickiup Acres Wildland Urban Interface Fuels Reduction projects, these communities are afforded a greater level of protection from a problem fire scenario such as the 2003 Davis Fire. Other foreseeable actions that are upwind or are farther away in adjacent watersheds, such as the BLT Vegetation Management Project and various hazard reduction activities (Crescent and Lakeside WUI) that overlap in time and space, show a complementary effect to risk reduction on a multiple watershed (fireshed) scale when Alternatives B or C scenarios are implemented.

The potential effectiveness of fuels treatments in reducing the risk of loss of late successional habitat to a large severe wildfire was evaluated using risk modeling procedures. An actuarial approach was taken to habitat risk that defines it as expected loss of late successional habitat. This approach, developed by Ager et al. (2006), provides a way to quantify potential habitat loss from natural disturbances, such as wildfire, specifically applied to the Five Buttes analysis area. The goal was to arrive at a quantitative comparison of how the risk of loss of late successional habitat to a large severe wildfire is affected by the different management alternatives in comparison to a passive management scenario (Alternative A).

The approach to risk modeling involved:

- including the activity layer of all risk reduction projects that have been implemented on federal lands that overlap the Five Buttes area up to the present;
- simulating major fire travel pathways (Minimum Travel Time or MTT) under severe burning conditions in order to affirm efficacy of active management in strategic locations using FlamMap 3;
- simulating landscape fuel treatment scenarios using the FVS and FFE;
- simulating random ignitions under severe burning conditions commonly found in the analysis area to compute burn probabilities for late successional habitat using FlamMap; and
- developing and applying stand-specific loss functions to determine the resultant simulated fire effect on LOS stands (FVS-FFE and FlamMap).

FlamMap, Version 3 (www.fire.org) was the primary modeling tool for the risk analysis with FVS and FFE projections providing key input data. Much of the analysis process was conducted in the ArcFuels (Ager, 2006) analysis framework using Visual Basic scripts (Pattison 1998) and the ArcObjects library (Chang, 2004) including building FVS-FFE runs, mapping FVS outputs, and building the input files for FlamMap. FVS-FFE was used to calculate the following inputs to FlamMap including: 1) crown bulk density (kg/m2), 2) height to live crown (ft), 3) total height (ft), 40 canopy closure (percent), 5) flame length, and 6) crown fire activity. These variables were then combined with a map of fuel models (Scott and Burgan, 2005) obtained from the Deschutes National Forest and used to generate landscape input files. The following processes were essential elements in modeling risk: 1) Location of point of ignition; 2) weather conditions; 3) distribution of fuels across the landscape. 4) Fuel reduction activities 5) Suppression efficacy; 6) Fire behavior; 7) Fuel conditions in Late Successional Habitat.

Minimum Travel Time Mapping

FlamMap, Version 3, was used to simulate major fire travel pathways to predict wildfire minimum travel times (MTT) and major flow paths. The model was run for three hours (Figures 3-11 through 3-13) and for ten hours (Figures 3-14 through 3-16) without suppression action to display a “real time” scenario when multiple ignitions are common and detection and suppression action may be delayed. The three-hour model displays which fires can be successfully suppressed with initial actions and which fires would likely be an extended attack. This is the timeframe where an Incident Commander can make an informed decision on the probability of a fire being contained with suppression resources on scene (personal communication, Boucher, 2006).

The ten-hour MTT model displays which alternative has the highest potential for changing the fire direction and/or size. It also displays whether a fire has exceeded initial action and where the likely burn path is located. Fires that exceed initial action usually require days to contain, are expensive to suppress, are much less safe, and have the highest potential for resource loss.

The ignition points were chosen in key locations, such as occupied owl home ranges, Davis Mountain, and adjacent private ownership to display potential effect on fire behavior.

Weather conditions and fuel moistures were used to replicate the 2003 Davis Fire. The fire was a problem fire, which burned and consumed 24 percent of the Davis Late-Successional Reserve, including two owl home ranges and 2,267 hectares of spotted owl nesting habitat. The idea was to simulate a problem fire under conditions where suppression efforts were ineffective. Based on observations of the fire weather on the Davis Fire, a wind speed of 17 mph and a wind azimuth of 230 degrees were used.

Alternative A maintains the landscape in the current condition. These are potentially the largest fires, burning across multiple northern spotted owl home ranges and spreading onto adjacent private land.

In Alternative B, active management in strategic locations had an effect on minimum travel time and overall size of a fire; however, there was limited success in avoid the burning of multiple owl home ranges. It is much more successful at minimizing spread onto private lands than is the passive management alternative.

In Alternative C, fires appear to have the shortest travel times. The greatest protection of owl home ranges is provided. Although the potential for spreading onto private lands is much reduced over Alternative A, Alternative C does not afford protection to private lands as effectively as does Alternative B.

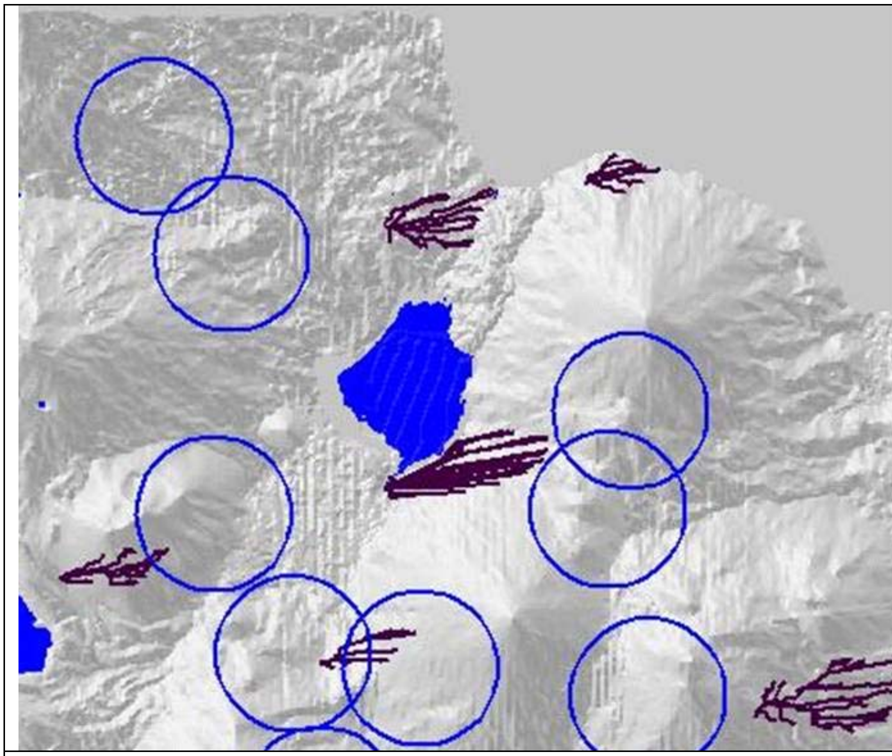
Burn Probability Mapping

For the reader, it helps to look at the burn probability mapping from a landscape-scale perspective, and not at individual pixels. For each alternative, a burn probability map (30 by 30 meter pixel) was developed. A shift from high to lower burn probabilities in late successional habitat is a positive quantitative measure of the effectiveness of the activity scenario. The spread parameters for each pixel were then used to simulate fire spread using the minimum travel time methods (Finney 2002) and inputs on wind, fuel moisture and topography. Five hundred random ignitions were used for each alternative. The wildfire simulations were performed at a 90 by 90 meter pixel resolution.

High burn probabilities are directly correlated to fire sizes that occur on a landscape under similar conditions. Large fires produce higher probabilities than small fires (each burn a larger fraction of the landscape). Since fire size is a function of the gross spread rate and duration of the fire, activities or conditions that reduce the spread rate will lower the burn probabilities.

Alternative A has the highest burn probability over the landscape as evidenced by a higher percentage of the map in yellow, orange and red (Figure 3-17). Notice the elevated probability around the home ranges and adjacent to private ownership on the eastern flank of the analysis area.

The average burn probability decreased significantly from the no action alternative (A) over the entire analysis area under the treatment scenarios in B and C, with alternative C showing the most reduction (Figures 3-18 and 3-19). The highest burn probabilities were clustered in three major areas. Expected loss of owl habitat was substantially reduced by active management; the most reduction was seen in Alternative C. For pixels inside spotted owl habitat, the average burn probability for Alternative C was 40 percent less than alternative A. Thus, the risk was reduced by 40 percent for Alternative C over the no action alternative. Both action alternatives moved the spotted owl habitat areas with the highest burn probabilities to much lower burn probabilities.

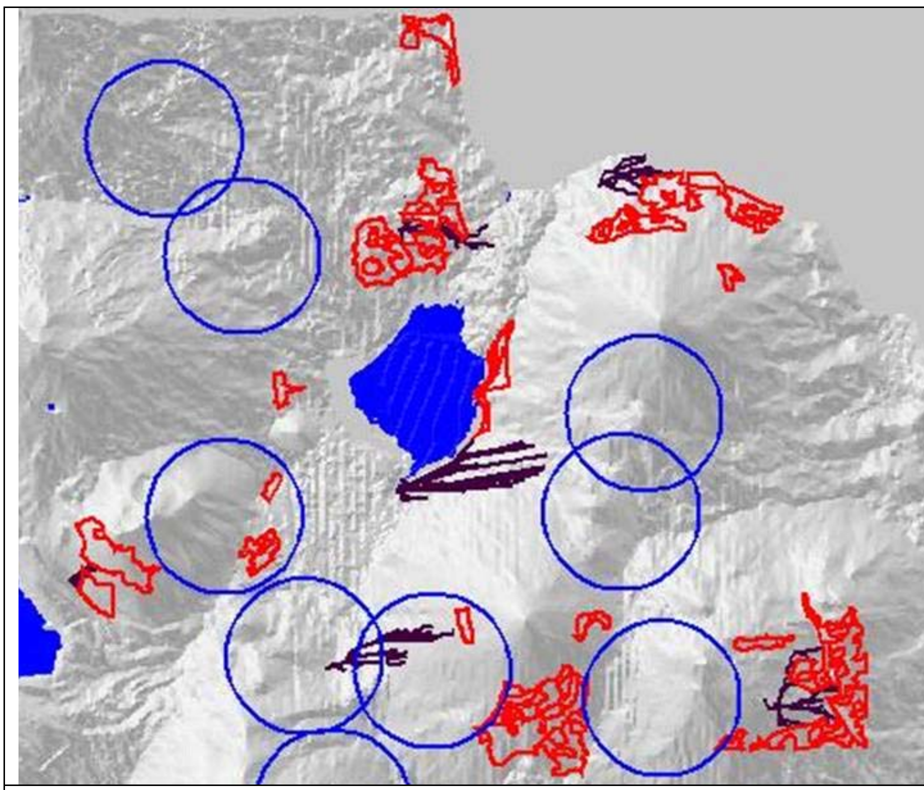


Legend:

Blue = Owl Home Ranges and Davis Lake

Black = Fire Travel Pathway

Figure 3-11. Minimum travel time For Alternative A at the three hour interval.

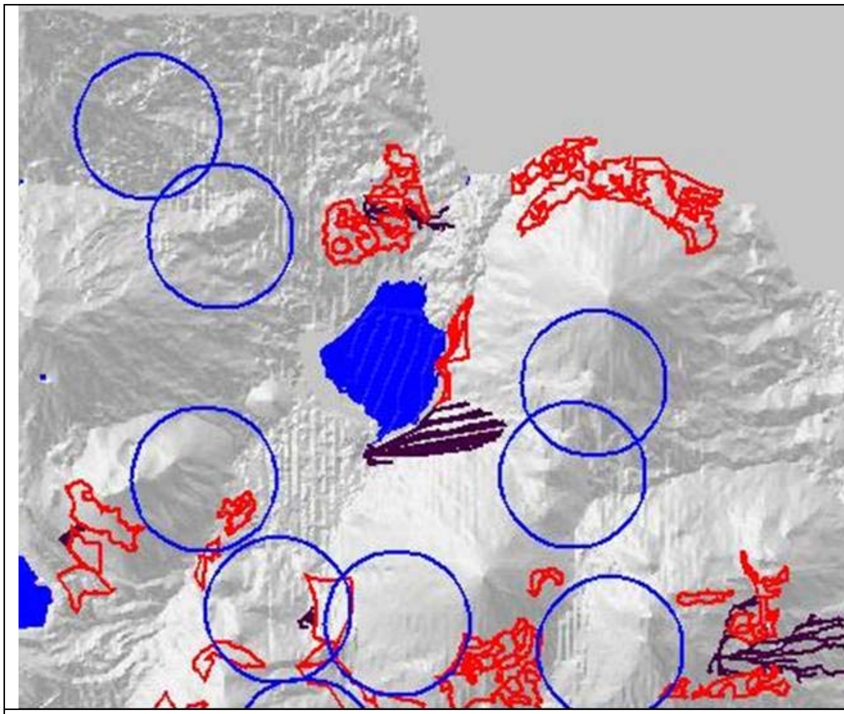


Legend:

Blue = Owl Home Ranges and Davis Lake

Black = Fire Travel Pathway

Figure 3-12. Minimum travel time For Alternative B at the three hour interval.

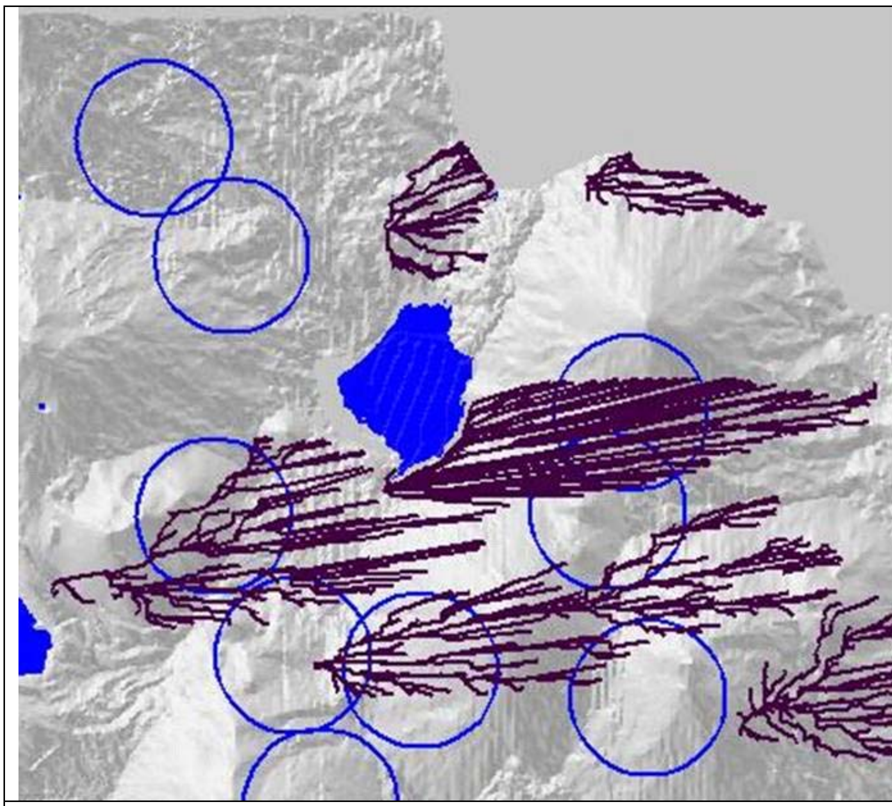


Legend:

Blue = Owl Home Ranges and Davis Lake

Black = Fire Travel Pathway

Figure 3-13. Minimum travel time For Alternative C at the three hour interval.

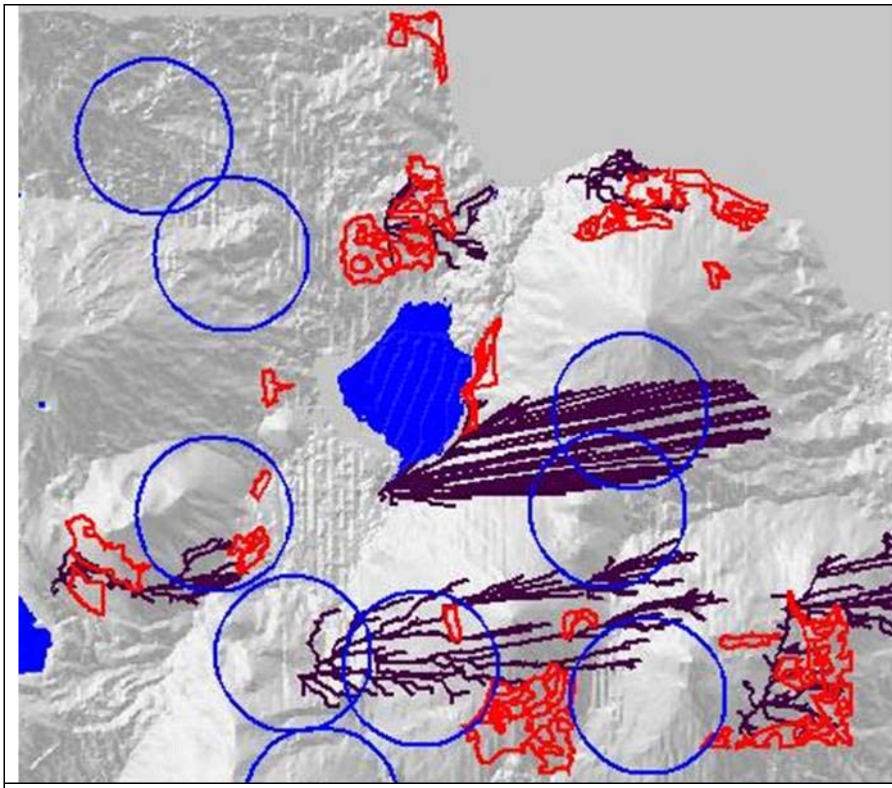


Legend:

Blue = Owl Home Ranges and Davis Lake

Black = Fire Travel Pathway

Figure 3-14. Minimum travel time for Alternative A at the ten hour interval.

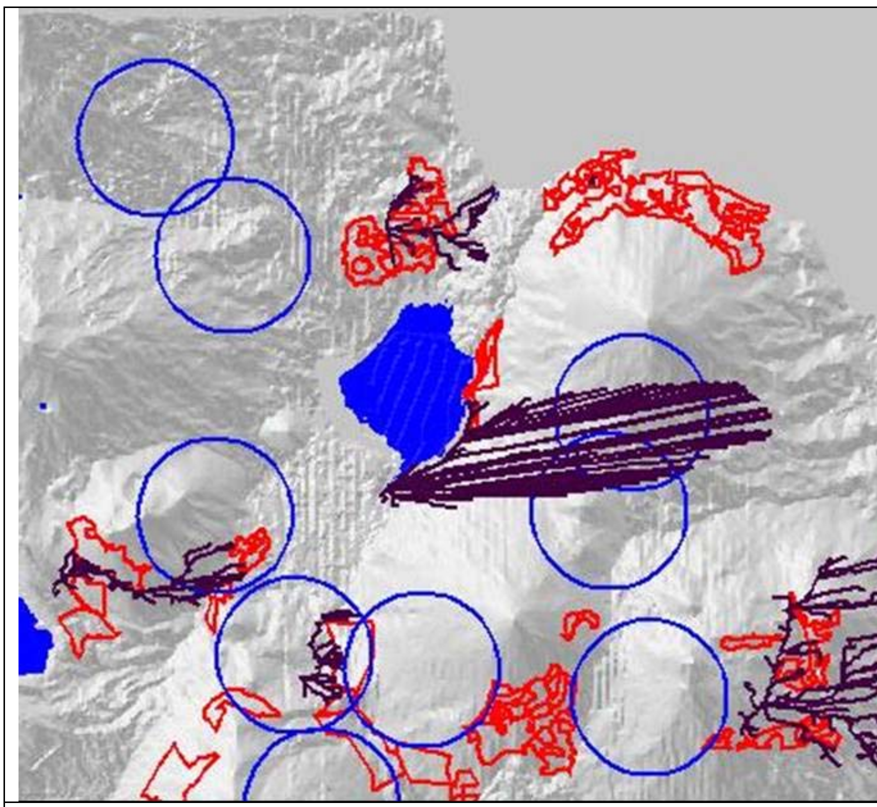


Legend:

Blue = Owl Home Ranges and Davis Lake

Black = Fire Travel Pathway

Figure 3-15. Minimum travel time for Alternative B at the ten hour interval.



Legend:

Blue = Owl Home Ranges and Davis Lake

Black = Fire Travel Pathway

Figure 3-16. Minimum travel time for Alternative C at the ten hour interval.

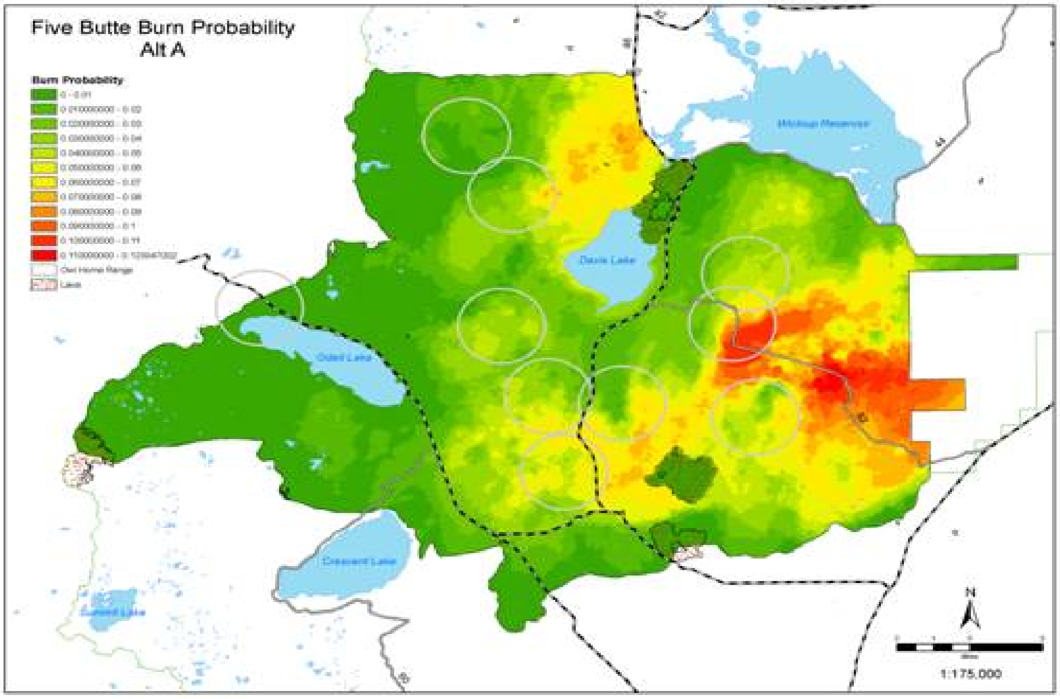


Figure 3-17. Alternative A burn probability.

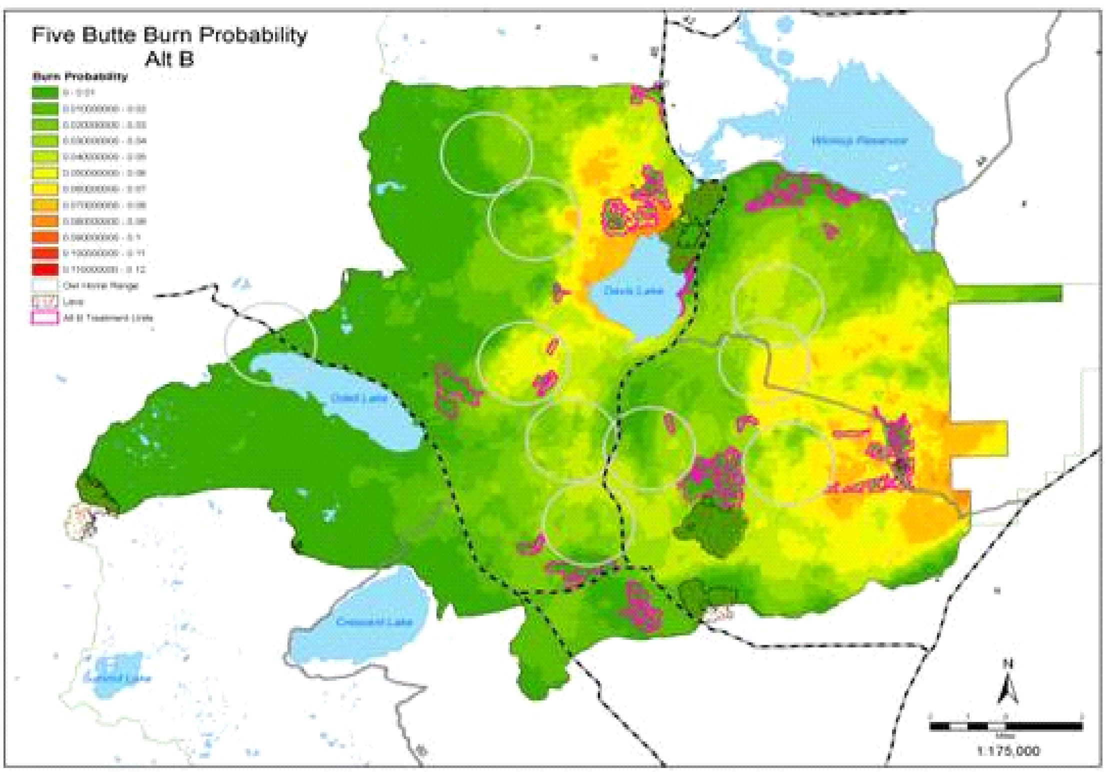


Figure 3-18. Alternative B burn probability.

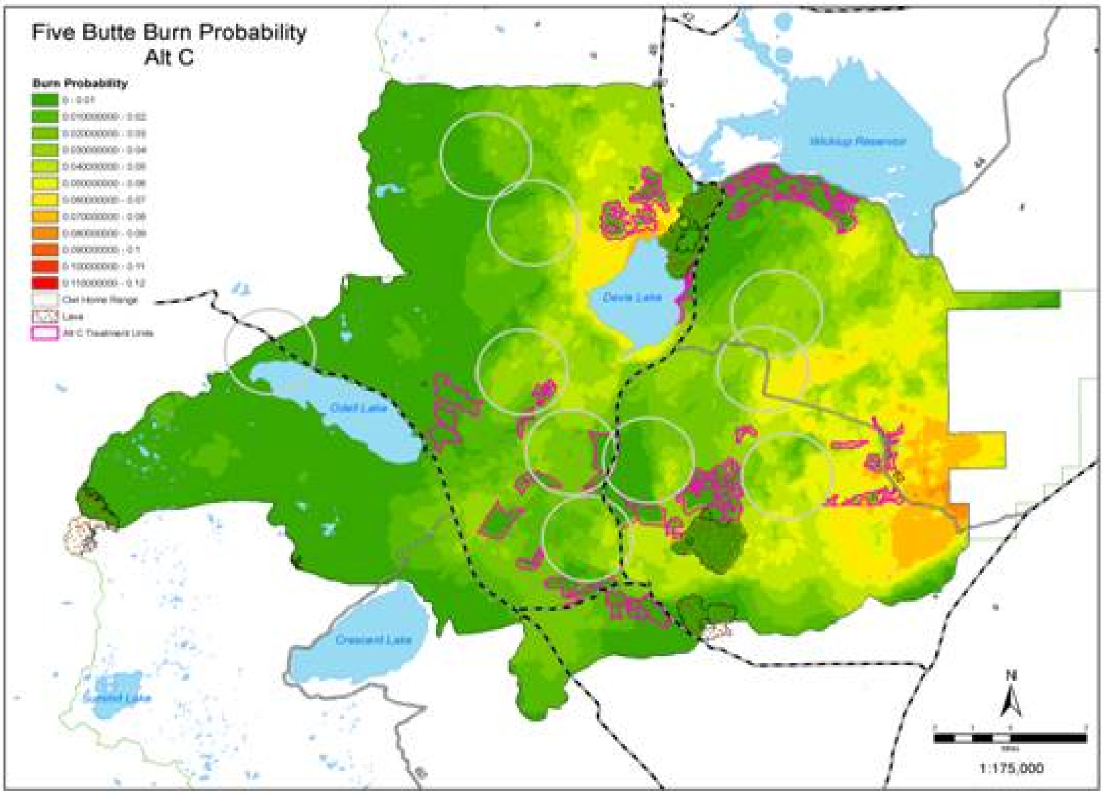


Figure 3-19. Alternative C burn probability.

Calculating Expected Habitat Loss

FVS-FFE was used to simulate impact of wildfire to key features, once it enters late successional habitat. If wildfire enters habitat and does not create damage to its key features (defined in Threatened and Endangered Species, Chapter 3), then a threat and risk is not reduced. Then, FVS output database was analyzed for the habitat criteria to determine the flame length at which the stand no longer met habitat requirements. This process resulted in a discrete loss function for each stand. The loss function was then applied to each pixel for the 1000 simulated and random ignition wildfires. If the flame length of an individual fire exceeded the threshold as identified in the loss function, the owl habitat was considered lost. The proportion of the 1000 fires with lethal flame lengths was the probability that a fire would eliminate the late successional habitat. The probability was then multiplied times the area of the pixel (0.3 acres) to generate an estimate of expected loss per acre.

Figure 3-20 graphically displays burn probability distribution in northern spotted owl Nesting, Roosting, and Foraging habitat by alternative. The X-axis displays the percent probability and the Y-axis displays the number of pixels from Figures 3-17 through 3-19 (Burn Probability for Alternatives A through C). Strategic placement of fuels modification in the action alternatives moves the area to a lesser burn probability (left hand side of the chart), and Alternative C is shown to be the most effective.

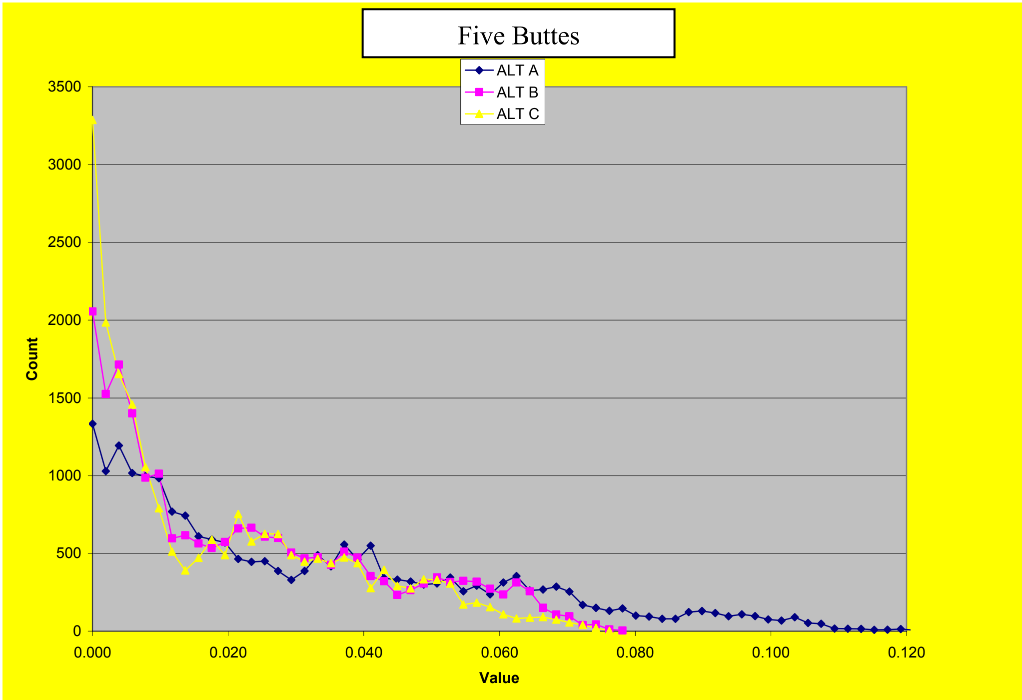


Figure 3-20. Burn probability distribution in spotted owl nesting, roosting, and foraging habitat by alternative.

Wildlife

- **Threatened and Endangered Species**
- **Regional Forester's Sensitive Species**
- **Management Indicator Species**
- **Birds of Conservation Concern**
- **Deer and Elk Habitat**

Threatened and Endangered Species

A Biological Evaluation (BE) has been prepared in compliance with the requirements of Forest Service Manual (FSM) 26702671, FSM W.O. Amendments 2600-95-7, and the Endangered Species Act (ESA of 1973, as amended. A Biological Assessment (BA) will be prepared in compliance with the requirements of Forest Service Manual (FSM) 2630.3, FSM 2672.4 and the Endangered Species Act of 1973 (Subpart B: 402.12, Section 7 Consultation, as amended) on actions and programs authorized, funded, or carried out by the Forest Service to assess their potential for effect on threatened and endangered species and species proposed for federal listing (FSM 2670.1).

The federally listed species thought to occur presently or historically on the Deschutes National Forest and analyzed in this document include the Canada lynx (*Lynx canadensis*), the northern spotted owl (*Strix occidentalis*), and the northern bald eagle (*Haliaeetus leucocephalus*). The Oregon spotted frog (R*ana pretiosa*) and the Pacific fisher (*Martes pennanti*) are federal candidates for ESA listing and are also on the Region 6 Regional Forester's Sensitive Species list.

Table 3-25 displays those species that are currently federally listed and whether the species has been documented to occur within the Five Buttes project area. Table 3-26 summarizes the determinations for federally listed species.

Table 3-25. Threatened and Endangered wildlife species summary, Five Buttes project Area.

Species	Listing Status	Habitat	Presence Within Five Buttes
Northern Spotted Owl	Federal Threatened	Old Growth Mixed Conifer Forest	Documented
Northern Bald Eagle	Federal Threatened	Lakeside, Reservoirs, Large Trees	Documented
Canada Lynx	Federal Threatened	Subalpine fir with Lodgepole Pine	Insufficient Habitat
Oregon Spotted Frog	Federal Candidate and Regional Forester Sensitive	Ponds, Marshes	Documented
Pacific Fisher	Federal Candidate and Regional Forester Sensitive	Mixed Forest, Complex Structure	Unknown

<u>Summary Conclusions for Threatened and Endangered Species (Table 3-24)</u>

1. The No Action alternative is not expected to have any effects on the Canada lynx, Oregon spotted frog, and the Pacific fisher.
2. The No action alternative "**May Affect, but is Not Likely to Adversely Affect**" the northern bald eagle.
3. The Action alternatives **"May Affect, but are Not Likely to Adversely Affec**t" the northern bald eagle and the Pacific fisher.

4. The No Action and Action alternatives "**May Affect, and are Likely to Adversely Affect**" the northern spotted owl and designated Critical Habitat.

Table 3-26. Summary of Conclusion of Effects for Threatened and Endangered Species, Five Buttes project.

Species/Habitat	Alt. A	Alt. B	Alt. C
Northern Spotted Owl	LAA	LAA	LAA
Northern Spotted Owl Critical Habitat	LAA	LAA	LAA
Northern Bald Eagle	NLAA	NLAA	NLAA
Canada Lynx	NE	NE	NE
Oregon Spotted Frog	NE	NE	NE
Pacific Fisher	NE	NLAA	NLAA

NE = No Effect
NLAA = May Affect, Not Likely To Adversely Affect
LAA = May Affect, Likely To Adversely Affect
NLJ = Not Likely to Jeopardize (Proposed species only)

Northern Spotted Owl

Federal Threatened, MIS

Existing Condition

In June 1990 the northern spotted owl was listed as a threatened species by the U.S. Fish and Wildlife Service and critical habitat was designated in 1992. In 2004 the USFWS completed a five year review of the status of the owl. They concluded a change in the classification of the owl was not warranted (USDI 2004). Beginning in 2004 a series of new publications became available on the northern spotted owl. In September 2004 the Sustainable Ecosystem Institute (SEI) under contract to the USFWS released a document titled *The Scientific Evaluation of the status of the Northern Spotted Owl*. Anthony et al. (2004) released a paper on the *Status and Trends in Demography of Northern Spotted Owls* 1985-2003. In September 2005 the Forest Service released a General Technical Report (GTR) on the *Status and Trends of Northern Spotted Owl Populations and Habitat* (Lint 2005). The Forest Service publication looked at results from monitoring spotted owl populations and habitat during the first 10 years of implementation of the Northwest Forest Plan. Collectively, these documents have been reviewed for relevant new information regarding the magnitude or imminence of previously identified threats to the species, new information regarding new threats, and their applicability to the Five Buttes project. Some key results of these reports are listed below:

Review and Summary of Key Findings Regarding the Northern Spotted Owl

The Bureau of Land Management (BLM), Forest Service (FS), and US Fish and Wildlife Service (USFWS) coordinated review of four recently completed reports containing information on the Northern Spotted Owl (NSO). These agencies reviewed the following four reports (hereinafter collectively referred to as "the reports"):

- *Scientific Evaluation of the Status of the Northern Spotted Owl* (Sustainable Ecosystems Institute, Courtney et al. 2004);
- *Status and Trends in Demography of Northern Spotted Owls, 1985-2003* (Anthony et al. 2004);
- *Northern Spotted Owl Five Year Review: Summary and Evaluation* (USFWS, November 2004); and
- *Northwest Forest Plan – The First Ten Years (1994-2003): Status and trend of northern spotted owl populations and habitat, PNW Station* (Lint, Technical Coordinator, 2005).

The most important conservation concerns addressed in the reports are:

1) the precipitous NSO population declines in Washington, and declining trends in the three northern Oregon demographic areas, as described by Anthony et al. 2004;
2) the three major current threats identified by Courtney et al. (2004), which are:
   - lag effects from prior harvest of suitable habitat,

- habitat loss due to wildfire in portions of the range, and
- competition from barred owls.

Anthony et al. (2004) indicated that spotted owl populations were doing poorest in Washington, with precipitous declines on all four study areas. The number of populations that declined and the rate at which they declined were noteworthy (Anthony et al. 2004). In northern Oregon, spotted owl population declines were noted in all three study areas. The declines in northern Oregon were less than those in Washington, except in the Warm Springs study area, where the decline was comparable to those in Washington (Anthony et al. 2004). The spotted owl has continued to decline in the northern portion of its range, despite the presence of a high proportion of protected habitat on federal lands in that area. Although Courtney et al. (2004) indicated that population declines of the spotted owl over the past 14 years were expected, they concluded that the accelerating downward trends on some study areas in Washington where little timber harvest was taking place suggest that something other than timber harvest is responsible for the decline. Anthony et al. (2004) stated that determining the cause of this decline was beyond the scope of their study, and that they could only speculate among the numerous possibilities, which include competition from barred owls, loss of habitat from wildfire, timber harvest including lag effects from prior harvest, poor weather conditions, and defoliation from insect infestations. Considering the fact that the spotted owl is a predator species, Anthony et al. (2004) also noted the complexities of relationships of prey abundance on predator populations, and identified declines in prey abundance as another possible reason for declines in apparent survival of spotted owls.

In southern Oregon and northern California, spotted owl populations were more stationary than in Washington (Anthony et al. 2004). The fact that spotted owl populations in some portions of the range were stationary was not expected within the first ten years, given the general prediction of continued declines in the population over the first several decades of Northwest Forest Plan (NWFP) implementation (Lint 2005). The cause of the better demographic performance on the southern Oregon and northern California study areas, and the cause of greater than expected declines on the Washington study areas are both unknown (Anthony et al. 2004). Courtney et al. (2004) noted that a range-wide population decline was not unexpected during the first decade, nor was it a reason to doubt the effectiveness of the core NWFP conservation strategy.

Lint (2005) indicated that loss of spotted owl habitat did not exceed the rate expected under the NWFP, and that habitat conditions are no worse, and perhaps better than expected. In particular, the percent of existing NSO habitat removed by harvest during the first decade was less than expected. Courtney et al. (2004) indicated that models of habitat growth suggest that there is significant ingrowth and development of habitat throughout the federal landscape. Courtney et al. (2004) also noted that management of matrix habitat has had a lesser impact on spotted owl populations than predicted. Owls are breeding in substantial numbers in some matrix areas. The riparian reserve strategy and other habitat management guidelines for the matrix area appear to preserve more, better quality, and better distributed dispersal habitat than earlier strategies, and there is no evidence to suggest that dispersal habitat is currently limiting to the species in general (Courtney et al. 2004). Anthony et al. (2004) noted declining spotted owl populations on some study areas with little harvest, and stationary populations on other areas with consistent harvest of mature forest. No simple correlation was found between population declines and timber harvest patterns (Courtney et al. 2004). Because it was not clear if additional protection of spotted owl habitat would reverse the population trends, and because the results of their study did not identify the causes of those trends, Anthony et al. (2004) declined to make any recommendations to alter the current NWFP management strategy.

Reductions of spotted owl habitat on federal lands are lower than those originally anticipated by the Service and the NWFP (Courtney et al. 2004). The threat posed by current and ongoing timber harvest on federal lands has been greatly reduced since 1990, primarily because of the NWFP (Courtney et al. 2004). The effects of past habitat loss due to timber harvest may persist due to time-lag. Although noting that it is probably having a reduced effect now as compared to 1990, Courtney et al. (2004) identified past habitat loss due to timber harvest as a current threat. The primary current source of habitat loss is catastrophic wildfire (Courtney et al. 2004). Although the total amount of habitat affected by wildfires has been small, there is concern for potential losses associated with uncharacteristic wildfire in a portion of the species' range. Lint (2005) indicated that the NWFP recognized wildfire as an inherent part of managing spotted owl habitat in certain portions of the range. Courtney et al. (2004) stated that the risk to spotted owl habitat due to uncharacteristic stand replacement fires is sub-regional, confined to the dry eastern and to a lesser extent the southern fringes of the spotted owl range. Wildfires accounted for 75 percent of the natural disturbance loss of habitat estimated for the first decade of NWFP implementation (Courtney et al. 2004). Lint (2005) cautioned against relying solely on the repetitive design of the conservation strategy to mitigate effects of catastrophic wildfire events, and highlighted the potential to influence fire and fire effects through active management.

Anthony et al. (2004) indicated there is some evidence that barred owls may have had a negative effect on NSO survival in the northern portion of the NSO range. They found little evidence for such effects in Oregon or California. The threat from Barred Owl competition has not yet been studied to determine whether it is a cause or a symptom of NSO population declines, and the reports indicate a need to examine threats from Barred Owl competition.

The synergistic effects of past threats and new threats are unknown. Though the science behind the NWFP appears valid, new threats from barred owls, and potential threats from West Nile Virus and Sudden Oak Death may result in spotted owl populations in reserves falling to lower levels (and at a faster rate) than originally anticipated. If they occur, such declines could affect spotted owl recovery (Courtney et al. 2004). According to Courtney et al. (2004), there exists a potential for habitat loss due to Sudden Oak Death in the southern portion of the range, however the threat is of uncertain proportions. In addition, Courtney et al. (2004) indicated there is no way to predict the impact of West Nile Virus, which is also identified as a potential threat. The reports do not provide supporting analysis or recommendations regarding how to deal with these potential threats. Courtney et al. (2004) concluded that the risks currently faced by the northern spotted owl are significant, and their qualitative evaluation is that the risks are comparable in magnitude to those faced by the species in 1990.

According to the USFWS (November 2004), the current scientific information, including information showing declines in Washington, northern Oregon, and Canada, indicates that the spotted owl continues to meet the definition of a threatened species. Populations are still relatively numerous over most of the species' historic range, which suggests that the threat of extinction is not imminent, and that the subspecies is not endangered even in the northern part of its range where greater than expected population declines were documented (USFWS, November 2004). The USFWS (November 2004) did not consider the increased risk to spotted owl populations due to the uncertainties surrounding barred owls and other factors sufficient to reclassify the species to endangered at this time.

In summary, although the agencies anticipated a decline of spotted owl populations under land and resource management plans during the past decade, the reports identified greater than expected spotted owl population declines in Washington and northern portions of Oregon, and more stationary populations in southern Oregon and northern California. The reports did not find a direct correlation between habitat conditions and changes in spotted owl populations, and they were inconclusive as to the cause of the declines. Lag effects from prior harvest of suitable habitat, competition with barred owls, and habitat loss due to wildfire were identified as current threats; West Nile Virus and Sudden Oak Death were identified as potential new threats. Complex interactions are likely among the various factors. The status of the spotted owl population, and increased risk to spotted owl populations due to uncertainties surrounding barred owls and other factors, were reported as not sufficient to reclassify the species to endangered at this time. The reports did not include recommendations regarding potential changes to the basic conservation strategy underlying the NWFP, however they did identify opportunities for further study.

The full reports are accessible on the internet as follows.

- Courtney et al. 2004: http://www.sei.org/owl/finalreport/finalreport.htm
- Anthony et al. 2004: http://www.reo.gov/monitoring/trends/Compiled%20Report%20091404.pdf
- USFWS, November 2004: http://www.fws.gov/pacific/ecoservices/endangered/recovery/5yearcomplete.html
- Lint, Technical Coordinator, 2005: http://www.reo.gov/monitoring/10yr-report/northern-spotted-owl/documents/owl_text%20and%20tables.pdf

NESTING HABITAT ASSOCIATIONS

Spotted owls are primarily inhabitants of old growth and mature forests. Suitable spotted owl habitat contains adequate quantities of dead and down woody material, decadent trees, a medium to high crown closure, multiple layers in the overstory, and trees at least 200 years of age or older or greater than 32 inches dbh (USDA 1990). Suitable nest sites are generally in cavities in the boles of live trees or snags but platform nests may also be used. Platforms could include abandoned raptor nests, broken tree-tops, or mistletoe brooms. A relatively heavy canopy habitat with a semi-open understory is essential for effective hunting and movement (USDA 2003a).

Everett et al. (1997) studied northern spotted owl nest stands in the eastern Cascades of Washington and Oregon, including six nest stands on the Deschutes National Forest. He concluded that the northern spotted owl utilizes a wide array of nesting habitat throughout its current ranges and successfully reproduces in a variety of stand types on the eastern slope of the Pacific Northwest Cascades. Within nest stands, a multi-layered canopy was more strongly expressed in numbers of both small and large dbh trees than in unoccupied stands of the same type within owl neighborhoods. Everett et al. (1997) also stated while spotted owls will use an array of nest stands and site conditions it does not indicate a wide range of preference or equal habitat suitability among nest stand types, but only that owls are successfully breeding in a variety of forest structural and compositional types. He also concluded that vegetation manipulation to reduce fire hazard may create less than optimum habitat for the northern spotted owl, but this should be weighed against the hazard for stand replacement fires and the complete loss of habitat over large areas.

On the Deschutes National Forest nesting, roosting, and foraging (NRF) habitat for the northern spotted owl includes stands of mixed conifer, ponderosa pine with white fir understory, and mountain hemlock with subalpine fir. Stand exam data collected on Deschutes National Forest in occupied and previously occupied spotted owl nest stands seem to indicate a strong association with old growth Douglas-fir (Stone pers comm. 2005). This is consistent with dwarf mistletoe infected Douglas-fir trees being commonly used as a spotted owl nest on east-side forests (Forsman presentation 2005). However, Forsman et al. (2006) also stated spotted owls will use old growth ponderosa pine, Douglas-fir, and grand fir with cavities as nest sites with ponderosa pine being less commonly used.

PREY BASE

The northern spotted owl's primary prey in much of the Pacific Northwest is the northern flying squirrel (Forsman et al 2006). Spotted owls will also prey on a wide range of other small mammals. An analysis of regurgitated pellets collected from Deschutes National Forest spotted owls showed prey species of flying squirrels, snowshoe hares, grouse, western pocket gophers, Pacific jumping mice, red back voles, Douglas squirrels, arboreal crickets, shrews, bushy-tailed woodrats, and chipmunks (Henshaw pers comm. 2005). Forsman et al. (2006) stated that northern spotted owl diets on the east-side forests showed northern flying squirrels make up about 40 percent of the owl diet in numbers of prey capture. He also stated that bugs represent 15 percent, other mammals 12 percent, red back voles 10 percent, woodrats 8 percent, and rabbits and pikas 5 percent of their total prey captures.

The northern flying squirrel was found to be the most important prey species for the spotted owl in 16 of 17 studies analyzed for the SEI Report (Courtney et al. 2004). Although much is known about northern flying squirrel ecology in wet forests of the Pacific Northwest west of the Cascade Range (Rosenberg and Anthony 1992, Zabel et al. 1993, Carey 1995, 2000a cited in Lehmkuhl et al. 2006), little is known about flying squirrel ecology in interior forests (Lemkuhl et al. 2006). Lemkuhl (2006 unpublished data) showed dwarf mistletoe brooms housed 40% and 33% of the flying squirrel dens in young and mature mixed conifer stands respectively while 6 % and 19% of the dens in young and mature stands were snag cavities in a study in the eastern Washington Cascades. Carey et al. (1997) documented flying squirrel dens in cavities in live and dead old growth trees, stick nests, moss nests, cavities in branches of fallen trees, decayed stumps, and suppressed young trees.

Mychorrizal and hypogeous fungi, in particular truffles, are an important food source for flying squirrels (Lemkuhl et al. 2004) but where winter snow levels are deeper, as seen in eastside habitats, foods such as lichens become important. Lemkuhl (2004) found that plant material was 22 percent of fall flying squirrel diets in the eastern Washington Cascades and diets were similar in diversity and species composition to squirrel diets in other parts of the Pacific Northwest. Lemkuhl et al. (2006) study of flying squirrels in the eastern Washington Cascades indicated low food availability (truffle and lichen biomass, understory plant richness) appeared to limit squirrel density, survival and recruitment in open pine forests as compared to mixed-conifer forests (Lehmkuhl et al. 2006). To compensate for low food productivity in pine forests, squirrels apparently forage over larger home ranges (Lehmkuhl et al. 2004).

Red-backed voles appear to select stands with abundant large-diameter logs and nest under roots or logs. They forage on the ground or in shrubs and understory vegetation and are omnivorous feeders. They shift their diet to food availability and includes lichens and fungal sporocarps, green vegetation, seeds, nuts, bark and insects. Bull and Blumpton (1999) found red-backed voles were less abundant in stands harvested for fuels reduction in northeastern Oregon Blue Mountains although they cautioned extrapolation of their data should be done with caution as sample size and sampling period were limited.

Bushy-tailed woodrats are also an important spotted owl prey species but woodrats may have a patchy distribution due to specific habitat requirements. Lemkuhl (in press 2006) in a study in the eastern Washington Cascades determined the highest densities of woodrats were in stands with abundant large snags, mistletoe brooms, and soft log cover and can be abundant in dry interior forests where rock is scarce. He also noted that annual survival rates were low and consistent with the observation that bushy-tailed woodrats are subject to intense predation and local extirpation by spotted owls (Carey et al. 1992 cited in Lemkuhl 2006, in press) and that logs and cavities may not provide adequate thermal protection during the winter in harsh climates (Carey et al. 1992, Carey et al. 1996 cited in Lemkuhl 2006, in press).

NRF DEFINITIONS AND DISTRIBUTION IN PROJECT AREA

On the Deschutes National Forest northern spotted owl nesting, roosting, and foraging habitat (NRF) is defined as forested stands regardless of plant association having a total canopy cover greater than or equal to 40 percent AND at least 5 percent of the canopy cover from trees >21 inches dbh. This definition assumes that the stand is multi-storied and contains some trees 32 inches dbh or greater. A maximum 6,000 foot elevational limit was also applied in defining NRF habitat. At the present time there is no evidence of spotted owls nesting above 6,000 feet on the Deschutes National Forest. That is why the 6,000 foot limit has been applied. Field verification is also a method used to confirm NRF capability and/or delete those stands that have been incorrectly identified as NRF habitat. The Five Buttes project area contains about 19,038 acres of NRF; Table 3-27 displays the amount of NRF habitat present in the project area by Northwest Forest Plan allocation and also Critical Habitat Unit CHU OR-7.

Table 3-27. Acres of Nesting, Roosting, and Foraging Habitat (NRF) Within the Five Buttes Project.

Administratively Withdrawn	Congressionally Withdrawn	Davis Late-Successional Reserve	Matrix	Critical Habitat Unit CHU-OR-7	Total Acres
2,111	1,725	8,313	6,889	5,750*	19,038
* CHU acres are not additive to the other land allocations					

In the Five Buttes project area NRF habitat is generally located on the higher elevations particularly on the north side of Davis Mountain, the south and west sides of Hamner Butte, Ringo Butte, Cryder Butte, Royce Mountain, Odell Butte, Maklaks Mountain, surrounding the perimeter of Odell Lake, and northwest of Davis Lake extending into roadless area. Nesting habitat connectivity would be described as somewhat fragmented because of past regeneration timber harvests, commercial thinning of NRF stands and conversion to foraging and dispersal habitat, lodgepole pine plant associations capable of only providing dispersal habitat for the owl, lakes, lava flows, and approximately 16,693 acres of privately owned lands.

DAVIS LATE-SUCCESSIONAL RESERVE ASSESSMENT (DLSRA)

Within the Five Buttes project area is the 48,900 acre Davis Late-Successional Reserve, one of many designated by the Northwest Forest Plan across the range of the northern spotted owl. Late-successional Reserves are to be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl. These reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem (Northwest Forest Plan C-11). The Davis Late-Successional Reserve Assessment (DLSRA) was prepared by district personnel in 1995 to respond to objectives set for LSRs in the NFP. The DLSRA developed twenty-eight Management Strategy Areas (MSAs) based on existing habitat conditions and would guide management decisions based on land capability. Some MSAs are capable of providing northern spotted owl habitat while others were designated to emphasize other species or guilds such as black-backed woodpeckers, great gray owls, or bald eagles. For each MSA an existing condition, desired condition, objective, management options, and monitoring and evaluation elements were identified and documented in the LSRA.

The DLSRA was updated in 2006 to reflect changing habitat conditions primarily as a result of the Davis Fire of 2003. Approximately 21,000 acres of forest was burned with about 16,000 acres of that total burned to a moderate or high intensity with nearly complete tree mortality. Only around the edges of the fire was there a mosaic of burn intensities with patches of live trees. Overall, the Davis Fire altered 24 percent of the Davis LSR and removed 3,736 acres of NRF habitat from the fire plus another 223 acres of NRF habitat related to suppression efforts within the LSR (USDA 2004).

The major updates to the DLSRA for 2006 are: 1) to include more strategic fuels treatments along with density management to provide habitat over time, recognizing that these conditions will shift around the landscape as some areas fade out due to fires or insects, and as other areas grow back into these conditions; 2) a shift away from trying to manage dry ponderosa pine sites for spotted owl habitat; 3) controlled access management due to the increase in recreational use and the ongoing reduction of road densities; and 4) integrate CHU objectives within the LSR.

Another adjustment made for the 2006 update was that the "emphasis species" changed for several MSAs. MSA Y and a portion of J in the wet lodgepole pine were adjusted to allow some fuels treatment. Strategic fuels treatments are necessary to provide a landscape level protection to the entire LSR. MSAs I, O, and J were changed from an eagle focal species to a joint bald eagle and northern spotted owl focal species in recognition of the importance of these MSAs for spotted owl connectivity and establishment of newly found spotted owl activity centers. MSA F was changed from a bald eagle to a spotted owl focus based on the presence of large diameter Douglas-fir capable of providing northern spotted owl habitat.

NORTHERN SPOTTED OWL CRITICAL HABITAT AND THE RECOVERY PLAN

The northern spotted owl was listed as federally threatened in 1990 and a draft recovery plan was published in 1992 (USFWS 1992). However, that plan was not completed due to the development of the Northwest Forest Plan in 1994, which became the cornerstone for conserving and recovering the northern spotted owl on 24.4 million acres of federal land in Oregon, Washington and California.

However, the Northwest Forest Plan only addressed northern spotted owl conservation on federal land and it did not establish criteria for measuring whether the species has recovered. A new draft recovery plan was released for public comment on April 26, 2007; this plan addresses what is needed to recover the species throughout its range, including federal and non-federal lands, and will set specific recovery criteria. The final designation of critical habitat for the northern spotted owl is expected in December 2007.

The Five Buttes project area lies within the Eastern Cascades Province which includes all forested lands in Oregon east of the crest of the Cascades and north of the Klamath Mountains province within the range of the spotted owl. This province provides the easterly extension of the spotted owl in Oregon. Key issues within this region within the range of the spotted owl include:

1. the continuing reduction and increased fragmentation of spotted owl habitat necessary to meet the species' life history requirements,
2. the resultant increased threat of isolation of spotted owl populations, and
3. the exacerbation of poor habitat conditions for dispersing individuals.

The U.S. Fish and Wildlife Service is concerned with the existing degraded condition of owl habitat and the low owl population levels in the eastern Cascades province.

Ten critical habitat units occur all or in part within the eastern Cascades province. Critical habitat unit OR-7 is located within the Five Buttes project area. This CHU (OR-7) was designated to maintain essential nesting, roosting, and foraging habitat and provide a north-south link with unit CHU OR-6 and the various federally reserved lands along the Oregon Cascades. Unit OR-7 also helps maintain the east-west continuum of spotted owl habitat by linking with unit OR-19 (Western Cascades province) though the Diamond Peak Wilderness which rides the crest of the Cascades Mountains. The Interagency Scientific Committee (ISC) identified the Southern Deschutes Area of Special Concern given the area's importance in maintaining a wide distribution of occupied plant community associations throughout the entire range of the subspecies. Unit OR-7 is within this area and helps ensure a range-wide distribution of owl habitat since it lies along the eastern limits of the owl within the eastern Cascades province. Total post-exclusion acreage mapped for this unit equals 32,262 acres of Forest Service land (with 0 private or State acres). Of the 32,262 federal acres, all are Forest Service-managed. Unit OR-7 was proposed as DES-2 in the August 1991 critical habitat proposal (Tweten 1992).

The *Draft Recovery Plan for the Northern Spotted Owl* (USDI, USFWS 1992) recognized the threats in the Eastern Cascades province:

- "Low Populations" – Major threats to the owl population reflect viability concerns related to the generally poor distribution and low numbers of owl sites, and the inability to provide suitable habitat conditions over the long-term (due to changes in forest – tree species, composition and habitat loss due to large fires). (Draft Recovery Plan, page 55).
- "Vulnerability to Natural Disturbance" – The potential for large-scale loss of owl habitat from fire is higher here than any other Oregon province, and is considered a severe threat. There is a low probability that DCAs (Designated Conservation Areas) in the province will avoid a stand replacing fire over a significant portion of the landscape during the next century. Loss of habitat is currently occurring as drought is creating forest health conditions which are expected to decrease the acreage of suitable habitat in the province." (Draft Recovery Plan, page 56)

Biological goals and implementation guidelines were also outlined to aid in reducing risk:

- "INSECTS – Fire exclusion, coupled with natural mortality factors, gradually reduce the pine and larch components of mixed conifer stands….the resulting multistoried stands of Douglas-fir and true fir create conditions for the build-up of defoliators. Douglas-fir tussock moth and western spruce budworm populations will increase with frequent outbreaks….Accumulations of heavy fuels within stands will make total fire protection very difficult." (Draft Recovery Plan, Likely Outcome of a Total Protection Strategy during the Next Century, pages 232-233).
- "There are no forest protection options to maintain owl habitat at its current level in the East Cascades sub-region. As noted, the current extensive habitat is likely a result of an historical anomaly: successful fire protection. The structure resulting from this anomaly is inherently unstable, subject to increased fire, wind, disease and insect damage. Any stand manipulation which will significantly increase resistance to these disturbance factors apparently will result in decreased owl habitat." (Draft Recovery Plan, Forest Protection Guidelines, page 471)
- "Forest ecosystems are dynamic. They change with or without active management…A recommendation to implement a strategy that in fact reduces optimum owl habitat may seem a paradox. We believe that such implementation will in the long run better protect owl habitat than a short-sighted attempt to continue total protection….Active management of habitat in the East Cascades sub-region, through protection strategies designed to prevent large-scale catastrophic events, is the most rational management direction." (Draft Recovery Plan, Conclusions, page 472)
- "Fire suppression in the Klamath and East Cascades subregions has helped to create a broader landscape pattern of multiple-canopied stands with thick understories, thought to be suitable for northern spotted owl habitat. The forest protection strategies recommended here will reduce some of that habitat to more effectively protect the rest. Such forests, in their present condition, are also more likely to be catastrophically disturbed because of higher physiological stress, caused by increased tree density, higher fire hazard, and higher horizontal and vertical fuel continuity…Recommendations to reduce owl habitat in order to save it may seem a paradox. We believe that such implementation will, in the long run, better protect owl habitat than a more short-sighted attempt to continue total protection. Active management in some areas to reduce the

probability of large-scale catastrophic events is the most rational management direction." (Draft Recovery Plan, pages 421-422).

On April 26, 2007, a revised Draft Recovery Plan for the northern spotted owl was released by the U.S. Fish and Wildlife Service. Public comment will be accepted until June 25, 2007. The Plan provides a blueprint for recovering the northern spotted owl to the point that it no longer needs Federal protection.

One of the findings by the team of experts that developed the Plan was that competition from barred owls is the primary threat facing the northern spotted owl. To better understand the impact of barred owls on spotted owls, the Draft Recovery Plan calls for additional research, including the control of barred owl populations in certain areas of the spotted owl's range.

The Plan also states that other important threats to the spotted owl include loss of habitat quality and quantity as a result of past activities and disturbances and ongoing and projected loss of habitat as a result of fire, logging and conversion of habitat to other uses. The Plan also ranked threats by importance in each province. The Eastern Oregon Cascades province scored high on threats from ongoing habitat loss as a result of wildfires and the effects of fire exclusion on vegetatation change. The Five Buttes project is located within the Eastern Oregon Cascades province.

In summary, the Draft Recovery Plan recognized a need to balance the management for the spotted owl with other habitat conditions on the landscape. Where development of suitable spotted owl habitat best fits the landscape, additional measures should be incorporated to ensure that components of habitat, such as prey species habitat requirements, dispersal habitat, and large trees, are being managed for.

DISPERSAL

The term dispersal habitat is commonly used to describe forest stands used by juvenile spotted owls during movement away from natal areas or by subadult and adult owls moving from one territory to another (Forsman et al. 2002 cited in Buchanan 2005). Generally, forest stands with an average tree diameter >11 in. and conifer overstory trees with closed canopies (>40 percent canopy closure) with open space beneath the canopy to allow for the owls to fly are considered owl dispersal habitat (Thomas et al. 1990 in Buchanan 2005).

The Status and Trends of Northern Spotted Owl Populations and Habitat (Buchanan tech. ed., chapter 4, 2005) provided a chapter summarizing owl movement based on an assessment of spotted owl natal and breeding dispersal from records of banded and radio-marked spotted owls between 1985 and 1996. These movement records provided tangible evidence that spotted owls are dispersing across the landscape under the Northwest Forest Plan. It also supports the conclusion by Forsman et al. (2002 in Buchanan 2005) that a conservation strategy that consists of numerous, closely spaced reserves of old forest would not likely result in genetic or demographic isolation of local populations because dispersal between reserves will be a common occurrence even if landscapes between the reserves consist of highly fragmented forests (Lint 2005).

The dispersal habitat definition described above is not biologically possible in all east-side Cascades plant association groups. The Deschutes National Forest convened a Science Team of experts on local conditions to determine dispersal habitats. The team determined a process by which local biological knowledge of sites would be used to describe dispersal habitat (USDA Letter 1996). The criteria displayed in Table 3-28 were developed using the prescribed process and used to define dispersal habitat for the Seven Buttes and Seven Buttes Return environmental assessments and will also be used for the Five Buttes project.

Table 3-28. Dispersal habitat definition developed by the Deschutes National Forest.

Plant Association Group	Even-aged Stands	Uneven-aged Stands
Mixed Conifer Wet	11" dbh, 40% Canopy Cover	11" dbh, 40% Canopy Cover
Mixed Conifer dry	8" dbh, 35% Canopy Cover	11" dbh, 35% Canopy Cover
Ponderosa Pine	8" dbh, 35% Canopy Cover	11" dbh, 35% Canopy Cover
Lodgepole Pine	7" dbh, 30% Canopy Cover	7" dbh, 30% Canopy Cover
Mountain Hemlock	7" dbh, 30% Canopy Cover	7" dbh, 30% Canopy Cover

There are approximately 81,000 acres (57 percent of the national forest lands) in the Five Buttes project area that provide suitable dispersal habitat for the spotted owl. This acreage does not include stands currently functioning as NRF habitat. The stand replacement severity of the Davis fire created an impediment to dispersal beginning north of Hamner Butte and extending northerly approximately 2 miles to the fire boundary. Dispersal connectivity was also lost from the southeastern shoreline of Davis Lake northeasterly over the top of Davis Mountain down to Round Swamp on Wickiup Reservoir. This break is also about 2-2.5 miles wide of moderate to high intensity forest loss. As a result there is no dispersal connectivity from the east side of Davis Lake easterly to the edge of the spotted owl range (about 4 miles) and northerly to Wickiup Reservoir and beyond on the Bend-Ft. Rock Ranger District.

Northern spotted owl dispersal capability is maintained on the remainder of the project area. However, dispersal capability is somewhat fragmented as a result of past regeneration timber harvests, shelterwood cuts, salvage of dead and down lodgepole northwest of Davis Lake, non-forested areas including Davis Lake lava flow and Black Rock lava pit, and stringer meadow systems in the upper Odell Creek drainage.

HOME RANGES AND SURVEY STATUS

Table 3-29 displays the survey and nesting status of the eleven northern spotted owl home ranges within the Five Buttes project area. The Willamette Pass pair was first located in 2002 and the Trapper Creek territory was first discovered in June 2005. The other home ranges have been known for greater than ten years. Surveys in the Five Buttes area were conducted three times each in 1999 and 2000 as part of the Seven Buttes Return environmental analysis. Three surveys were also completed in 2004 and again in 2005. Three visits to each activity center were completed in 2006. Results from those surveys are displayed Table 3-29.

Table 3-29. Status of northern spotted owls within Five Buttes project area.

Owl Pair Name/Number	Status 97	Status 98	Status 99	Status 00	Status 01	Status 02	Status 03	Status 04	Status 05	Status 06
McCool Bt. (2001)	NA	NA	P-1	NA	NA	UNK	NA	STVA	NA	NA
Hamner Bt. (2002)	P	NA	NA	NA	NA	NA	R/1	P	P	NA
Ringo Bt. (2003)	NA	R/2	P-1	UNK	NA	NA	NA	P-1	P	NA
Maklaks Mtn. (2004)	P-1	P	P-1	NA	NA	R/2	NA	R/2	R/1	NA
Moore Cr. (2005)	NA	P	NA	UNK	UNK	R/1	R/?	NA	NA	NA
Davis Mtn. (2006)	P	R/1	P	P	P-1	P	R/1*	NA*	NA*	NA*
Saddle Bt. (2008)	NA	R/2	P-1	UNK	NA	NA	NA	NA	NA	NA
Royce Mtn. (2010)	P-1	NA	UNK	UNK	UNK	P-1	P-1	NA	NA	NA
Moore Cr. Trail (2011)	NA	UNK	NA	UNK	NA	NA	NA	NA	OS	P
Willamette Pass (2013)						R/2	P	NA	NA	NA
Trapper (2014)									P	P
NA = Not active P = Pair site occupied OS = single bird site R/1* = Davis site with 1 young prior to wildfire	P-1 = Pair site, 1 bird located R/# = Pair, # of young NA* = Davis territory destroyed by wildfire 2003				Unk = Unknown status STVA = Barred owl presenc					

Barred owls have been documented in the project area for at least 10 years including individual responses while conducting northern spotted owl surveys, unsolicited while conducting other avian species surveys, and from random observations. As of late-summer 2006 there were no known barred owl pair territories in the project area or anywhere on the Crescent Ranger District. Within the project area, auditory calls and/or visual observations have been recorded on Royce Mountain (1996 and 2006), McCool Butte (2004), above Odell Lake on Maklaks Mountain (2005) and outside the project area on Refrigerator Creek (2002) and near Big Marsh in 2003. There is no evidence that barred owls have displaced spotted owls on the Crescent Ranger District as of May, 2007.

Evaluation Criteria

The following evaluation criteria are designed to display expected changes in habitat conditions for the northern spotted owl as well as what changes may occur within known spotted owl territories. Included will be discussions on differences in silvicultural and fuels treatments, change in prey base habitat, dispersal connectivity, short- and long-term effects of converting spotted owl NRF habitat to dispersal habitat, and acres of treatments by Northwest Forest Plan allocations and designated Critical Habitat.

The following criteria will be used to evaluate the effects of planned activities:

1. Acres of Nesting, Roosting, and Foraging (NRF) habitat treated by alternative as compared to the existing condition.
2. Acres of NRF habitat treated within the Davis Late-Successional Reserve and northern spotted owl Critical Habitat Unit (CHU) OR-7.
3. Acres of northern spotted owl dispersal habitat treated in the project area.
4. Acres of NRF habitat affected by treatment type (i.e. commercial thinning versus small tree thinning).
5. Acres and types of treatments occurring within known northern spotted owl home ranges.

Environmental Consequences

Alternative A – No Action

NRF Habitat

The selection of this alternative would result in no timber harvest or fuels reduction treatments in the 19,038 acres of currently defined NRF habitat in the project area. In the short-term there would likely be little change in the amount or distribution of NRF habitat present. Over time, in-growth of shade tolerant species such as white fir in late-seral single story stands of mixed conifer may create additional acreage of NRF habitat in the project area. Over the long-term there would also likely be NRF habitat lost to wildfire, tree diseases or beetle outbreaks. Although there is no way to predict the severity or timing of these events the 21,000-acre Davis Fire of 2003 resulted in the loss of at least 5,090 acres of NRF. Since vegetation conditions similar to those associated with the Davis Fire still exist on the landscape and would not change under Alternative A, the risk of another large-scale event like the Davis Fire is high (also see the sections titled “Forested Vegetation” and “Fire and Fuels” in Chapter 3 of this EIS). Depending on the severity of the habitat loss, pairs or individual spotted owls would have less dispersal and nesting habitat available to them. Wildfires may also result in the direct mortality to spotted owls.

Davis LSR/CHU

Effects to the Davis LSR and designated critical habitat would be similar to that described above. This alternative would not take any steps toward meeting the DLSRA objectives of cycling NRF habitat in the LSR over time.

Dispersal Habitat

Natural ecological processes would continue to evolve likely resulting in some additional in-growth of stands into suitable dispersal conditions particularly within younger aged plantations. However, there is also the risk of some currently suitable dispersal stands being affected directly or indirectly from a fire event that could limit avenues of owl dispersal both within and out of the project area. As a reference point, the majority of the Davis Fire area was available as dispersal habitat for the spotted owl; following the fire, very little dispersal habitat remained in the fire area. An epidemic infestation of beetles could have a similar effect on habitat.

Approximately 4,700 acres of the Davis Fire was planted with tree seedlings in the spring of 2006. The Davis Fire Recovery projected spotted owl dispersal habitat conditions would be attained in 30-40 years.

Over time, this would help facilitate spotted owl dispersal within the fire area as well as lands within the Five Buttes project area and onto adjoining ranger districts.

Northern Spotted Owl Home Ranges

The selection of this alternative would have no effect on existing northern spotted owl home ranges, at least in the short-term. However as previously stated, the lack of risk reduction work may result in an unacceptable loss of large tree at some point in the future to wildfires or beetle outbreaks related to drought or tree density competition.

Northern Spotted Owl Threats

The 1992 and 2007 Draft Recovery Plans identified these threats to the northern spotted owl:

- **Barred owls**. Although barred owls have been documented to occur on the Crescent Ranger District, there are no known pairs. There is also no evidence that spotted owls have been displaced from their territories by barred owls. Implementation of this alternative would not result in habitat fragmentation that could contribute to an increase in barred owl occupancy of the project area.
- **West Nile Virus**. One captive spotted owl in Ontario, Canada contracted West Nile Virus and died, but there are no cases of the virus in wild spotted owls (Draft Recovery Plan, USFWS 2007). Health officials expect that West Nile Virus eventually will spread throughout the range of the spotted owl (Blakesley et al. 2004, in USFWS 2007) but it is unknown how the virus will ultimately affect spotted owl populations. This factor is beyond the scope of the Five Buttes project.
- **Sudden Oak Death**. This threat is not applicable to the project area because the host species is not present.

The selection of Alternative A would not result in any change in these threats that would affect the spotted owl.

Summary

In summary the selection of this alternative would have long-term consequences. The cycling in-and-out of NRF habitat is important for maintaining northern spotted owl habitat in the east-side Cascades where most spotted owl habitat is unsustainable over time without periodic silvicultural treatments. This condition has been recognized by biologists since stated in the Draft Northern Spotted Owl Recovery Plan produced in 1992. Lint (2005) cautioned against relying solely on the repetitive design of the conservation strategy to mitigate effects of catastrophic wildfire events, and highlighted the potential to influence fire and fire effects through active management. Thomas (2006) stated "protection strategies likely contributed to the creation of spotted owl habitat east of the Cascade crest. In order to protect the new habitat created by fire exclusion, we must thin to prevent stand-replacement fire. But thinning could alter owl habitat adversely. So, likely the answer is to thin to protect habitat knowing full well that the condition will return as we thin other habitat for short-term protection. In other words, the management is dynamic and protective at the same time." Agee (2006) had similar comments for the southern and eastern portions of the Northwest Forest Plan lands: "In those areas fires historically were much more frequent, and suppression has altered them considerably. We're going to have to thin and conduct controlled burning in order to restore them. Ironically, the long-term future of owls may depend on altering some of their habitat in order to protect them." Therefore, NRF habitat is at high risk of loss with the implementation of this alternative.

Direct and Indirect Effects Common to Both Action Alternatives

Both action alternatives propose a combination of vegetative treatments that involve stand density reduction through commercial thinning, small-tree thinning, and underburning as prescribed. The silvicultural prescriptions for commercial thinning include treatments to maintain a multi-storied forest although the intensity level will vary depending on site objectives. Heavier thinning such as a 60 upper management zone (UMZ) prescription reduces the time frequency before another commercial entry is required but still preserves the largest diameter trees in a given stand. Heavier thins would just remove more understory to reach a target basal area and could return to NRF conditions in an estimated 3-5 decades depending on the amount of understory trees left and their growth response to the thinning. Lighter thinning in NRF stands allows the treated stands to recover to a NRF condition in a shorter timeframe, perhaps in 2-3 decades depending on site conditions and the ability of the understory to respond to thinning with increased tree height and crown diameter. In both prescriptions however, enough canopy would be retained in the overstory for the stand to function as spotted owl foraging and dispersal habitat.

Single story prescriptions that retain and enhance late-seral and old growth ponderosa pine and/or Douglas-fir are generally designed in NRF habitat where the site objective is bald eagle nesting habitat. This results in a trade-off of nesting habitat of one species for that of another; in this case, both species are federally listed. While spotted owl nesting capability would be removed, enough canopy cover would be retained to provide spotted owl dispersal capability. This would be a direct, long-term effect, converting current NRF stands to a late-seral single-story condition. Repeated silvicultural entries would be required to maintain this objective. Generally, the understory tree removal will focus on cutting white fir and lodgepole pine but minor amounts of ponderosa pine, Douglas-fir, Shasta red fir, mountain hemlock, and sugar pine may also be removed. The majority of the trees to be removed will be less than 21 inches dbh but occasionally trees over 21 inches will be cut to meet basal area objectives, spacing needs, or diseased tree removal. Based on past environmental assessments utilizing similar objectives, 5 percent or less of the trees to be cut will be greater than 21 inches dbh.

Commercial thinning will also occur in forested stands not currently providing NRF conditions and those plant associations not capable of growing NRF such as lodgepole pine. The largest diameter trees would be the priority for retention because they may require several centuries to attain that size. Where dispersal habitat is currently present it is assumed dispersal habitat ability would be maintained after treatment although in lodgepole pine stands meeting the 30 percent canopy cover requirement can be problematic depending on existing conditions.

An indirect effect of commercial thinning is the increased risk of additional tree loss to windthrow. Typically, prevailing storms approach from the south or southwest and reducing stand density on these aspects increase the risk of more green tree loss to windthrow though there is no way to predict if or when this might occur or the severity. The south side of Davis Mountain, Maklaks Mountain, and the east side of Davis Lake are several areas that may be more susceptible to windthrow. During site layout of individual units where past windthrow has occurred, feathering the stand edges with additional tree retention could be used to lessen the risk (see mitigation measures).

Both alternatives propose the construction of approximately 6 miles of temporary road to provide access to harvest units. Because temporary roads are usually less than 14 feet in width, this would amount to a loss of about 12 acres of forested stands across the 160,000 acre planning area. After the completion of all associated activities, the temporary roads would be subsoiled and allowed to re-vegetate. The effects to the spotted owl would be negligible overall because the ground appearance would be similar to many mature forested stands with tree spacing of 12 - 14 feet.

Underburning has been proposed as a fuels reduction activity on some of the harvest units. Burning would occur near the Crescent cut-off road, south side of Royce Mountain, Maklaks Mountain, east of Ringo Butte, east of Davis Lake, south of Pine Butte, in the Wickiup Bald Eagle Management Area, and north of Ranger Butte. Some of these burning units are within stands currently classified as NRF habitat although no burning would occur within any spotted owl home ranges.

Typically, underburning objectives are to reduce surface fuels particularly in the small diameter ranges 3 inches and under. This would change the amount of small diameter wood present in an affected area and depending on the site, may negatively affect the shrub and small tree layers. This would then affect small mammal cover and their forage base including mushrooms, truffles, and fruits and seed sources from existing shrubs. If repeated burning operations are conducted it has the potential to change the understory shrub composition and/or convert from a shrub dominated site to one favoring grasses and forbs. By conducting a mosaic burn leaving patches undisturbed from fire, effects on small mammals can be reduced. This recommendation is normally written into burn plans (see mitigation measures). One potential benefit of underburning is a reduction of seedling and sapling sized trees that would allow avian predators such as the spotted owl easier access to the forest floor to pursue prey.

The ability of mammals to survive fire depends on their mobility and on the uniformity, severity, size, and duration of the fire (Wright and Bailey 1982 in Smith 2000). Most small mammals seek refuge underground or in sheltered places within the burn and avoid fire by using underground tunnels, pathways under moist forest litter, stump and root holes, spaces under rock, talus, and large dead wood (Ford and others 1999 in Smith 2000). Small rodents such as woodrats that build surface nests are more vulnerable to fire-caused mortality. Most reports of woodrat responses to fire indicate that they usually suffer relatively high mortality because their nests are above ground (Simons 1991 in Smith 2000). Within the Five Buttes project area, underburning would not occur within rock outcrops and lava pressure ridges to maintain unaltered habitat favorable to the woodrat. However, some mortality to woodrat populations would be expected on those lands without rock outcrops or lava pressure ridges. Efforts would be made to avoid burning snags and large down logs that may provide habitat for this species. Lehmkuhl et al. (2006 in press) suggested that a variable density thinning prescription with retention of woody-debris legacies (large snags and woody debris) on the scale of 0.2-0.5 hectare patches might be a useful starting point for developing new dry forest management prescriptions. Mitigation measures have been provided for unmanaged retention areas where no thinning or underburning would occur. This would help maintain bushy-tailed woodrat populations across the project area.

As previously mentioned, northern flying squirrels are an important prey species for the northern spotted owl and truffles provide the bulk of the diet for flying squirrels. Lemkuhl et al. (2004) in a study in the east Cascades of Washington stated that active management of dry forest types may result in stands with fewer trees, a less complex and more open canopy structure with some likely warming and drying effects on microclimate compared to more xeric conditions and his data suggests that will result in lower richness and biomass of truffles, but would favor species associated with dryer conditions. He also found that flying squirrel summer home ranges increased in open pine forests compared to young and mature forest. Within the project area, open ponderosa pine forest is the objective near Pine Butte and within the BEMA near Wickiup Reservoir. As also previously mentioned, there are currently no known northern spotted owl activity centers near either of these areas.

Because northern flying squirrels are heavily dependent on truffles and mushrooms as a major portion of their diet, forest vegetation manipulations that have an effect on truffles and mushroom production will also affect populations of flying squirrels and ultimately northern spotted owls which prey on the squirrels. Luoma et al. (2004) conducted a study of ectomycorrhizal fungus production in response to varying levels and patterns of green-tree retention as one experiment in the DEMO Study (Aubrey et al. 2004). Ectomycorrhizal fungi produce sporocarps in the form of mushrooms and truffles including above ground or below ground species. Their study on the Gifford Pinchot and Umpqua National Forests lend support to the use of dispersed green tree retention in combination with aggregated retention when maintenance of sporocarp production is a goal. They determined the 40 percent dispersed (40 percent of the basal area) green tree retention treatments maintained higher levels of ectomycorrhizal sporocarp biomass and total number of fruiting species than the 15 percent retention units. The commercial thinning planned in the Five Buttes project would retain greater than 40 percent of the basal area in all harvest units that propose commercial thinning; consequently, truffle and mushroom production should be maintained although likely at a reduced level from the current condition. This would continue to provide a forage base for flying squirrels and prey for the spotted owl.

To summarize, the effects of commercial thinning and underburning may have some negative effects on prey populations but can be partially ameliorated by the retention of snags, down woody debris in all size and decay classes, and the retention of understory shrubs to serve as cover and food resources for small mammals. This would be accomplished by leaving a well distributed component of dead and down wood and shrubs during the underburning operations and retaining unmanaged areas scattered in each activity unit. The potential negative stand-scale effects on flying squirrels, truffles, and lichens of dry-forest thinning for fire and fuels management are traded for potential long-term stability of dry-forest landscapes (Agee and Edmonds 1992, Agee 1998, 2003 cited in Lehmkuhl et al. 2006 in press).

Alternative B
Direct and Indirect Effects

NRF Habitat
Table 3-30 displays the acres of spotted owl nesting, roosting, and foraging habitat affected within each Northwest Forest Plan allocation.

Table 3-30. Acres of Nesting, Roosting, and Foraging Habitat (NRF) in activity units by Northwest Forest Plan Allocation.

Alternative	Administratively Withdrawn	Congressionally Withdrawn	Late-Successional Reserve	Matrix	Total
A	0	0	0	0	0
B	29 (<1%)	53 (<1%)	648 (3%)	2,092 (11%)	2,822 (15%)
C	0	74 (<1%)	936 (5%)	2,197 (12%)	3,254 (17%)

Table 3-31 displays the acres of NRF habitat affected by treatment type across the entire Five Buttes project area.

Table 3-31. Acres of nesting, roosting, and foraging habitat (NRF) proposed in activity units within the Five Buttes project area.

Alternative	Existing NRF Acreage	Acres of Commercial Thinning Treatment in NRF	Acres of Fuels Reduction Treatment in NRF	Acres and Percentage of NRF Habitat Remaining
A	19,038	0	0	0%
B	19,038	2,822	0	16,216 (85%)
C	19,038	2,023	1,231*	16,932 (89%)

* Only removes green trees <3 inches dbh to an average18-20 foot leave tree spacing, stand is assumed to remain functional NRF after treatment.

The selection of alternative B would result in the commercial thinning of 2,822 acres (15 percent) of NRF habitat across the project area. As displayed in Table 3-30, the majority of the NRF treatments would occur in the Matrix allocation of the Northwest Forest Plan. This alternative includes prescriptions for single story late-seral objectives to maintain and enhance bald eagle nesting habitat along the eastern shore of Davis Lake and on the north side of Davis Mountain near Wickiup Reservoir, both within BEMAs. Regular commercial thinnings and underburning activity would be used on an as needed basis to maintain the desired habitat components for bald eagles. This would be an expected long-term conversion of spotted owl NRF habitat to mostly single-storied late-seral habitat for nesting bald eagles. Pockets of multi-storied late-seral stands however would be maintained for eagle winter roosting habitat within the 15 percent retention areas and in those stands not selected for commercial thinning as part of this project analysis. The single-story late-seral stands would function as dispersal spotted owl habitat for the foreseeable future. At the present time there are no known spotted owl activity centers on the north side of Davis Mountain so this would not affect known owl pairs or territorial single birds.

In the remainder of the project area, multi-storied forest would still be retained on much of the NRF habitat affected with the expectation these stands would still provide foraging and dispersal habitat post-harvest for owls that may be dispersing through these areas. There would be no loss of NRF habitat within occupied spotted owl home ranges in this alternative. While NRF habitat would be converted to foraging and dispersal habitat in the multi-story harvest units, these stands will have the capability to return to NRF conditions in the future. The in-growth of shade-tolerant tree species is what helped create NRF habitat originally. In essence, this alternative sets back NRF succession in activity units within both single- and multi-story harvest areas although the large diameter trees would be maintained in each.

LSR/CHU

Table 3-32 displays the acres of NRF habitat affected by treatment type within the Davis Late-Successional Reserve. Total Davis Late-Successional Reserve acreage is 48,900 of which 8,313 acres (17%) meets the NRF definition.

Table 3-32. Acres of Nesting, Roosting, and Foraging Habitat (NRF) proposed in activity units within the Davis Late-Successional Reserve.

Alternative	Existing Acres of NRF In LSR	Acres of NRF Treated In LSR	NRF Treated That Remains NRF	NRF To Foraging and Dispersal	NRF To Dispersal	Acres of NRF Remaining
A	8,313	0	0	0	0	8,313
B	8,313	648 (8%)	0	535	113	7,665 (92%)
C	8,313	936 (11%)	318*	543	75	7,695 (93%)
* Alternative C proposes 936 acres of NRF stand treatment including 618 acres of commercial thinning and 318 acres of fuels treatment. Fuels treatment only removes live green trees <3 inches dbh to an average 18-20 foot leave tree spacing; stands are assumed to remain functional NRF after treatment.						

Table 3-33 displays the acres of NRF habitat affected by treatment type within designated Critical Habitat Unit CHU OR-7. Total CHU acreage is 32,262 of which 5,750 acres (18%) meets the NRF definition.

Table 3-33. Acres of Nesting, Roosting, and Foraging Habitat (NRF) proposed in activity units within Critical Habitat Unit CHU OR-7.

Alternative	Existing Acres of NRF in CHU	Acres of NRF Treated in CHU	NRF Treated That Remains NRF	NRF To Foraging and Dispersal	NRF To Dispersal	Acres of NRF Remaining
A	5,750	0	0	0	0	5,924
B	5,750	286 (5%)	0	254	32	5,464 (95%)
C	5,750	522 (9%)	264*	254	4	5,492 (96%)
*Alternative C proposes 522 acres of NRF stand treatment including 258 acres of commercial thinning and 264 acres of fuels treatment. Fuels treatment only removes live green trees <3 inches dbh to an average 18-20 foot leave tree spacing; stands are assumed to remain functional NRF after treatment.						

Approximately 8 percent of the NRF acreage within the Davis LSR and 5 percent of the CHU NRF acreage would be affected by project activities with nearly all of that still functioning as foraging and dispersal habitat for the spotted owl after the completion of harvest activities. This is the result of most silvicultural prescriptions maintaining a relatively high canopy cover and a multi-storied canopy. The most noticeable difference will be a reduction in understory trees under 21 inches in diameter. Snags would not be intentionally removed nor would dead and down woody material be appreciably changed, which would provide continued prey base habitat for northern flying squirrels, woodrats, red-backed voles and other small mammals.

Dispersal

Table 3-34 displays the acres of dispersal habitat treated by alternative.

Table 3-34. Acres of spotted owl dispersal habitat with silvicultural and/or fuels treatments in the Five Buttes project area.

Existing Dispersal Acres*	Alt. A Treated Acres	Alt. B Treated Acres	Alt. C Treated Acres
80,932	0	2,551 (3%)	4,429 (6%)
* Dispersal acres do not include forested stands currently functioning as NRF habitat. The assumption is that all treatments in dispersal habitat will remain dispersal habitat after treatment.			

All commercial thinning and fuels reduction work would maintain dispersal capability after the completion of all activity treatments to the canopy cover levels specified in Table 3-26.

Spotted Owl Home Ranges Affected
Table 3-35 displays the acres of silvicultural and fuels treatments with spotted owl home ranges.

Table 3-35. Acres of silvicultural and fuels treatment within spotted owl home ranges.

Alternative	Hamner Home Range (1,952 ac. NRF)		Maklaks Home Range (678 ac. NRF)		McCool Home Range (637 ac. NRF)		Royce Home Range (846 ac. NRF)	
	Ac. NRF	Ac. Non-NRF	Ac. NRF	Ac. Non-NRF	Ac. NRF	Ac. Non-NRF	Ac. NRF	Ac. Non-NRF***
A	0	0	0	0	0	0	0	0
B	0	55	0	149	0	0	0	0
C	145* (10%)	86**	0	115	274* (43%)	291**	0	124**

* Fuels treatments removing green trees <3" dbh
** Fuels treatments removing green trees <6" dbh
*** Non-NRF is defined as stands meeting a dispersal habitat definition or not currently meeting dispersal habitat due to canopy cover or average stand diameter.

As displayed in Table 3-33, Alternative B would conduct stand density reductions (commercial thinning) within the Hamner Butte and Maklaks spotted owl territories, but there would no tree removal within any NRF stand. Activity unit #440 (55 acres) is near the outer edge of the Hamner Butte home range and is currently described as foraging and dispersal habitat. The silvicultural prescription for this unit is 9M which will maintain a multi-storied canopy. Because snags and down wood are not targeted for removal and no underburning is proposed which could adversely affect prey base habitat, this stand should still function as foraging and dispersal habitat post-harvest for the Hamner pair of owls.

Two harvest units are within the home range of the Maklaks pair, unit #370 (115 acres) and unit #825 (34 acres). Unit #825 would be a salvage recovery of dead and down lodgepole within a stand that does not function as nesting, roosting, foraging, or dispersal habitat because of the tree species present and the lack of canopy cover that defines dispersal habitat. This stand is defined as non-NRF and does not meet a dispersal habitat definition because of low canopy cover levels primarily due to tree loss from mountain pine beetle.

None of the commercial thinning or salvage proposed should have a negative short- or long-term effect on either spotted owl pair because the current habitat capability would still remain after the completion of harvest activities.

Northern Spotted Owl Threats
Effects of Alternative B would be similar to those described for Alternative A.

Alternative C
Direct and Indirect Effects

NRF
The selection of alternative C would result in the commercial thinning of 2,023 acres (11 percent) and the small-tree thinning only (<3" dbh) of 1,148 acres (6%) of the NRF habitat within the project area. As displayed in Table 3-30, the majority of the NRF treatments would occur in the Matrix allocation of the Northwest Forest Plan. Similar to alternative B, alternative C proposes objectives to promote and maintain single story late-seral stands for bald eagle nesting habitat on the east side of Davis Lake and on the north side of Davis Mountain near Wickiup Reservoir, both areas within eagle management areas. As displayed on the alternative maps (Figures 2-1 and 2-2) there is less commercial thinning proposed in these two areas as compared to alternative B; however, more total acreage would have some tree removal. Alternative C

would permit small-tree sized tree removal (<3" dbh) in the BEMA acreage to reduce the amount of ladder fuels in these older multi-storied stands. Pruning to a height of 6-8 feet of the remaining trees would also be performed to reduce the susceptibility of ground fire reaching into the tree crowns. This combination would provide some additional protection from fire but at the same time still function as NRF habitat for spotted owls. This conclusion is reached because these small diameter trees and the limited pruning would have no affect on the overall stand canopy cover with nesting and roosting capability maintained. A multi-storied forest would persist in these small diameter removal stands. While no spotted owls are known to occupy the north side of Davis Mountain, the removal of small diameter trees to a spacing of 15-18 feet would allow owls better access to the forest floor for prey capture.

Within the commercial thinning units repeated silvicultural entries and underburning activity would be used on an as needed basis to maintain the desired habitat components for bald eagles. This would be an expected long-term conversion of spotted owl NRF habitat to mostly single-storied late-seral habitat for nesting bald eagles. Pockets of multi-storied late-seral stands however would be maintained for eagle winter roosting habitat within the 15 percent retention areas and those stands not selected for commercial thinning as part of this project analysis. The single-story late-seral stands would function as dispersing spotted owl habitat for the foreseeable future.

In the remainder of the project area, multi-storied forest would be retained on much of the affected NRF habitat with the expectation these stands would continue to provide foraging and dispersal habitat post-harvest for owls that may be dispersing through these areas. There would no loss of NRF habitat within occupied spotted owl home ranges in this alternative. While NRF habitat would be converted to foraging and dispersal habitat in the multi-story harvest units, these stands will have the capability to return to NRF conditions in 2-3 decades. The in-growth of shade-tolerant tree species is what helped create NRF habitat originally. Similar to Alternative B, Alternative C also sets back NRF succession within both single- and multi-story harvest areas, although the large diameter trees would be maintained in each.

LSR/CHU

Tables 3-32 and 3-33 display the acres of NRF habitat proposed for commercial thinning within the Davis LSR and Critical Habitat Unit CHU OR-7. Approximately 936 acres of NRF habitat would be affected by project activities although 318 acres (LSR) of that total would still function as NRF habitat after the completion of fuels reduction work. This would equate to 7 percent of the NRF acreage within the Davis LSR being converted to dispersal or foraging habitat.

Within the CHU 522 acres of NRF habitat would be affected by thinning and fuels work although 264 acres would still remain as viable NRF habitat because only trees less than 3 inches in diameter would be removed. This would equate to 4 percent of the CHU NRF acreage affected by project activities with nearly all of that still functioning as foraging and dispersal habitat for the spotted owl after the completion of harvest activities.

The most noticeable difference between Alternative B and Alternative C is the addition of fuels treatment units in Alternative C. These treatment areas would focus on removing green trees less than 3 inches dbh and pruning of green limbs to 6-8 feet. If a fire start were to occur in these stands a fire suppression crew would have an increased opportunity to catch the fire before it reached into the canopy or into adjacent acreage with a ladder fuel component. This small diameter thinning would not change the ability of these stands to provide nesting habitat for the owl over the long-term. The commercial thinning and fuels reduction activities would reduce the risk of fire reaching into untreated NRF habitat across the LSR and CHU if the fire start occurred in the treated stands. This would help maintain the capability of the LSR and CHU to function as envisioned in the Davis Late-Successional Reserve Plan and the Northern Spotted Owl Recovery Plan.

Within either type of treatment unit (commercial thinning or fuels) the most noticeable visual difference will be a reduction in the understory tree layer. Snags would not be intentionally removed nor would dead and down woody material be appreciably changed which would provide continued prey base habitat for northern flying squirrels, woodrats, red-backed voles and other small mammals. In those units proposed for commercial timber harvest the conversion of existing NRF habitat to a foraging and dispersal condition is expected to be at least a short-term effect. Within an estimated 2-3 decades canopy cover will have increased enough particularly in the understory to meet NRF standards once again. The retention of the largest trees present in the stands and an understory, though reduced, would retain the option of allowing these stands to become nesting and roosting habitat for the spotted owl in the future.

Dispersal

Similar to described for Alternative B, Alternative C commercial thinning and fuels reduction work should maintain dispersal capability after the completion of all activity treatments particularly in the ponderosa pine and mixed conifer plant associations.

Spotted Owl Home Ranges Affected

As displayed in Table 3-35, Alternative C would conduct stand density reductions within three spotted owl home ranges as compared to the two in Alternative B. Thinning of trees less than 3 inches diameter and pruning of existing trees to 6-8 feet in height in the fuels harvest units is proposed in NRF habitat within two owl home ranges (Hamner and McCool). Each treated stand would retain its nesting and roosting habitat capability. It would also improve the spotted owl foraging accessability to the forest floor for prey capture by greatly reducing the density of small trees blanketing the ground. In addition to the thinning of 3 inch diameter and smaller, some thinning of 6 inch and smaller trees would also occur in the Hamner, McCool and Royce territories. This would occur within stands not currently functioning as NRF habitat but capable of providing foraging and/or dispersal habitat. Post-treatment, each stand would have the same function since only small diameter trees would be removed, which would not result in a significant change in canopy cover, snag levels or the amount and distribution of down wood in the harvest units.

Northern Spotted Owl Threats

Effects of Alterantive Cwould be similar to those described for Alternative A.

None of the commercial thinning or small-tree thinning should have a negative effect on any spotted owl pair because the habitat capability that was present before the silvicultural or fuels work would still be present post-harvest. There are no treatment units planned within ¼ mile of any spotted owl pair activity center based on surveys completed in 2004, 2005, and 2006.

Summary of Action Alternative Differences

NRF Habitat

Alternative B proposes the greatest amount of commercial thinning within NRF habitat (2,822 acres) although Alternative C proposes more total treatment acres of NRF habitat (3,254). In Alternative C there would be 2,023 acres of NRF habitat with commercial thinning and 1,148 acres of NRF habitat with fuels reduction treatment where only green trees less than 3 inches dbh would be removed. The fuels reduction only acreage would remain NRF habitat. Consequently, Alternative C would be less impactive to the NRF habitat since less acreage would be converted from NRF habitat to a foraging or dispersal habitat condition.

Alternative C dropped 799 acres of commercial thinning in NRF habitat (proposed in Alternative B) on the north sides of Davis Mountain and Odell Butte and east of Ringo Butte/Cryder Butte. These areas are currently capable of supporting new spotted owl pair occupancy; by removing these acres from the proposal and because adjacent NRF stands are not proposed for silvicultural treatment in the Five Buttes project, Alternative C would maintain the capability of these areas to support occupancy.

NRF Habitat Risk Reduction/Habitat Protection

Both action alternatives propose commercial thinning activities that in combination with post-harvest fuel treatment of slash will act as fuel breaks in the event of a fire. Commercial thinning also lowers the risk of catastrophic loss of large trees to insect and disease outbreaks because competition has been reduced. While large tree loss may still occur it would be at endemic levels. Both action alternatives have harvest or treatment units that were placed strategically, however Alternative C proposes an additional 1,148 acres of NRF treatment of small trees (<3 inches dbh) located on the north slope of Davis Mountain, north slope of Odell Butte, Royce Mountain, McCool Butte, and the west side of Hamner Butte. This action would provide some additional resource protection of NRF stands adjacent to the fuels units. The reduction of the small diameter trees would reduce ladder fuels capable of reaching the overstory in a fire event. This provides some additional time for fire suppression personnel to catch the fire while it is still small. The small tree thinning would not effectively reduce the potential of large tree loss due to stand density competition.

In addition to the <3 inch dbh green tree thinning in NRF stands, Alternative C also proposes fuels treatments in non-NRF stands by removing green trees <6 inches dbh. This would occur in the Odell Creek drainage, Royce Mountain, McCool Butte, and along the Cascade Lakes Highway. The combination of small tree thinning (fuels units) and the commercial thinning planned would result in Alternative C providing better risk reduction of NRF stands than Alternative B because more total acres are planned for treatment.

Spotted Owl Home Ranges
The commercial thinning treatments planned in Alternative B would result in NRF habitat risk reduction to five spotted owl home ranges (Maklaks, Royce, Hamner, Ringo and Saddle Butte). The placement of treatments outside the home ranges plus the non-NRF commercial thinning planned within the Maklaks and Hamner home ranges would reduce the risk of wildfire entering into these home ranges and causing loss of NRF habitat. Alternative C proposes a combination of commercial thinning and fuels treatments outside 6 spotted owl home ranges (Maklaks, Royce, Hamner, Ringo, Saddle Butte and McCool Butte but also plans treatments areas within 4 spotted owl home ranges as displayed in Table 3-35. While Alternative C does not plan as much commercial thinning as Alternative B, the addition of units having fuels treatments only strategically placed adjacent to commercial thin units and between home ranges should provide more effective risk reduction to existing NRF habitat within spotted owl home ranges as compared to Alternative B.

Cumulative Effects
Activities identified in Table 3-1 were reviewed to assess whether, in combination with the Five Buttes Project, there would be overlap of time and space. Cumulative effects will be addressed at three different scales – Five Buttes project area, Crescent Ranger District, and the Deschutes National Forest.

Five Buttes Project Area
The Five Buttes project could result, depending on the action alternative, in the modification of 2,023 to 2,822 acres of NRF habitat being converted to foraging and dispersal habitat or to a dispersal only habitat condition. None of this modification would occur within an occupied spotted owl home range; consequently, there would be no effect to known pairs or territorial single owls. However, NRF habitat modification would occur within unoccupied home ranges and could affect the ability of new owls to locate and establish a territory where commercial thinning treatments are planned. Some of this NRF acreage is within BEMAs, where the focus is to maintain large tree single-story stands for nesting bald eagle habitat. Where multi-story forest is the desired objective, commercially thinned stands could be allowed to develop into NRF habitat conditions again, although it may require 2-5 decades to achieve this condition. The commercial thinning and fuels reduction treatments also result in reduction of risk to existing habitat that is currently occupied. See the Fire and Fuels discussion where risk of burning multiple spotted owl home ranges is discussed by alternative. By taking an active management approach, there is an increase in the likelihood of spotted owls being able to persist in their current home ranges. As displayed in Table 3-31, 85 percent to 89 percent of the existing NRF habitat in the project area would be retained after the completion of all Five Buttes harvest and fuels reduction activities.

Other planned commercial activities within the planning area and district-wide is the harvest of mushrooms outside the Davis LSR. The Davis Fire area has experienced a flush of morel mushrooms the last several years and may continue for an additional few years. Harvest permits for morels are issued but it is unknown how many pounds are being removed within the fire area. Mushrooms are an important forage base for the northern flying squirrel and the squirrel is the primary prey for the northern spotted owl. Based on surveys conducted since 2004, there is no indication spotted owls are utilizing the fire acreage for nesting, roosting foraging, or for dispersal habitat. This may be because it was primarily a stand replacement event. It was determined that morel harvesting is having a neutral effect on the spotted owl.

There are about 18,278 acres of private lands in the project area with the majority of that in industrial forestlands located in the southeastern area and outside the range of the spotted owl. Of the private land within the range of the spotted owl, the majority of that acreage is in housing subdivisions. It is assumed NRF habitat does not exist now or in the future on private land. However, limited dispersal ability is currently present on some of those lands near Crescent Lake Junction. The assumption is that dispersal habitat would not be maintained on these lands for the long-term.

Crescent Ranger District
The Davis Fire of 2003 reduced the availability of NRF habitat by approximately 5,000 acres (USDA 2004) in the Five Buttes project area. Of the 5,000 acres, approximately 3,736 were within the Davis LSR. Approximately 450 of the 5,000 acres of NRF habitat lost were due to suppression efforts.

Where the fire was stand replacement, it completely removed the habitat within the Davis Mountain spotted owl home range and portions of Saddle Butte and Hamner Butte home ranges. Over the last 10 years, vegetation manipulation in the Seven Buttes (3,341 acres), Baja 58 (1,068 acres), and Crescent Lake WUI (162 acres) in NRF habitat has been accounted for in the Biological Assessment. None of this NRF acreage was within a known spotted owl home range. The U.S. Fish and Wildlife Service provided consultation of all three projects and authorized “habitat take.” The Seven Buttes Return EA (USDA 2001) was authorized to treat 3,434 acres of NRF; however, this was never implemented due to the Davis Fire. In light of the wildfire, subsequent loss of NRF, and the vulnerability of the remaining NSO habitat, the need for active management was reinforced. The prescriptions for thinning in earlier projects are similar to that described for the Five Buttes project. In addition to the commercial thinning of NRF, these projects also actively managed stands that were not considered suitable NRF habitat at the time. These stands were characterized as small tree diameters, lack of old growth trees, and/or lack of sufficient canopy cover that defines NRF habitat. These treatments occurred within the range of the owl and implemented the landscape scale strategy to risk to large tree loss. They also retained the ability to promote the development of suitable NRF habitat where desired in the future.

Reasonably foreseeable vegetation projects in NRF habitat on the district that potentially overlap the Five Buttes project in space and time include the BLT EIS, Wickiup Acres CE, and the Lakeside WUI CE. There are no NRF treatments planned in the BLT and Wickiup Acres project areas. The Lakeside WUI encompasses the perimeter of Odell and Crescent Lakes and NRF habitat is present in both project areas, although it is outside the Davis LSR. The fuels prescriptions would remove live trees less than 3 inches in diameter in both areas and stands that were classified as NRF before treatment would remain as NRF after implementation.

Deschutes National Forest
Other vegetation projects that have reduced NRF habitat include the Charlie Brown EA (USDA 2000) on 990 acres. Habitat “take” was granted by the USFWS, and accounted in the Five Buttes Biological Assessment.

Across the rest of the forest, wildfire and active management has reduced owl habitat further. In the past 5 years, approximately 16,654 acres of NRF habitat has been lost mostly due to wildfires on the Crescent and Sisters Ranger District (Davis, B&B, and Link Fires). Since the January 2004 baseline for the Crescent District, 1,169 acres of NRF has been removed from the baseline because field verification determined the stands did not meet the NRF definition for canopy cover or large trees. Table 3-36 displays the baseline NRF habitat for the forest up to May, 2007.

Table 3-36. Deschutes NF Baseline NSO Nesting, Roosting, and Foraging (NRF) Habitat Acres

Ranger District	May 2006 Baseline Acres
Crescent	26,427
Sisters	36,935
Bend/Ft. Rock	24,787
	Total 88,149*
*Acres are from the 2006 - 2009 Programmatic BA.	

Since 2003, wildfires have affected 16 of the 42 spotted owl home ranges on the Deschutes National Forest. It is questionable if 15 of the 16 sites would continue to support spotted owls based on the amount of habitat removed. Because of the low density of owls, the retention of owl habitat, particularly habitat within occupied home ranges, becomes very important to the persistence of owls on the Deschutes National Forest.

The Five Buttes project follows a larger plan which is the Davis Late-Successional Reserve Assessment (available on file at the Crescent Ranger District). It specifies a strategy for cycling habitat around the landscape. With the recent loss of over 5,000 acres of NRF habitat and two owl territories, the strategy for the LSR has changed to a more strategic active management scenario. The desired condition is to manage at least 60 percent of the remaining unburned area toward a climatic-climax condition through time maintaining at least 25 percent in NRF habitat. This requires a landscape-scale strategy to cycle in and out of NRF habitat while maintaining the large tree component throughout the cycle. The cycling from non-NRF (may be NRF capable, or not) to near-NRF to NRF across the landscape over time would reduce risk to large and contiguous blocks of habitat to disturbance processes. Part of this strategy is to incorporate the drier and more strategic sites for risk reduction in an open condition benefiting bald eagles and white-headed woodpeckers. This strategy includes developing dispersal habitat (at a minimum) on non-NRF capable lands while reducing threats from wide-scale disturbance processes. ***Silvicultural and fuel reduction activities that have the capability to reduce the risk of long-term permanent loss of owl habitat are an increasingly important strategy for the persistence of spotted owls on the Deschutes National Forest.***

The 1992 and 2007 draft recovery plans identified threats to the northern spotted owl:

Barred owl: Although barred owls have been documented to occur on the Crescent Ranger District although there are no known pairs. There also is no evidence that spotted owls have been displaced from their territories from barred owls. Implementation of the action alternatives would not result in habitat fragmentation that could contribute to an increase in barred owl occupancy in the project area.

West Nile virus: One captive spotted owl in Ontario, Canada contracted west Nile virus and died, but there are no documented cases of the virus in wild populations (Draft Recovery Plan, USFWS, 2007). Health officials expect west Nile Virus will eventually spread throughout the range of the spotted owl (Blakesley et al, 2004 in USFWS Draft Recovery Plan, 2007), but it is unknown how the virus will ultimately affect spotted owl populations. This factor is beyond the scope of the Five Buttes analysis.

Sudden Oak Death Syndrome: Sudden oak death syndrome has no host species located in the project area that would facilitate its establishment and spread.

Critical Habitat Unit CHU OR-7

Critical Habitat Units were developed by the USFWS as a network of habitat to support continued persistence of the northern spotted owl. Generally, their boundaries are very similar to LSRs. Critical habitat units were established prior to the signing of the NFP and the designation of LSRs. As with LSRs, maintenance of habitat in CHUs is important. Both action alternatives implement a strategy to retain habitat on the landscape although forest vegetative activities that would change constituent habitat elements (nesting, roosting, foraging, and dispersal) in the short-term. In the long-term, this strategy is designed for long-term benefit of landscape-scale risk reduction, promoting the survival and recovery of the northern spotted owl. Therefore, the determination is that implementation of Alternatives B or C would "**May Affect, and is Likely To Adversely Affect**" CHU OR-7. Formal consultation with the USFWS has been completed.

Determination

The Odell Watershed Assessment and the Davis LSRA identified most of the watershed and LSR at risk for large scale tree loss to insect, disease and wildfire due to the in-growth of shade-tolerant tree species (e.g. white fir). As evidenced in the Davis Fire, there is the potential for large scale wildfire events to severely affect National Forest system lands in the east-Cascades province. Fuel loadings and stand density likely higher than historical conditions on much of the planning area increase the risk for an additional large scale disturbance event.

Implementation of the strategy to cycle NRF around the landscape in the Five Buttes Project would maintain the large tree component on the landscape and allow cycling from non-NRF to near NRF to NRF over time to reduce risk to large and contiguous blocks of habitat to disturbance processes. Part of this strategy is to incorporate the drier and more strategic sites for risk reduction in an open condition benefiting bald eagles and white-headed woodpeckers. In all actively-managed stands currently providing either NRF or dispersal habitat, they should remain as foraging and/or dispersal habitat at a minimum, if it is determined more important for strategic risk reduction than remaining NRF. Alternative B reduces more acres of NRF habitat through thinning to reduce stand density. Although Alternative C actively manages more acres in NRF stands, it retains more NRF because the prescriptions for the "fuels only" treatments do not change the NRF status. Because of the additional risk reduction activity to create larger blocks in strategic places, Alternative C provides greater risk reduction for existing spotted owl territories from wildfire. Alteration of fire behavior on a landscape scale is a product of essentially three aspects of the fuel profile: 1) ground fuels 2) ladder fuels 3) crown bulk density. Small diameter thinning (only) can alter the first two, but it is necessary to incorporate all three (except in areas desired to remain NRF habitat) in order to be effective on a landscape scale.

Alternative A - Because stands would remain at current levels of risk to a wide-scale disturbance similar to the Davis Fire of 2003, the determination is that implementation of Alternative A **"May Affect, and is Likely to Adversely Affect"** the northern spotted owl.

Alternatives B and C - The selection of either alternative would result in conversion of some NRF habitat to a foraging and/or dispersal condition. Where this occurs in a strategic location, it would be maintained as part of the landscape risk reduction strategy, benefiting bald eagle nesting habitat and providing an area of modified fire behavior. The remaining stands that are actively managed would be cycled from non-NRF to NRF across the landscape, dependent on the need to provide habitat in a particular place and time. This would retain the largest diameter trees throughout the cycle, and make it more likely for them to remain on the landscape to provide future options. Because active management will occur in occupied spotted owl territories and that NRF habitat would be affected across the project area, the determination is that implementation of Alternatives B or C "**May Affect, and is Likely to Adversely Affect**" the northern spotted owl.

Consistency with the Programmatic Biological Assessment

The Five Buttes project does not comply with all Project Design Criteria (PDCs) provided in the 2006-2009 Programmatic Biological Assessment for northern spotted owls. More specifically, project activities will remove, downgrade, or degrade primary constituent elements of northern spotted owl critical habitat including stands currently functioning as nesting, roosting, foraging and dispersal habitat (PDC Criteria B.1.(a), (b), (c), and (d). The project also does not maintain all existing NRF habitat for connectivity (PDC C.4). Because the project does not comply with all PDCs, formal consultation with the USFWS is required.

Consistency with the Davis LSR Assessment and Odell Pilot Watershed Analysis

The Five Buttes project is consistent with the recommendations for Management Strategy Areas in the 2007 updated Davis Late-Successional Reserve Assessment and the Odell Pilot Watershed Analysis update completed in 1999.

Northern Bald Eagle

Federal Threatened, Management Indicator Species

The northern bald eagle population in Oregon is currently listed as a Threatened species by the USFWS although a de-listing proposal was initiated on July 6, 1999. At the present time, the USFWS has reopened the public comment period on its original 1999 proposal to remove the bald eagle from the Federal list of threatened and endangered species. The reopening of the comment period is due to new information related to the nesting management guidelines and the regulatory definition of "disturb" along with updated population numbers and status information received since the 1999 proposed delisting.

Most bald eagle nest territories continue to be monitored on an annual basis. The eagle's listing status was the result of habitat destruction, harassment and disturbance, shooting, electrocution, poisoning, declining food base, and environmental contaminants. More recently, bald eagles in the state of Oregon are increasing, expanding their range, and the population is nearly doubling every decade (Isaacs, pers comm. 2004).

Ecology: A detailed account of bald eagle habitat requirements can be found in the Pacific Bald Eagle Recovery Plan (USDI 1986). Bald eagle nesting territories are normally associated with lakes, reservoirs, or rivers. Nests are usually located in large conifers in uneven-aged, multi-storied stands with old-growth components (Anthony et al. 1982). Nest trees usually provide an unobstructed view of the associated body of water. Live, mature trees with deformed tops are often selected for nesting. East of the Cascade Mountains in Oregon, bald eagles prefer nesting in ponderosa pine trees that average 46 inches in diameter (range 21-76 inches) and tend to be larger than the surrounding trees (Anthony et al 1982).

Existing Condition

The Recovery Plan designated Recovery zones for each state and the Deschutes National Forest is within the High Cascades Zone of Oregon. The Recovery Plan goal for the High Cascades is 33 territories and the Habitat Management goal is 47 territories. By the end of the 2005 nesting season there were 64 occupied bald eagle breeding territories in the High Cascades Zone. The 5-year average (2001-2005) of young/occupied territory was 1.01 for the High Cascades Zone (Isaacs and Anthony 2005). This rate has met the objectives of the Pacific Bald Eagle Recovery Plan.

Nesting surveys are conducted annually on the Crescent Ranger District to determine site occupancy and nesting status. Table 3-37 displays the thirteen bald eagle territories within the Five Buttes project area and their nesting status over the last 10 years.

Table 3-37. Bald eagle nest territories and historical nesting status 1997-2006 for territories within the Five Buttes Project Area (compilation from Isaacs and Anthony 2005 and survey results from 2006).

Territory Name	Year First Located	Status 2006	Status 2005	Status 2004	Status 2003	Status 2002	Status 2001	Status 2000	Status 1999	Status 1998	Status 1997
Round Swamp	1971	oF	1	2/s	2,ND/n*	2	F	oF	2	1	oF
Wickiup South	1978	1	2	2	oF	oF	oF	oF	oF	2	1
Lava Flow	1993	1	oF	oF	1	2	2	1	1	1	F
Davis SE	1971	oF	2	1/s	2/n	oF	*2	2	F	oF	oF
Davis W	1985	1	1	2	1	1	al	al	al	Al	al
Davis NW	1973	1	2	*oF	1/n	oF	1	F	oF	F	2
Odell SE	1976	1	1	1	F	1	oF	oF	2	1	F
Odell Creek/ Resort Ridge	2004	oF	2	2							
Triple Thunder	1995	2	2	1	2	2	1	1	al	2	2
Odell NE	1979	1	oF	oF	oF	NL	NL	NL	2	NL	NL
Odell NW	1976	1	oF	1	*2d	F/j	2	1	1	2	1
Pengra Pass	1998	2	1	1	2	2	1	F	1	1	
Pebble Bay	1997	2	oF	oF	2	2/j	2	1	1	F	1
Chinquapin Point	2006	oF									
Total Young		13	14	13	15	12	11	6	10	10	7

1or 2 = # young produced
2/n = 2 young, nest burned in a fire
oF = site occupied, nest failed
F = failed nesting
NL = nest not looked for or not located
2,ND/n* = 2 young, nest down burned in a fire
1/s = 1 young, nest tree 100% dead
RT = red-tailed hawk occupied the nest
2/j = 2 young, camera installed after nesting season
al = alternate nest
*2 = 2 young, nest rebuilt since last observation

In addition, a mid-winter survey is conducted in early to mid-January of each year to estimate the number of bald eagles wintering on Crescent Lake, Odell Lake and Davis Lake. Over the last 5 years the annual mid-winter count of bald eagles has ranged from a low of 16 in 2005 to a high of 27 birds in 2004.

Management direction for bald eagle habitat is provided by the Deschutes LRMP through the designation of Bald Eagle Management Areas (BEMAs). Management direction in the Deschutes LRMP for BEMAs permits small-tree thinning and timber harvest to achieve eagle habitat objectives. In catastrophic situations all efforts are to be made to protect or create suitable eagle habitat (Deschutes LRMP M3-4, 5, 6, 7 page 4-94). It also calls for protection of all existing nest, roost, and perch trees which are defined as 110 feet in height and 40 inches or greater in diameter (Deschutes LRMP M3-11, 12, page 4-95). Site specific BEMA plans have also been prepared by district personnel for nest sites near Wickiup Reservoir, Davis Lake, Crescent Lake, and Odell Lake. At the present time there are no known communal winter roosts, although a fall roost with over 20 individual adult and immature eagles was discovered in October 2003 on Breezy Point of Odell Lake.

There are about 9,224 acres of National Forest land designated as BEMAs within the Five Buttes project area. Included in this total are 181 acres (1 BEMA) on the east side of Crescent Lake, 3,872 acres (4 BEMAs) adjacent to Davis Lake, 1,481 acres (4 BEMAs) adjacent to Odell Lake, and 3,690 acres (3 BEMAs) on the Crescent Ranger District side of Wickiup Reservoir. Within the Davis BEMAs, 2,009 acres were burned at a moderate or high intensity and 345 acres burned at a low intensity. In the Wickiup BEMAs 916 acres were burned at a moderate or high intensity and 118 acres were of low intensity. The moderate and high intensity burns essentially killed the majority of the green trees while the low intensity burns mainly killed the understory trees and left the large diameter Douglas-fir and ponderosa pine alive. The Davis Fire killed the bald eagle nest trees for the Round Swamp, Davis SE, and the Davis NW pairs; however, each pair re-built nests in fire-killed ponderosa pines and were each successful in fledging young in 2005. Live old growth ponderosa pine trees are still available, though limited, for future nesting opportunities in the Wickiup, Davis SE, and Davis NW territories. For the 2006 nesting season, all 3 bald eagle pairs were still occupying fire-killed old growth trees for nesting.

Vegetative conditions within the BEMAs vary considerably, although each BEMA contains at least some component of old growth ponderosa pine capable of providing nest tree habitat. Past vegetation management has reduced stand densities in some stands while others have a dominant overstory of old growth ponderosa pine with or without Douglas-fir and understory layers of mixed fir and lodgepole pine. These two and three layer stands provide potential roost habitat but are also susceptible to an increased risk of large tree loss to competition stress and/or wildfires because the understories trees could carry fire into the overstory.

Evaluation Criteria

While several thousand acres of large tree habitat within BEMAs was lost to the Davis Fire, there is still risk of losing additional bald eagle habitat to beetle outbreaks and/or additional wildfire events. Accelerating the development of younger-aged tree stands and maintaining the health of existing nesting and roosting habitat is needed for bald eagle habitat management. The effects on the northern bald eagle will be evaluated by the following measure:

- Total acres and types of silvicultural treatments that would occur within Bald Eagle Management Areas (BEMAs).

Environmental Consequences

Alternative A – No Action

Direct and Indirect Effects

Implementation of this alternative would result in no immediate change to the vegetative condition within the 9,224 acres of BEMAs within the project area. Natural successional processes would occur which may result in some level of large tree loss due to stand competition. The prolonged absence of a disturbance agent including wildfire has caused most mid-elevation, dry, mixed-conifer forests to develop into densely stocked, multi-storied forests that used to be relatively less common for the area.

This alternative foregoes the opportunity to allow understory green tree removal to reduce stand densities and the competition for water and soil nutrients beneficial to the late-successional and old growth ponderosa pine and Douglas-fir trees used by nesting bald eagles. Planting of ponderosa pine and Douglas-fir seedlings has occurred within the Davis and Wickiup BEMAs in the spring of 2006 as prescribed in the Davis Fire Recovery EIS (USDA 2004) for future bald eagle nesting and roosting habitat.

Determination
Alternative A

Selection of Alternative A of the Five Buttes project **"May Affect, but is Not Likely To Adversely Affect"** the northern bald eagle. This determination is based on the potential for large tree loss to disease, insects or wildfire events within the BEMAs.

Effects Common to Alternatives B and C
Direct and Indirect Effects

Both action alternatives propose silvicultural and fuels treatments within lands allocated as BEMAs adjacent to Davis Lake and Wickiup Reservoir and Odell Lake in Alternative C. Silvicultural treatment intensities and the amount of unthinned retention areas will vary between alternatives as described below. There will also be differences in the amount of acreage planned for underburning to reduce fuel loadings. Implementation of any action alternative will result in stand density reduction that would relieve competition to the late and old structure (LOS) ponderosa pine and Douglas-fir capable of providing current and future nest structure for bald eagles. Arnett et al (2001) in a study of selective logging in southcentral Oregon's Klamath Basin determined that bald eagle territory occupancy and productivity can be maintained in conjunction with careful forest management planning and implementation.

Mitigation measures have been provided to prohibit all disturbance activities including timber harvesting, temporary road construction, and fuel reduction treatments within 0.25 to 0.50 mile of nesting bald eagle pairs during the nesting season of January 1 through August 31and winter roosting habitat from November 1 through April 30 each year.

Table 3-38 displays the acres of silvicultural thinning and fuels reductions prescriptions planned in BEMAs that are within the boundaries of the Five Buttes project.

Table 3-38. Acres of silvicultural and fuels treatments within Bald Eagle Management Areas (BEMAs) within Five Buttes Project Area

BEMA	Alt. A		Alt. B		Alt. C	
Wickiup (3,690 ac.)	Thinning	0	Thinning	475	Thinning	446
	Fuels Only*	0	Fuels Only*	0	Fuels Only*	883
	Total	0	Total	475	Total	1,329
Davis (3,872 ac.)	Thinning	0	Thinning	366	Thinning	345
	Fuels Only*	0	Fuels Only*	0	Fuels Only*	10
	Total	0	Total	366	Total	355
Crescent (181 ac.)	Thinning	0	Thinning	0	Thinning	0
	Fuels Only*	0	Fuels Only*	0	Fuels Only*	0
	Total	0	Total	0	Total	0
Odell (1,481 ac.)	Thinning	0	Thinning	0	Thinning	0
	Fuels Only*	0	Fuels Only*	0	Fuels Only*	8
	Total	0	Total	0	Total	8
Grand Total (9,224 ac.)		0		841		1,692

* Live trees to be removed are less than 3 inches in diameter in northern spotted owl nesting, roosting, and foraging (NRF) habitat and 6 inches or less in non-NRF habitat.

Alternative B
Direct and Indirect Effects

Eight hundred forty-one (841) acres of commercial and small diameter thinning is proposed in Alternative B within the BEMAs. Prescriptions are designed to reduce stem densities with the emphasis on removing trees less than 21 inches in diameter. There may be conditions where an occasional green tree over 21 inches diameter would be removed to meet spacing requirements, basal area objectives, or to remove a diseased tree. Generally, this would not exceed 5 percent of the total commercial trees harvested and the largest trees would remain.

Large trees are the component in bald eagle habitat that takes the longest to replace. There are many benefits associated with density reduction, including:

- Keeping actual and potential nest trees healthy.
- Recruitment of new potential nest trees.
- Reducing the risk of a problem fire occurring by removing the ladder fuels that allow ground fires to transition to crowns[14].

With mitigation measures in place to restrict activities during the nesting and winter roosting periods there would be no direct effects to bald eagles nesting or roosting in the project area. The range of effects from disturbance as a result of project implementation is dependent upon the life stage of the eagle. Project implementation can cause a disruption of courtship with unsuccessful reproduction, and mortality of young due to nest abandonment or exposure to the weather. However, mitigation to protect bald eagles (see Chapter 2 of this EIS) has been used on the forest, is a standard and guideline identified in the Deschutes LRMP, and has documented success in implementation.

The majority of the thinning would take place in the Wickiup BEMA with a silvicultural objective of moving the BEMA toward a late-successional single story forested condition. Small tree thinning (including seedlings and saplings) would occur after commercial harvest, followed by fuels reduction activities that may include hand piling or grapple piling of slash, utilization or disposal or landing piles and carefully prescribed underburning (or a combination of methods). The thinning and fuels activities would be similar in the Davis BEMAs. Activities would occur within 0.25 mile of two nest stands (Wickiup South and Lava Flow pairs) in Alternative B. Mitigation would restrict activities during the bald eagle breeding season of January 1 through August 31 of each year unless surveys determine the pairs' nesting attempts have failed. Winter roost sites have not been confirmed at this time although Isaacs (2004 pers comm.) has stated they are generally very near the nest stands. For this reason a winter work restriction has been placed on units #74, #85, #265, and #757 because of their proximity to the Lava Flow and Wickiup South bald eagle nest stands. If surveys determine no winter roosting is occurring, the November 1 through April 30 restriction could be lifted, although seasonal restrictions would still apply beginning January 1 of each year when the nesting period begins.

All of the planned commercial thinning units in the BEMAs are currently multi-storied stands capable of providing roosting habitat. However, the thinning prescription is to move towards a single story condition which would lessen their ability to provide thermal protection during winter storms. Retention of 15 percent of the stands in an unmanaged condition (project design criteria) would provide adequate roosting habitat in addition to suitable stands that were not identified for commercial thinning in the Five Buttes project area. Retention areas would be at least 1-2 acres in size and in larger units, untreated blocks could be greater than 15-20 acres in size.

Activities such as thinning and prescribed underburning increase the risk of windthrow within treated stands and potentially increase the loss of large diameter trees. Typically the trees that remain are dominant or co-dominant and already have a developed root system. Activities such as thinning and prescribed burning are designed to improve growing conditions which improves overall survival. As

[14] Crown fires typically result in mortality of large trees; please refer to the "Fire and Fuels" section for more discussion of types of wildfires and associated risks.

vegetation is removed, previously occupied root zones are available for the remaining trees to take advantage. During the first growing season, remaining trees are more vulnerable to windthrow, but it has not been evidenced as a common event on the forest in similar conditions and the effect is more than offset by the beneficial aspect.

The commercial thinning proposed in Alternative B would provide short- and long-term protection from a fire event for the bald eagle nest stands near Lava Flow campground on Davis Lake plus the Wickiup South and Round Swamp nest stands near Wickiup Reservoir. Because both understory and intermediate sized trees would be removed, risk of ground and/or crown fire reaching into the nest stands would be reduced.

Thinning prescriptions and fuels treatments identified are consistent with the Wickiup Reservoir/Davis Lake BEMA plan and the Odell Lake/Crescent Lake BEMA plan (USDA Forest Service, on file at the Crescent Ranger District). Also, planned activities are consistent with the Project Design Criteria (PDCs) in the 2006-2009 Joint Aquatic and Terrestrial Programmatic Biological Assessment for Federal Land Administered by the Deschutes and Ochoco National Forests (USDA, 2006).

Alternative C
Direct and Indirect Effects

The selection of Alternative C would result in the commercial thinning of 446 acres and understory fuel reduction on 883 acres within the Wickiup BEMA. The Davis BEMAs would experience 345 acres of commercial thinning and 10 acres of fuel reduction only treatment. All fuels treatments units would focus on small tree removal less than 6 inches in diameter. Small diameter live trees would be retained at an average spacing of 18-20 feet. The disturbance associated with commercial thinning would be similar to those described for Alternative B although reduced. The greatest difference in Alternative C is the increased amount of acreage that would receive only fuel reduction activities focusing on green tree removal less than 3 inches in diameter in stands identified as northern spotted owl NRF habitat and 6 inches and smaller on those stands that are not identified as northern spotted owl NRF habitat. Similar to Alternative B, green trees to be retained would have an average spacing of 18-20 feet. Pruning of the remaining green trees would be done to an average height of 8 feet to reduce the ladder fuel effect. Stands treated to this prescription would be considered multi-storied and capable of providing nesting and roosting habitat. Also similar to Alternative B roosting habitat would be provided in blocks of unthinned forest (15 percent) within harvest units as part of design criteria. This roosting habitat would also be available within suitable stands that were not identified for active management in the Five Buttes project area.

Disturbing activities would occur within 0.25 mile of two nest stands (Wickiup South and Lava Flow pairs) in Alternative C and a winter work restriction has been placed on units #74, #85, #135, #265, and #757 because of their proximity to the Lava Flow and Wickiup South bald eagle nest stands. The same conditions apply as discussed for Alternative B, including consistency with relevant BEMA plans and Project Design Criteria developed cooperatively with the U.S. Fish and Wildlife Service.

Effects discussed regarding windthrow under Alternative B are similar.

Alternative C would provide greater protection to bald eagle nest stands than Alternative B. While there is no difference in treatments between Alternatives B and C at the Lava Flow nest stand, there is additional acreage planned for treatment south of Wickiup Reservoir in Alternative C. Even though this added acreage is limited to less than 3 inches diameter tree removal, the additional acreage would reduce the ladder fuel component on lands south of both Wickiup bald eagle nest stands. However, periodic small tree thinning would be required to maintain this reduced fire risk to bald eagle habitat.

All thinning prescriptions and the fuels treatments identified are consistent with the Wickiup Reservoir/Davis Lake BEMA plan and the Odell Lake/Crescent Lake BEMA plan. Planned activities are also consistent with the Project Design Criteria (PDCs) in the 2006-2009 Joint Aquatic and Terrestrial Programmatic Biological Assessment for Federal Land Administered by the Deschutes and Ochoco National Forests (USDA, 2006).

Cumulative Effects for Both Action Alternatives
The following discussion used BEMAs and home ranges as the spatial scale, including past and present actions to provide the most relevant, useful, helpful, necessary and informative format for the public and deciding official. Foreseeable actions in Table 3-1 were reviewed to assess whether effects of these actions in combination with the expected effects from Five Buttes were additive with regard to bald eagles.

The Davis Fire of 2003 reduced bald eagle nesting and roosting habitat in the Wickiup and Davis BEMAs by approximately 2,900 acres of which nearly 2,700 acres were burned to a moderate or high intensity. However, nesting habitat is still available on 48 percent of the Davis Lake BEMA acreage and on 72 percent of the Wickiup BEMA acreage.

Project areas that overlap with Five Buttes in the zone of influence include the Seven Buttes, Seven Buttes Return and Charlie Brown. The Seven Buttes EA (USDA 1996) implemented 929 acres of understory thinning within the same 9,224 acres of BEMAs (Wickiup, Davis and Odell Lake). The Seven Buttes Return EA (USDA 2001) decision included 1,466 acres of commercial thinning, salvage and individual tree culturing in the same BEMAs; however, the entire decision has not been completely implemented (due to the Davis Fire) and is being re-analyzed with the Five Buttes project. Both decisions were based on the rationale that there would be no loss of nesting habitat within the BEMAs. For the activities implemented to date, this has been shown to be true. The remaining timber sales to be implemented in the Seven Buttes Return area are not within nesting or roosting habitat. The Crescent Lake WUI EA (USDA 2004) decision included 100 acres of silvicultural treatments including 29 acres of commercial thinning and 71 acres of small diameter thinning within the Crescent Lake East BEMA which is inside the Five Buttes project area. At the present time, these sales have not been sold or awarded but are projected for sale and award later in 2006. The biological assessments for all three projects reached a "**Not Likely to Adversely Affect**" determination based on the reduction in roosting habitat. The U.S. Fish and Wildlife Service concurred with these determinations in a separate biological opinion for each project (on file at the Crescent Ranger District). These projects were incorporated into the existing condition discussion.

The Bend/Ft. Rock Ranger District prepared an environmental assessment (Charlie Brown, USDA 2001) that proposed vegetative treatments similar to those analyzed in Seven Buttes Return. A total of 1,835 acres were evaluated within 11 BEMAs including acreage surrounding Wickiup Reservoir. The biological evaluation stated there would be a few minor short-term effects on bald eagles; overall, a beneficial effect determination was made for both action alternatives. The U.S. Fish and Wildlife Service concurred with these determinations in a biological opinion. These projects have also been completed with no loss of bald eagle nesting habitat, and compliment the entire BEMAs surrounding Wickiup Reservoir by reducing the likelihood of wide-scale disturbance processes in area that has a high level of recreation during the summertime.

Additional silvicultural and/or fuels treatments are expected in the future within BEMAs to continue the reduction of stand susceptibility to large tree loss from insects and disease. Several new projects are proposed and are considered foreseeable actions, including better defining existing campsites within Lava Flow campground, Lakeside Wildland Urban Interface small diameter thinning and fuels reduction (including removal of 3 inch and smaller material), Wagon Trail Wildland Urban Interface Fuels Reduction on Bureau of Land Management lands in the La Pine Basin, and Wickiup Estates, a smaller project to reduce the risk from wildfire around a subdivision. Activities proposed in these foreseeable actions would not remove bald eagle habitat and would incorporate seasonal restrictions as needed; therefore, there is no additive effect.

Other commercial activities within the Five Buttes planning area include springtime morel mushroom hunting within the Davis Fire area. It is unknown if harvesting is occurring within bald eagle nest groves with the exception of the Lava Flow site on Davis Lake, which is under a signed closure order. Morels are typically found in fire areas within the first few years post-fire; since the Davis Fire occurred in 2003, it is likely that conditions that produce morels will decrease until the wildfire area no longer provides extraordinary fungi habitat[15]. The level of exposure to mushroom harvesters is considered similar to campers who use the area during the spring/summer season; effects of the actions proposed in the Five Buttes planning area are not additive to effects related to mushroom harvesters on bald eagles or bald eagle habitat.

At the present time there are no known bald eagle nests located on private lands in and adjacent to the project area. Present and future actions on private lands include timber harvest and road construction on former Crown Pacific lands, and potential for home construction. These activities are not expected to affect bald eagle territories because most private land acreage is located away from the lakes and reservoirs where bald eagles are currently known to roost or nest and the best existing suitable habitat is on federal lands.

Determination
Alternative B

Selection of Alternative B **"May Affect, But Is Not Likely To Adversely Affect"** the northern bald eagle. This determination is based on the following factors.

Alternative B would not reduce the most important aspect of bald eagle habitat (nesting) over the short-term, which is considered five years through implementation. Over the long-term, it would be beneficial by reducing risk to wide-scale disturbance processes. The Davis Fire of 2003 killed three bald eagle nest trees although each pair rebuilt new nests almost immediately either in the same fire-killed nest tree or in another fire-killed tree within 150 yards of the previous nest. At this time it does not appear the fire has negatively affected the bald eagle nesting territories or nesting success. However, nesting capability in these snags will likely be temporary because the snags may only stay standing several decades. The understory reduction of live trees within the BEMAs is designed to reduce the risk of an uncharacteristic loss to late and old structure ponderosa pine and Douglas-fir from insects, disease, or wildfire.

While there is a potential of loss of large trees due to windthrow, this is usually limited to 1-2 years after commercial harvest and has not been documented as a major concern in the BEMAs. Project implementation should also not result in increased recreational use in the BEMAs nor result in increased nest visibility from open road systems.

Exact levels of human disturbance associated with nesting sites are unknown. Many of the nests are known to the public. The Five Buttes project has incorporated measures that restrict activities during the breeding and winter roosting period. Evidenced by similar projects such as Seven Buttes, Seven Buttes Return, and Charlie Brown around high use recreation sites, these measures are effective and numbers of bald eagles on the forest are increasing (Table 3-37).

Determination
Alternative C

Selection of Alternative C **"May Affect, But Is Not Likely To Adversely Affect"** the northern bald eagle. This determination is based on the following factors:

Alternative C would not reduce the most important aspect of bald eagle habitat (nesting) over the short-term, which is considered five years through implementation. Over the long-term, it would be beneficial by reducing risk to wide-scale disturbance processes. While this alternative proposes a considerable increase in the number of acres of active management, over half the acreage involved would remove live trees less than 3 inches in diameter and pruning limbs to a height of about 8 feet.

Measures to limit disturbance and the discussion of the effects are similar to those described for Alternative B.

[15] This trend is evidenced by the sale of permits on the Crescent Ranger District. In 2005, the Ranger District issued less than a hundred morel personal-use and commercial permits district-wide.

Canada Lynx

Federal Threatened

The Canada lynx was listed as a threatened species on March 24, 2000 (Federal Register Volume 65, No. 58). At that time the USFWS and the Forest Service entered into a conservation agreement to establish an interagency framework for lynx conservation. The original agreement expired in 2004 but was renewed on May 31, 2005. The agreement is an interim measure to reduce or eliminate adverse effects of proposed projects to lynx and occupied habitat until long term conservation measures are in place. Federal agencies also agreed to consider the Lynx Conservation Assessment and Strategy (LCAS) in the design of projects and forest plan amendments and revisions to address risks to lynx.

Critical Habitat designation for the lynx was completed in November, 2006. Critical Habitat designation fell within three states, and comprises approximately 1,841 square miles within Washington, Minnesota and Montana. No evidence suggests that Oregon ever supported self-sustaining populations of lynx in the past 100 years, and no Critical Habitat for the lynx was designated within Oregon. The conclusion is that not all occupied habitat is essential to conservation of the lynx (FR Vol. 71, No. 217, November 9, 2006).

Existing Condition

The Forest Wildlife Biologists for the Deschutes and Ochoco National Forests and the Crooked River National Grassland have made a determination based on the best available science, that neither Canada lynx nor their habitat are currently present on these administrative units (Jeffries and Zalunardo 2003). There is only one verified Canada lynx record from the Deschutes National Forest collected near Lava Lake in 1916, and only 12 verified records in all of Oregon since 1897. Most of the verified lynx records in Oregon coincide with population peaks of lynx in Alaska and Canada. Self- maintaining populations of lynx in Oregon have not existed historically, and lynx occurrence here is likely the result of dispersal from occupied areas with declining prey populations (Verts and Carraway 1998; McKelvey and Aubrey 2001). Surveys for lynx were conducted on the Deschutes National Forest in 1999, 2000, and 2001. There were no lynx detections confirmed from the survey effort.

The Lynx Biology Team reported that all investigations into lynx habitat in the southern part of its range show an association between lynx and lodgepole pine cover types within the subalpine fir series. The best available scientific information suggests that subalpine fir plant associations capable of supporting a minimum density of snowshoe hares is a reasonable surrogate for describing lynx habitat conditions to support survival (primary vegetation to support survival and reproduction and constitute a Lynx Analysis Unit). In addition, the Lynx Conservation Assessment and Strategy (Reudiger et al. 2000) identified the need for at least 10 square miles of primary vegetation to support lynx survival and reproduction and constitute a lynx analysis unit. On the Deschutes National Forest, four subalpine fir plant associations (subalpine fir-Engleman spruce, alpine parkland sedge, alpine parkland woodrush, and alpine parkland sagebrush) could be considered primary vegetation that could contribute to lynx habitat. In total, about 3,650 acres of subalpine fir plant associations occur across the entire Deschutes National Forest and most of those acres (3,500) are “parklands” which do not support snowshoe hare. Therefore, there is not an adequate amount of primary vegetation to identify any lynx habitat or a Lynx Analysis Unit on the Deschutes National Forest.

No lynx habitat has been identified south or west of the Deschutes National Forest in the Cascade Mountains of Oregon. It is therefore, unlikely that the Ochoco National Forest (ONF), Deschutes National Forest (DNF), or the Crooked River National Grasslands (CRNG) are important for maintaining connectivity between lynx populations and/or their habitat.

Environmental Consequences

Effects Common to all Alternatives

Because there is an inadequate amount of primary vegetation to identify any lynx habitat or a Lynx Analysis Unit (LAU) on the Deschutes National Forest, there are no direct, indirect, or cumulative effects to the Canada lynx from the Five Buttes project.

Determination
Implementation of any alternative with the vegetation and fuels management activities as proposed in the Five Buttes project would have "**No Effect**" on the Canada lynx or their habitat.

If lynx are confirmed on the Deschutes National Forest they will receive full protection under the Endangered Species Act and consultation with the U.S. Fish and Wildlife Service will commence immediately if necessary. Also, if new information becomes available on vegetation that constitutes lynx habitat, analysis will occur to identify any lynx habitat on the Deschutes National Forest.

Oregon Spotted Frog

R6 Sensitive, *Federal Candidate Species*

The Oregon spotted frog (*Rana pretiosa*) is currently listed as a federal candidate species by the USFWS. Spotted frogs have a historic distribution that covers a small part of western North America, from southern British Columbia to northeastern California, and from the west side of the Willamette Valley to the east side of the Klamath Basin in Oregon. They have been extirpated in much of their range by introduction of the bullfrog (*Rana catesbeiana*), and habitat alteration and loss through intensified agriculture, grazing, and urbanization (USGS 2003).

Ecology: Oregon spotted frogs are associated with relatively large wetland complexes with breeding occurring in shallow, relatively unshaded emergent wetlands. Breeding ponds range from 2-14" in depth during the breeding season and are vegetated by low-growing emergent species such as grasses, sedges, and rushes. Oviposition usually occurs between mid-February and mid-April depending on water temperature. The diet of the Oregon spotted frog includes arthropods (e.g. spiders, insects) earthworms and other invertebrate prey. In turn, they may be preyed upon by mink, river otter, herons, bitterns, corvids, and garter snakes.

Existing Condition

In 1994 Oregon spotted frog surveys were conducted on selected streams and marshes on the Crescent Ranger District (Hayes 1995). Oregon spotted frogs were confirmed in Big Marsh, Odell Creek and Ranger Creek. Odell Creek and Ranger Creek are within the boundaries of the Five Buttes project area. Greater than 300 frogs were counted in Big Marsh but only small populations (<10 individuals) on Odell Creek and Ranger Creek. Hayes (1995) stated spotted frog habitat was limited in Odell Creek and Ranger Creek because brook trout were present, stream temperatures were cold, and side channels were limited that offer warm shallow water habitat needed by frogs. In 2004 another inventory was conducted on Odell Creek and Ranger Creek to determine if Oregon spotted frogs were still present in these streams 10 years after the first survey. District wildlife personnel confirmed 2 sub-adult and 1 adult spotted frogs in Odell Creek between East Davis campground and the confluence of Odell Creek and Davis Lake. There were no observations of spotted frogs or egg masses in Ranger Creek in 2004. Two new small populations of spotted frog adults and egg masses were also confirmed in the Little Deschutes River near Highway 58 during inventories conducted in 2001 and 2003 (Branum pers comm. 2005). The greatest concentration of Oregon spotted frogs on the district occurs within Big Marsh. Inventories conducted in Big Marsh in the spring of 2006 counted over 1,700 egg masses.

Environmental Consequences

Effects Common to All Alternatives
There are no silvicultural or fuels treatments planned within the wetland area of any riparian reserve of any alternative that would have the capability to directly, indirectly or cumulatively affect any Oregon spotted frog habitat.

Determination
Implementation of any alternative of the Five Buttes project would have "**No Effect**" on the Oregon spotted frog or their habitat. The Five Buttes project is consistent with all Project Design Criteria (PDCs) in the 2006-2009 Joint Aquatic and Terrestrial Programmatic Biological Assessment for Federal Land Administered by the Bureau of Land Management Prineville Office and For Federal Lands Administered by the Deschutes and Ochoco National Forests (USDA 2003).

Pacific Fisher

R6 Sensitive, Federal Candidate Species

The USFWS was issued a court order in April 2003 to conduct a 90 day finding on a petition to list a distinct population segment of the fisher. In July 2003 the USFWS published a 90 day finding that substantiated a listing may be warranted and began a 12 month status review. In April 2004 the USFWS determined that the fisher in Washington, Oregon and California is a"distinct population segment" of the entire fisher species. The USFWS determined that the fisher faces significant biological threats that are sufficient to warrant listing but is precluded by other higher priority listing actions (Federal Register Vol. 69, No. 68). Threats to the fisher include loss and fragmentation of habitat, mortalities and injuries from incidental captures, decreases in prey base, increasing human disturbance, and small isolated populations.

Ecology: The fisher is a house-cat sized member of the Mustelidae family which includes weasels, mink, marten, and otters. Their occurrence is closely associated with low- to mid-elevation forests (generally <1250 m) with a coniferous component, large snags or decadent live trees and logs for denning and resting, and complex physical structure near the forest floor to support adequate prey populations (Powell and Zielinski 1994). Prey item remains collected in Oregon include snowshoe hare, brush rabbit, California ground squirrel, Douglas' squirrel, northern flying squirrel, woodrats, opossum, striped skunk, porcupine (male fishers only), bobcat, deer, elk, Stellar's jay, pileated woodpecker, and hairy woodpeckers (Aubrey and Raley 2002). They are fast, agile and adept at climbing trees and will eat any prey the can catch and overpower, including squirrels, hares, mice, birds and porcupines. Although adapted for climbing, fishers are primarily terrestrial. When inactive, the fisher occupies dens in tree hollows, under logs, or in ground or rocky crevices, or rests in the branches of conifer trees during the warmer months. Young are born in a tree hollow or under a log or in a rocky crevice. Large snags greater than 20 inches in diameter are important as maternal den sites (Thomas et al. 1993). In the western USA, fishers generally avoid clearcuts and forested stands with less than 40 percent canopy cover, occur at low densities in second-growth forests and landscapes that have been extensively fragmented by timber harvesting (Aubrey and Lewis 2003).

Prior to extensive European settlement, fishers occupied most coniferous forest habitats in Washington, Oregon and California (Aubrey and Lewis 2003). Extensive trapping in the 1800s and 1900s is frequently cited as the principal initial cause of the substantial reduction of the range of the fisher in Washington, Oregon and California (Federal Register Vol. 69, No. 68). Other factors consistently identified as contributing to the reduction of the fisher's distribution include the alteration of forest habitats as a result of logging and conversion to other land uses (Powell and Zielinski 1994). Fishers have a low annual reproductive capacity; not all females produce young every year and litters usually consist of 2 to 3 kits raised entirely by the female. In addition, recent evidence suggest only juvenile males disperse long distances which would affect the rate at which fishers may be able to colonize formerly occupied areas within its historical range (Aubrey et al 2003).

Existing Condition

In Oregon, the fisher apparently has been extirpated from all but two portions of its historical range (Aubrey and Lewis 2003). Within Oregon the two known extant populations are in the southwestern portion of the state: one in the southern Cascade Range that was established through reintroductions of fishers from British Columbia and Minnesota that occurred between 1961 and 1981, and one in the northern Siskiyou Mountains of southwestern Oregon that is presumed to be an extension of the population in northern California. Genetic testing has revealed the populations are isolated from each other (Aubrey et al 2002). The same study revealed juvenile male fishers are capable of long distance dispersal with one collared male relocating to the Crescent Ranger District in the summer of 1999 having traveled fifty-five kilometers from point of capture on the Rogue River National Forest. The radio signal from this animal was lost in December 1999 and it is unknown if this animal is still alive on the district or where it may have eventually occupied a territory.

Carnivore surveys were conducted on the Crescent District in 1993-1996 and 1998 using bait with camera sets, snow tracking and track plates. There were no detections of fishers or wolverine from these surveys although marten were confirmed. At the present time there is no confirmation that there are reproducing fisher populations on the Crescent Ranger District.

Environmental Consequences

Alternative A
Direct and Indirect Effects
There would be no direct effects to fishers or their habitat with implementation of this alternative. Fishers, if currently present could continue to utilize late and old structural stands in the planning area for foraging, denning, and as resting sites. Habitats would also be available to fishers that may be trying to colonize into suitable lands from existing populations on the Rogue-Siskiyou National Forests. Barring catastrophic habitat changes, habitat would be maintained at least in the short-term. Over the long-term increased tree growth in existing plantations will develop enough canopy cover for a more connected landscape available to fishers. Implementation of the no-action alternative would have **"No Effect"** on the Pacific fisher.

Alternatives B and C
Direct and Indirect Effects
While it is unknown if fishers occupy the project area, active management would lessen risk for habitat loss from an uncharacteristic event. As evidenced by the Davis Fire, loss of large trees would remove suitable habitat and fragment the landscape for more than a century.

Management activities have the potential to cause disturbance which could displace individuals, or in the worst case scenario, cause dens to be moved while rearing young. In the short-term, management activities have a potential to create disturbance above present levels for 1-5 years. Activities in Alternatives B and C would not inhibit the ability of dispersing fishers to re-colonize into the project area and surrounding lands. There would be sufficient opportunities for displaced individuals to occupy suitable habitat (absent of disturbing activities above existing levels) inside and adjacent to the project area. Thinning and fuel reduction activities would be accomplished in late and old structured stands of mixed conifer habitat that have the potential to provide habitat for this species. Silvicultural prescriptions would reduce understory live tree densities to relieve stress on the late-successional and old growth trees. Post-sale activities may include small diameter thinning to further reduce the densities of 6 inch diameter and smaller trees. Fuels treatments could include grapple piling and burning slash, handpiling and burning, underburning or a combination of these treatments.

While past regeneration timber harvests in the project area removed potentially suitable habitat and increased forest and habitat fragmentation, it is unknown how the project area may have been used by fishers, if at all, over the last 30-40 years. In the western USA, fishers generally avoid clearcuts and forested stands with less than 40 percent canopy cover, and occur at low densities in second-growth forests and landscapes that have been extensively fragmented by timber harvesting (Aubrey and Lewis 2003). Activities within the Five Buttes project area would reduce canopy cover from existing levels and decrease horizontal and vertical diversity; however, canopy cover would generally remain above 40 percent. The large tree component, understory conifer layer, and snags and down wood would be retained and would maintain suitability for fisher occupancy. Because the understory conifer densities would be reduced, there may be a reduction in habitat suitability for the snowshoe hare, a fisher prey species. The retention of unthinned patches (15-25 percent) of denser multi-storied stands would offset this effect. Since the suitable habitat for fishers is located within the Davis Late-Successional Reserve, snag and down wood levels specified in the DLSRA would provide sufficient habitat for prey base, denning and resting.

All action alternatives propose a combination of commercial thinning and fuels reduction treatments to lessen the risk of large scale loss of forest to uncharacteristic wildfire events and disease outbreaks. Proposed treatments would include forested stands of late and old structured stands of mixed conifer habitat that could provide habitat for the fisher. The silvicultural prescriptions would reduce understory green tree densities to relieve stress on the late-successional and old growth trees in these stands. Post-sale treatments may include small-tree thinning to further reduce the densities of trees smaller than 8 inches in diameter. Fuels treatments could include grapple piling and burning slash, handpiling and burning, underburing, or a combination of treatments.

It is unknown how extensive road building and regeneration timber harvesting from the 1960s to the early 1990s may have affected the fisher in the planning area if they were present during that time period. For this analysis, it is most informative to know the existing condition. Current research shows that fishers are slow to re-colonize formerly occupied sites and that only juvenile males will disperse long distances (Aubrey et al 2003). Habitat fragmentation from active management is usually associated with timber harvest with a prescription for regeneration. Since none is planned, an active management scenario would not increase habitat fragmentation. In addition, tree growth in existing plantations will gradually provide overhead forest cover also lessening the effects of a fragmented landscape.

While Alternatives B and C both propose construction of new temporary roads (5.94 miles and 6.36 miles respectively), when viewed over a 160,000 (250 square miles) planning area, there would likely be little effect to fishers. In addition the temporary roads would be obliterated after the completion of harvest activities and post-sale work. Both alternatives also propose the re-opening of currently closed roads to provide access for harvest and/or fuel reduction work. Generally, the roads to be opened occur on the buttes where existing road densities are already high and would not result in a long-term increase in open road density because these roads would also be re-closed after all activities have been completed. As previously described, some displacement of individuals may occur if fishers are dispersing through an active sale area.

Cumulative Effects Alternatives B and C
The activities in Table 3-1 were reviewed to assess whether, in combination with the effects of the Five Buttes project, there would be any overlap in time and space to the fisher. Foreseeable activities that would occur adjacent to habitats that have potential for source populations from which colonization might occur (Oregon Cascades Recreation Area and Wilderness) include the Crescent Lake Wildland Urban Interface Fuel Reduction and the BLT Vegetation Management projects; these projects may displace individual fishers. The Bucky timber sale from the Seven Buttes Return analysis is being implemented in suitable habitat on Royce Mountain. Activities for all three projects would maintain the largest tree structure and maintain snags and the down wood component that provides suitable habitat. There may be some local displacement with activity, but this would not be additive to the actions planned within Five Buttes or inhibit the ability of dispersing fishers to re-colonize into the project area and surrounding lands. Seven Buttes Return (Bucky TS) and the Crescent Lake Wildland Urban Interface Fuels Reduction project predicted a “May Impact Individuals or Habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species.” These effects would be relatively short-term (less than 5 years) and would maintain options for the future. All other foreseeable actions such as the Air timber sale, Wickiup Acres Wildland Urban Interface Fuels Reduction project, and adjacent projects in the La Pine Basin would not occur in suitable habitat.

Determination
While there is no documented evidence that fishers currently occupy the planning area, suitable habitat is present. Timber harvest and fuel treatment activities have the potential to create disturbance to animals that may occupy a drainage or may be dispersing through the planning area. The determination is that implementation of Alternative B or C **“May Affect, but is not Likely to Adversely Affect”** the Pacific fisher.

Regional Forester’s Sensitive Species

Species classified as sensitive by the Forest Service are to be considered by conducting biological evaluations (BE) to determine potential effects of all programs and activities on these species (FSM 2670.32). The BE is a documented review of Forest Service activities in sufficient detail to determine how a proposed action may affect sensitive wildlife species, and to comply with the requirements of the Endangered Species Act. Table 3-39 lists the sensitive species that have potential habitat within the Five Buttes project area.

The 2004 Updated Forest Service Region 6 Sensitive Animal list was reviewed for species that may be present on the Deschutes National Forest. After a review of existing records, habitat requirements, and existing habitat components, it was determined that the following sensitive species have habitat present or are known to occur in the project area and will be included in this analysis: Horned grebe (*Podiceps auritus*), Rednecked grebe (*Podiceps grisegen),* Bufflehead duck (*Bucephala albeola*), Harlequin duck (*Histrionicus histrionicus*), American peregrine falcon (*Falco peregrinus anatum*), Tricolored blackbird (*Agelaius tricolor*), Gray flycatcher (*Empidonax wrightii*), and the California wolverine (*Gulo gulo*). Effects to the Crater Lake Tightcoil snail (*Pristiloma arcticum crateris*) are discussed under the Survey and Manage section of this document.

Table 3-39. Deschutes National Forest Sensitive Animal Species summary.

Species	Listing Status	Habitat	Presence Within Five Buttes
Horned Grebe	Regional Forester Sensitive	Lakes	Unknown
Red-necked Grebe	Regional Forester Sensitive	Lakes	Unknown
Bufflehead Duck	Regional Forester Sensitive	Lakes, Snags	Documented
Harlequin Duck	Regional Forester Sensitive	Fast Flowing Streams	Unknown
Peregrine Falcon	Regional Forester Sensitive	Cliffs, Riparian	Unknown
Tricolor Blackbird	Regional Forester Sensitive	Lakeside, Bulrushes	Unknown
Gray Flycatcher	Regional Forester Sensitive	Ponderosa pine, sagebrush or bitterbrush	Unknown
California Wolverine	Regional Forester Sensitive	Mixed Forest, High Elevations	Unknown
Pygmy Rabbit	Regional Forester Sensitive	Sagebrush Flats	No Habitat
Western Sage Grouse	Regional Forester Sensitive	Sagebrush	No Habitat
Yellow Rail	Regional Forester Sensitive	Marshes	No Habitat
Crater Lake Tightcoil Snail	Regional Forester Sensitive and Northwest Forest Plan Survey and Manage	Riparian	Documented

Summary of Conclusions for Sensitive Species (Table 3-40)

- There is no habitat or the following species are not expected to occur within the project area and therefore were not analyzed: pygmy rabbit, western sage grouse, and the yellow rail.
- The No Action alternative is not expected to have any effects on the horned grebe, red-necked grebe, bufflehead duck, harlequin duck, peregrine falcon, tricolor blackbird, gray flycatcher, and the California wolverine.
- The action alternatives "**May Impact Individuals or Habitat**" but will not likely contribute to a trend toward federal listing for the bufflehead duck, gray flycatcher, and California wolverine.
- The action alternatives are not expected to have any effects on the horned grebe, red-necked grebe, harlequin duck, peregrine falcon, and the tricolor blackbird.

The following species were determined not to occur in the project area based on existing sighting information, reviewing habitat requirements and the habitat types present. These species will not be included in any further analysis: pygmy rabbit (*Brachylagus idahoensis*), Western sage grouse (*Centrocercus urophasianus phasios*), and the yellow rail (*Coturnicops noveboracensis*).

Pygmy rabbits typically occur in dense stands of big sagebrush growing in deep loose soils (NatureServe 2003). This habitat type does not occur within the project area. Implementation of any alternative would have **No Impact** on pygmy rabbit.

Western sage grouse are found in foothills, plains, and mountain slopes where sagebrush is present and the habitat contains a mixture of sagebrush, meadows, and aspen in close proximity. Winter habitat containing palatable sagebrush probably is the most limited seasonal habitat in some areas (NatureServe 2003). While this habitat type and sage grouse are known to occur on the Deschutes National Forest, this habitat type does not occur within the project area or the Crescent Ranger District. Implementation of any alternative would have **No Impact** on the western sage grouse.

From information gathered over the last 6-7 years, nesting habitat for the yellow rail in Oregon has been described as marshes or wet meadows which have an abundance of thin-leaved sedges, a layer of senescent vegetation to conceal their nests, and an average water depth of 7 cm. (Popper 2001). Winter habitat is thought to occur along the California coast although more research is needed to confirm this (Popper 2001). A very small breeding population of yellow rails (2-5 pairs annually) is known to occur on Big Marsh on the Crescent Ranger District based on information gathered since 1997 (Popper 2003). Within the project area there is no suitable breeding habitat although the margins of Davis Lake contain marsh habitat. However, this marsh habitat is not sufficient in size, does not contain the necessary vegetative conditions nor the consistent water depths conducive for yellow rail breeding habitat. Implementation of any action alternative would have **no impact** on the yellow rail.

Table 3-40. Summary of conclusion of effects, Region 6 Sensitive Animal Species.

Species	Alt. A	Alt. B	Alt. C
Horned Grebe	NI	NI	NI
Red-necked Grebe	NI	NI	NI
Bufflehead Duck	NI	MIIH	MIIH
Harlequin Duck	NI	NI	NI
Peregrine Falcon	NI	NI	NI
Tricolor Blackbird	NI	NI	NI
Gray Flycatcher	NI	MIIH	MIIH
California Wolverine	NI	MIIH	MIIH

NI = No impact
MIIH = May impact individuals or habitat, but will not likely contribute to a trend toward federal listing or loss of viability to the population or species
BI = Beneficial impact

Horned Grebe, Red-necked Grebe

R6 Sensitive

Ecology*:* Horned grebes in North America breed from Alaska and northern Yukon south to eastern Oregon and Idaho. Winter range extends along the Pacific coast from Aleutian Islands south to northern Baja California. In Oregon horned grebes are rare breeders east of the Cascades (Marshall 2003). The Malheur Refuge has recorded 4-5 pairs annually since 1958 and there are individual nest records from Sycan Marsh in Lake County, southern Oregon (Stern, Del Carlo et al 1987). They nest among tall vegetation in shallow water. Summer diet consists of fish, crawfish, and aquatic insects, including caddisflies, damselflies, mayfly larvae, leeches, beetles, flies, and gnats. In the winter the Pacific coast diet of horned grebes is predominantly crawfish, shrimp, prawns, and fish. Fall migration occurs soon after young have fledged in late summer or early fall. During October-November forty-five to sixty-five (45-65) individuals are typically observed at Wickiup Reservoir, Deschutes County, Oregon. Most have left eastern Oregon by early December. Declining water levels may strand nests during the breeding season and rough water from high winds may cause nest damage or failure (Dubois 1919, Littlefield 1990 in Marshal et al 2003).

The red-necked grebe has been confirmed to breed in Oregon with the only consistent breeding population found in Upper Klamath Lake. Other incidental nests have been discovered in Malheur Refuge and Big Lava Lake in Deschutes County. The red-necked grebe is the least common grebe seen in Oregon in all seasons (Marshall et al 2003). Breeding habitat consists of extensive clear, deep-water lakes, marshy lakes, and ponds in timbered regions. The adult diet is composed of small fish, aquatic and terrestrial insects and their larvae, and crustaceans and mollusks. Because there is only one consistent breeding population in Oregon (Upper Klamath Lake) deteriorating water conditions from runoff, drought, and pollution have the potential to affect this population. In addition, human water-recreation disturbances may potentially affect this population (Marshall et al 2003).

Existing Condition

There are no known sightings of either grebe species on the Crescent Ranger District. There is potential breeding habitat for each species on Davis Lake, Big Marsh and possibly on some of the high elevation ponds and lakes within the Oregon Cascades Recreation Area (OCRA). There were no surveys conducted to determine their presence on the district.

Environmental Consequences

Effects Common to All Alternatives
There are no silvicultural or fuels treatments planned within the wetland portion of any riparian reserve of any alternative that would have the capability to directly, indirectly or cumulatively affect any potential habitat for the horned grebe or red-necked grebe.

Determination
Implementation of any alternative of the Five Buttes project would have "**No Impact**" on the horned grebe or the red-necked grebe.

Bufflehead Duck

R6 Sensitive

Ecology: The bufflehead is North America's smallest diving duck. It winters throughout Oregon but is an uncommon breeder in the central and southern Cascades (Marshall 2003). Known nest sites in central and southern Oregon include Hosmer Lake, Crane Prairie Reservoir, Twin Lakes, Wickiup Reservoir, Davis Lake and along the Little Deschutes River in Deschutes County. Broods have also been reported in small lakes near the crest of the Cascades in western Deschutes County. The bufflehead will use tree cavities or artificial nest boxes in trees close to water. Human disturbance at Cascade Lakes and a shortage of suitable nesting cavities due to forestry practices may have had an effect on their population status in Oregon (Marshall et al 2003).

Existing Condition

On the Crescent Ranger District buffleheads are commonly seen on Odell Lake, Crescent Lake, Davis Lake, and on the nearby Wickiup Reservoir nearly year-round or until freeze-up. They have also been observed on some of the high elevation lakes and ponds in the Oregon Cascades Recreation Area during the summer months.

Environmental Consequences

Alternative A – No Action
Direct and Indirect Effects

Implementation of this alternative would not affect any snag habitat that may potentially be used by this species.

Alternatives B and C
Direct and Indirect Effects
Because buffleheads are dependent on tree cavities or artificial nest structures for nesting purposes, the removal of snag habitat near lakes or reservoirs have the potential to negatively affect this species. While snags are not specifically targeted for removal in this project, those determined to be a safety concern during logging operations or temporary road construction may be felled. This may result in fewer snags available for nesting bufflehead ducks near Wickiup Reservoir and Davis Lake where thinning and underburning operations would occur. Mitigation measures have been provided for snag retention for cavity dependent species consistent with Deschutes Forest Plan and Northwest Forest Plan requirements. Implementation of this measure would assure snag habitat is present for all cavity nesting species including the bufflehead.

Cumulative Effects
Past vegetation management practices, including hazard tree reduction in campgrounds and commercial tree thinning, may have reduced snag densities along the perimeter of Davis Lake and Wickiup Reservoir. The Five Buttes Project may include incidental removal of snags for occupational safety at Davis Lake. The combined effects of past snag removal and any snag removal that might occur with the Five Buttes project were offset by the Davis Fire of 2003, which created thousands of new snags where the fire moved to the shorelines of Davis Lake and Wickiup Reservoir. Suitable sized snag cavities that were present prior

to the fire could be utilized by buffleheads for nesting purposes. New cavities in fire killed snags may require several years for rot to start and primary cavity excavators to drill new cavities.

For both action alternatives, snag recruitment over time and across the landscape is similar when compared to Alternative A, no action. Changes in snag densities over time are very similar, particularly adjacent to water.

Determination
Because there is the potential for the incidental loss of snags to meet OSHA requirements, there may be reduced nesting opportunities for individual buffleheads. Project implementation "**May impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species**."

Harlequin Duck

R6 Sensitive

Ecology*:* The Harlequin duck nests along fast-flowing rivers and mountain streams in the Cascade Mountains of Oregon and Washington. There are no confirmed breeding sites in the east Cascades of Oregon with the exception of the Hood River basin (Marshall et al 2003). Harlequin broods have been documented though in northeast Oregon. In the western Cascades of Oregon breeding pairs are observed on low to moderate gradient (1-7 percent) third to fifth-order streams in the western hemlock zone with simple channels and abundant in-stream rocks for loafing sites (Marshall et al 2003). Nests are scooped depressions lined with down. Bruner (1997 in Marshall et al 2003) stated 35 percent of his located nests were placed on exposed shelves of logs or root wads and 65 percent were found on natural ledges on slopes or cliffs within 1-82.5 feet of water. On the breeding range foraging occurs on stream invertebrates such caddisflies and stoneflies. Non-breeding adults can be found along the Oregon coast and the winter population includes migrant birds. They are often seen resting on rocks at high tide and feeding around exposed rocks at low tide (Gilligan et al 1994). Threats to the species may include recreation related disturbances and oil spills. Direct effects of timber harvesting, mining, road building or other activities have not been documented (Marshall et al 2003).

Existing Condition

Potential breeding habitat may exist on the Crescent Ranger District in the upper Little Deschutes River canyon and perhaps in Trapper Creek which flows into Odell Lake. At the present time there are no documented sightings of Harlequin ducks on the Crescent District although there have been no formal surveys conducted by district personnel to determine their presence.

Environmental Consequences

Effects Common to All Alternatives
Potential breeding habitat in the planning area is likely limited to Trapper Creek which empties into Odell Lake and possibly Odell Creek which drains into Davis Lake. Harlequin observations have not been documented in either stream. There are no proposed silvicultural or fuels treatment units within the riparian reserves of either stream system that would have the potential to modify habitat use or result in any disturbance to nesting individuals or hatched broods. As a result, no negative direct, indirect or cumulative effects to harlequin ducks, if present at either site, are expected.

Determination
Implementation of the Five Buttes project would have "**No Impact**" on the harlequin duck or its habitat.

American Peregrine Falcon

R6 Sensitive

The peregrine falcon was officially de-listed as a threatened species by the USFWS on August 25, 1999 although the species currently remains on the Northwest Regional Forester's sensitive species list. At the present time, known eyries in the region are being monitored annually for occupancy and reproductive success. There are no known eyries on the Deschutes National Forest

Ecology: In Oregon peregrines occur as resident and migratory populations. They nest on cliffs greater than 75 feet in height and within 1 mile of some form of water (Pagel, 1992). Nesting occurs in xeric areas of eastern Oregon, marine habitats of western Oregon, montane habitats to 6,000 feet elevation, small riparian corridors statewide, and more recently urban habitats of the lower Willamette and Columbia Rivers. Peregrines are widely distributed in western Oregon and at least 15 pairs are known to occur in the Columbia River Gorge (Isaacs pers comm. 2005). Riparian corridors are used for travel and as hunting areas; 90-95 percent of all prey items are birds that may come from these systems (Pagel, 1992). Peregrine falcons are most susceptible to disturbance during the onset of their courtship activities. Land management activities which the falcons are not accustomed to during the preliminary phase of their nesting chronology could induce desertion of the site (Pagel, 1991).

Existing Condition

There are no known peregrine falcon eyries on the Deschutes National Forest or in Deschutes County and only one known eyrie in Klamath County located near Klamath Lake (Isaacs pers comm. 2005). District wildlife sighting records list one peregrine report from Davis Lake during the fall; however, this may have been a migrant. Clowers (2004) reported seeing an adult peregrine hunting near Wickiup Dam (just outside the project area) during the late winter of 2003-2004 and 2 fledgling peregrines hunting near Reservoir Campground on Wickiup Reservoir in August 2004. Potential nesting habitat is present on the Crescent Ranger District in the lava flow near Davis Lake, in the upper Little Deschutes River canyon, and on Maiden Peak. One survey for nesting peregrines was conducted in April 2005 on the lava flow near Davis Lake but no peregrines were observed.

Environmental Consequences

Effects Common to All Alternatives

The nearest potentially suitable eyrie habitat to proposed treatment units is located in the lava flow at the north end of Davis Lake. This area is greater than 0.5 mile from the nearest harvest units west of the Cascades Lakes Highway and north of Lava Flow campground. Based on this spatial distance there should be no direct, indirect or cumulative negative effects to nesting peregrines, if present in the lava flow area of Davis Lake. If an eyrie is discovered before or during any management activity, the activity would be reviewed for potential disturbance to nesting peregrines and the activity halted from February 15 – August 15. **Ability to implement and effectiveness are High.**

Determination

Because no nesting habitat would be affected, it is my determination that implementation of any alternative of the Five Buttes project would have "**No Impact**" on the peregrine falcon or its habitat.

Tricolor Blackbird

R6 Sensitive

Ecology*:* The tricolored blackbird is a highly gregarious colonial breeder largely endemic to California. However, breeding colonies are scattered and intermittent in Oregon. In Oregon they breed most consistently in southern Klamath County in the southern part of the state. There are no records of nesting tricolored blackbirds in Deschutes County or northern Klamath County. Nesting occurs in fresh-water marshes of cattails, tules, bulrushes and sedges (NatureServe 2004). Little is known about their diet in Oregon (Marshall et al 2003). Most birds in Oregon migrate to California for the winter. Threats to this species include habitat loss due to drainage of wetlands and conversion of former nest and roost sites to agriculture. Human disturbance has also been implicated in nesting colony abandonment or failure (Marshall et al 2003). The Oregon population of tricolored blackbirds was estimated to have declined 22 percent in the 1980s but the Oregon population represents only 1 percent of the total tricolored blackbird population (Beedy et al 1999).

Existing Condition

There are no documented sightings of tricolored blackbirds on the Crescent Ranger District although potentially suitable breeding habitat is present along the shoreline of Davis Lake, Wickiup Reservoir, Big Marsh, and along the Little Deschutes River. Surveys have not been conducted for this species.

Environmental Consequences

Effects Common to All Alternatives
There are no silvicultural or fuels treatments planned within the wetland portion of any riparian reserve in any alternative that would have the capability to directly, indirectly or cumulatively affect suitable habitat for the tricolor blackbird.

Determination
It is my determination that implementation of any alternative of the Five Buttes project would have "**No Impact**" on the tricolor blackbird.

Gray Flycatcher

R6 Sensitive

Ecology: Marshall et al (2003) describes the gray flycatcher as among the least conspicuous of Oregon's birds and is an inhabitant of arid country in the pine and juniper woodlands and sagebrush shrublands. Preferred shrub habitat includes sagebrush and bitterbrush. In southeast Deschutes County and northwest Klamath County this flycatcher commonly nests in sparse lodgepole pine over bitterbrush and sagebrush (Marshall et al 2003). Breeding bird surveys indicate this species is increasing by 5 percent annually in Oregon (Marshall et al 2003). Threats to the species include habitat alteration including juniper and sagebrush removal.

Existing Condition

On the Crescent Ranger District there are no documented reports of gray flycatchers. However, they have been reported to occur 20 miles south of Crescent, Oregon on the Chemult Ranger District, Winema National Forest. The flycatcher observations were in thinnged ponderosa pine/lodgepole pine plantations with abundant bitterbrush, areas that were generally more open than surrounding forested areas. Potentially suitable nesting habitat is present in the Five Buttes project area in plantations along the Cascade Lakes Highway (Forest Road 46), west and north of Davis Lake, and scattered plantations east of Saddle Butte.

Environmental Consequences

Alternative A – No Action
Direct and Indirect Effects

Implementation of this alternative would result in no immediate change in the vegetative condition in the project area for the gray flycatcher. Lodgepole pine and ponderosa pine plantations with a bitterbrush component would continue to provide nesting habitat for this species.

Effects Common to All Action Alternatives
All action alternatives propose commercial and small-tree thinning within stands of lodgepole pine and ponderosa pine that have a bitterbrush shrub understory, which has potential to provide habitat for the gray flycatcher. The majority of these stands would be described as mid- and late-successional; however, they also tend to have a bitterbrush shrub layer. Thinning these stands would reduce stem densities and allow more light and increased growth to the bitterbrush, improving potential habitat. Post-harvest conditions may closely resemble the stands occupied by gray flycatchers south of the project area on the Chemult District, Winema National Forest. This beneficial effect would last several decades, when increased tree growth and canopy cover reduces the amount of sunlight reaching the bitterbrush layer.

Table 3-1 was reviewed for sources of additive effects which have the potential to overlap the Five Buttes project in space and time. The zone of influence is the Crescent Ranger District. Annually, approximately 2,000 acres of small tree thinning is conducted primarily in young (15-25 year-old) plantations. Bitterbrush is an element in lodgepole pine and ponderosa pine/lodgepole pine plant associations. Even young plantations are capable of providing suitable nesting habitat. This results in an increase in habitat capability across the district. Because silvicultural and fuels treatments may occur during the nesting season, there is the potential for breeding pairs, if present, to be displaced from occupied sites into adjacent suitable habitats. Adjacent suitable habitats would include recently thinned plantations and unmanaged stands with the present of bitterbrush. The potential displacement of flycatchers, if present, during Five Buttes management activities would be more than offset by the several thousand acres of habitat that are improved for this species annually.

Determination
Because of the potential for disturbance during the nesting season, implementation of any action alternative "**May impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species**."

California Wolverine

R6 Sensitive

In October 2003 the USFWS issued a 90-day petition finding that listing the California wolverine as threatened or endangered in the contiguous United States was not warranted (FR Doc. 03-26475). This determination was based on insufficient information on wolverine habitat requirements or range to determine whether destruction or modification of wolverine habitat is occurring to the extent that it affects the status of the wolverine. There is also insufficient data to determine whether human disturbance is negatively effecting wolverine populations on a scale the effects the status of the species. Since 1995 little new information on wolverine biology, distribution, habitat requirements or possible threats has been published. However, additional research on wolverine ecology, current and historic distribution, population demographics, and habitat requirements is underway that should provide better information with which to understand the wolverine.

Ecology: The wolverine is the largest terrestrial member of the mustelid family with males weighing 26 to 40 pounds and females 17 to 26 pounds. Wolverines are opportunistic feeders consuming a variety of foods depending on availability. There is no evidence hunting by wolverines is limited by habitat structure. Primarily a scavenger rather than a hunter, the wolverine forages where carrion can be found (Ruggiero 1994). In addition to carrion they will also prey on small animals and birds and eat fruits, berries, and insects. Wolverines occupy a wide variety of habitats from the arctic tundra to coniferous forest. The most common habitats are those that contain a high diversity of microhabitats and high prey populations. High elevation alpine wilderness areas appear to be preferred in summer, which tends to effectively separate most wolverine and human interactions. The essential component of wolverine habitat may be isolation and the total absence of disturbance by humans (Ruggiero 1994). Copeland (1996) found that wolverines tend to prefer montane coniferous forest habitats during the winter.

The most critical and limiting habitat for wolverines seems to be acceptable natal denning habitat Magoun and Copeland (1998) described two types of dens used by wolverines: natal and maternal. Natal dens are used during parturition and occur more commonly in subalpine cirque basins associated with boulder talus slopes. Maternal dens are used subsequent to natal dens and before weaning occurs; these consist of a complex of dens associated with boulders or fallen trees. Magoun and Copeland (1998) believe that a critical feature of wolverine denning habitat is the dependability of deep snow (one meter deep or more) to persist through the denning period of February through May. Ruggiero (1994) described natal dens having been found in snow tunnels, hollow trees and even caves in the ground. Ruggierro (1994) also reported that in forested habitats the structural diversity provided by large snags, fallen logs and stumps would likely provide natal den sites.

Home ranges for adult wolverines tend to be large ranging from 38.5 square miles to 348 square miles (Banci 1994 in Federal Register Doc. 03-26475). Copeland (1996) radio collared wolverines in Idaho and reported annual home ranges of resident adult females averaged 148 square miles and an average of 588 square miles for resident adult males. The current range of wolverines in the contiguous United States is believed to include Idaho, Montana, Oregon, Washington, Wyoming and possibly California (Federal Register Doc. 03-26475).

Existing Condition

The Crescent Ranger District performed carnivore surveys from 1993-1996 and 1998 using bait with camera stations but the only carnivore species detected was the American marten. District records list unconfirmed wolverine sightings near Willamette Pass, on Maklaks Mountain, and near Crescent Creek. Potentially suitable natal denning habitat may be found in the Mt. Thielsen and Diamond Peak Wilderness areas and Cowhorn Mountain within the Oregon Cascades Recreation Area (OCRA). It is unlikely denning habitat would be found on the remainder of the Crescent Ranger District because of open roads and high recreation use.

In 2000 the Forest Service completed an environmental assessment that allowed them to conduct helicopter surveys during the winter over the southern and central Cascade Mountains of Oregon including the Sky Lakes Wilderness, Mt. Thielsen Wilderness, and the Diamond Peak Wilderness. The study was to last five years and beginning in 2001 a limited number of landings were authorized in wilderness areas to investigate possible tracks if sighted. Flight areas have included some of the most southern portions of the Crescent Ranger District. As of December 2006, no track observations from any flight have been confirmed to be wolverine (Henshaw pers comm. 2005). At the present time wolverines have not been confirmed to occur on the Crescent Ranger District.

Environmental Consequences

Alternative A – No Action
Direct and Indirect Effects

Implementation of this alternative would lead to no immediate change in the vegetative character of the planning area. Natural successional processes would continue to occur resulting in increased tree growth in younger aged stands and also the higher likelihood of uncharacteristic loss of forest (particularly in the Five Buttes Project area) due to insect, disease and wildfire events. Wolverines, if present, would likely continue to utilize the highest elevations in and adjacent to the planning area during most of the year. There would be no change in prey availability (at least in the short-term) unless an uncharacteristic habitat altering event occurred that would change how large mammal populations use the project area.

Alternatives B and C
Direct and Indirect Effects

Effects to the wolverine include past and present actions as it is informative to know where we are today regarding vegetative condition and potential. It is unknown what effect road building and regeneration timber harvest over the last 30-40 years may have had on the wolverine. Since the 1990s and the Northwest Forest Plan, silvicultural prescriptions for forest management by design are generally less fragmenting. The greatest risk of losing contiguous forest is from events such as insect, disease, and wildfire (as evidenced by the 21,000 acres Davis Fire in 2003). Although increased access and potential for disturbance has allowed greater national forest use for summer and winter recreation, watersheds are trending toward less dense road systems as past forest management decisions such as Baja 58, Seven Buttes, Seven Buttes Return, Charlie Brown and Crescent Lake Wildland Urban Interface Fuels Reduction close and obliterate roads. In the last 10 years, vegetation management on the district has tended to focus on density reduction and fuels management; temporary roads have been constructed as needed for access and closed following post-sale work. Approximately 4,600 acres of conifer planting was completed in the Davis fire area in the spring of 2006. Snowbrush is becoming well established on portions of the fire and is providing limited overhead cover that could facilitate wolverine dispersal if these animals are present in the planning area. Ruggiero (1994) reported that wolverines seem less sensitive to overhead canopy cover or vegetation near the ground as compared to marten, fisher or lynx

The new temporary roads to be constructed and the existing roads proposed for re-opening to access harvest units are located within the same roaded landscape with heavy recreational use primarily on the buttes, Royce Mountain or Davis Mountain. No road construction, re-construction or timber harvest would occur within or adjacent to high elevation rocky slopes or cirque basins where potentially suitable denning habitat may be present in the planning area. While no activities are planned in denning habitat, incidental use by wolverine in the project area may occur during the late fall or early winter months while foraging at lower elevations. Ruggiero (1994) reported that wolverine detections at lower elevations showed a preference for mature to intermediate aged forests. All action alternatives propose to reduce live tree stand densities and conduct fuel reduction activities (including prescribed underburning) in stands that would be described as mature or intermediate aged. The silvicultural and fuels prescriptions would maintain the character of mature and intermediate stands by focusing tree removal on the understory tree component.

While the thinning and burning proposed would reduce stand densities on several thousand acres of big game habitat it should not result in a change in big game populations that are present in the 160,000 acre planning area (see section title "Big Game - Deer and Elk" in Chapter 3 of this EIS). While large mammal carrion has been shown to be important to wolverines (Ruggerio et al. 1994) the thinning and burning proposed should not change the ability of wolverines to locate mammal carcasses.

One potential indirect effect to wolverines is the possibility of disturbance to an animal(s) that may have moved to lower elevations during the late fall or early winter. Winter logging of selected harvest units may occur and have the potential to displace an animal that may be moving through the area. However, because wolverines have home ranges that can be as large as 588 square miles for a resident adult male (Copeland 1996) any effect would likely be very temporary, localized and the animal would likely tend to move away from the disturbance. Winter logging would not occur over the entire planning area but likely restricted to a relatively small portion of the entire planning area allowing undisturbed habitats to be available.

Cumulative Effects

The projects described in Table 3-1 were reviewed to assess whether there is an additive effect with the Five Buttes project that could result in cumulative effects to the wolverine. Projects that have not been incorporated into the existing condition analysis, are considered relevant, and are considered foreseeable actions include BLT and projects in the La Pine basin around residential structures (Wagontrail and Wickiup Estates). Prescriptions for these actions include density reduction (thinning) and fuels management activities. The Lakeside Wildland Urban Interface project proposes to reduce fuel loadings using small diameter thinning (3 inches diameter or less) around the perimeter of Odell and Crescent Lakes. All these projects would occur over the next 1-5 years.

All foreseeable actions are planned in relatively low elevation terrain and generally near urban interface where existing background levels of disturbance would likely be avoided by wolverines. In addition, prescriptions would not create forest or habitat fragmentation and activities would be planned outside of denning habitat. However, BLT and Crescent Lake Wildland Urban Interface Project have the potential to overlap implementation with the Five Buttes project during winter operations and cause disturbance at a time when wolverine move down from higher elevations. This effect coupled with winter recreation and snowmobiling would be localized and wolverine would tend to avoid operations and traverse around in areas that provide more solitude, such as the adjacent Oregon Cascades Recreation Area and Wilderness.

Determination

While wolverines are thought to be infrequent visitors to the project area, there is the potential for disturbance to foraging or dispersing wolverines while Five Buttes project operations are being conducted. Implementation of the Five Buttes project "**May impact individuals or habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species**."

Crater Lake Tightcoil Snail

R6 Sensitive, Northwest Forest Plan Survey and Manage

Potential effects to the Crater Lake tightcoil snail are disclosed under the section titled "Northwest Forest Plan Survey and Manage Species" in Chapter 3 of this EIS.

Management Indicator Species

During the preparation of the Deschutes National Forest Land and Resource Management Plan (USDA 1990), several wildlife species were identified as management indicator species (MIS). These species were selected because their condition could be used as an indicator of the condition of other species dependent upon similar habitat. Indicator species can be used to assess the effects of management actions on a wide range of other wildlife with similar habitat requirements. The species listed in Table 3-41 were selected for the Deschutes National Forest.

Table 3-41. Deschutes National Forest Management Indicator Species.

Deschutes National Forest Management Indicator Species	Presence Within The Project Area
3-Toed Woodpecker	Yes
American Marten	Yes
Northern Goshawk	Yes
Osprey	Yes
Northern Bald Eagle	Yes
Northern Spotted Owl	Yes
Mule Deer	Yes
Elk	Yes
Woodpecker Guild	Yes
Great Blue Heron	Yes
Great Gray Owl	Not Documented
Peregrine Falcon	Not Documented
Wolverine	Not Documented
Townsend’s Big-eared Bat	Not Documented
Waterfowl	Yes
Golden Eagle	Yes
Redtail Hawk	Yes
Cooper’s Hawk	Yes
Sharpshinned Hawk	Yes

The effects on the 3-toed woodpecker, woodpecker guild, and the American marten are discussed in the Snags and Down Wood portion of this document. Effects on mule deer and elk are disclosed under the big game section of this document. Effects to the northern spotted owl, the northern bald eagle, peregrine falcon and wolverine are discussed in the Proposed, Endangered, Threatened, and Sensitive species section. The effects on the Townsend’s big-eared bat and the great gray owl are disclosed in the Survey and Manage portion of this document. Potential effects to the remaining species are discussed below.

Northern Goshawk

Ecology

The northern goshawk is the largest member of the accipiter family and is distributed across most of Canada, the northern and western United States and into Mexico. Reynolds and Wight (1978) located goshawk nests in Oregon from 580 meters elevation on the west slopes of the Cascades to 1,860 meters elevation in the Gearhart Mountains in eastern Oregon. Reynolds (1995) noted that goshawk nests in Oregon were in stands ranging from those with closed, mature canopies with few shade-tolerant trees to stands with more open, mature canopies and many understory trees. Goshawks require trees with large limbs to support their large nests, and not surprisingly, tend to place their nest in one of the larger trees on their nest site. Reynolds et al. (1982) in an eastern Oregon study described goshawk nest sites having a canopy cover ranging from 10-95 percent with a mean of 60 percent. Vegetation plot data collected from Deschutes National Forest goshawk nest sites showed canopy cover ranging from 49-94 percent (USDA 1993). Foraging areas are typically 4,900-5,900 acres comprising a forest mosaic that must support a wide range of suitable prey including ground dwellers or those occuring near the forest floor (Marshall et al. 2003).

Sauer et al. (1996 cited in Wisdom et al. 2000) determined that breeding bird survey data for goshawk were insufficient to determine population trends for any state or physiographic region within the interior Columbia River basin because of low detection rates. However, sufficient data were available to indicate a stable trend in numbers between the years 1966-1995 for western North America.

Existing Condition

Suitable goshawk habitat is found in mixed conifer, ponderosa pine and lodgepole wet and dry PAGs. Potential nesting habitat includes stands having greater than 9 inch average diameter (9"+) and greater than 40 percent canopy cover. Foraging habitat is described using the same minimum diameter stands but no restrictions on canopy cover. Suitable habitat is generally widely distributed across the project area although some fragmentation has occurred from regeneration timber harvests on all the buttes or mountains. District databases list two goshawk nest territories in the project area including one near Willamette Pass and the other near Ringo Butte. The most recent goshawk surveys in the project area were conducted in 2004 and confirmed goshawks on Hamner Butte and Royce Mountain although no nests were located.

Environmental Consequences

Table 3-42 summarizes the effects of proposed treatments to existing goshawk habitat in the Five Buttes project area.

Table 3-42. Acres of potential goshawk nesting habitat within the Five Buttes Project Area (National Forest System Lands only).

Alternative	Nesting Habitat Acres		
	Pre-Treatment	Acres Treated	Acres Remaining
A	41,172	0	41,172
B	41,172	3,301 (8%)	37,871
C	41,172	4,499 (11%)	36,673

Alternative A – No Action
Direct and Indirect Effects

Implementation of this alternative would have no immediate direct effect on northern goshawks. In the short-term the existing territories would likely continue to be occupied by nesting pairs. Undiscovered pairs if present in the project area would also be unaffected by vegetation management actions. However, as identified earlier, many forested stands are still at risk of catastrophic wildfire events similar to the Davis Fire, which resulted in the long-term loss of over 16,000 acres of suitable habitat. Alternative A would not allow for understory tree removal and underburning to reduce fuel loadings and stand competition to maintain desired late- and old structural habitats closer to historical levels across the project area. This may result in additional habitat loss to catastrophic events.

Alternative B
Direct and Indirect Effects

The selection of this alternative would result in the commercial thinning of 3,301 acres (8 percent) of potential goshawk nesting habitat in the project area. The two known goshawk nest stands would be unaffected since the nearest planned harvest units are at least 1 ¼ mile from the Ringo Butte territory and more than 3 ½ miles from the Willamette Pass territory. The proposed commercial thinning is designed to reduce stem densities, particularly in the understory layer, and would primarily remove trees less than 21 inches diameter. Post-sale treatments would include small-tree thinning, slash removal, and underburning where desired. This combination of effects would likely preclude these stands from remaining as nesting habitat because of the reduced canopy cover. However, the change in cover types may enhance the quality of this acreage for goshawk foraging. Hargis et al. (1994 cited by Wisdom 2000) stated goshawk foraging occurs in various cover types and structural stages, and the juxtaposition of several habitats may enhance the quality of foraging habitat around nest sites. Because snags are not designated for removal except in limited circumstances, snags and coarse woody debris in all harvest areas where they occur would be available for goshawk prey base habitat.

Current forest structure in the Five Buttes project area is at least partially the result of decades of fire suppression. This has resulted in an increase in closed canopy stands with a dense conifer understory which may not be as valuable for goshawks as the more open stands that occurred previously. A high density of small diameter trees may be detrimental to foraging and nesting aspects of goshawk ecology in at least three ways: (1) by obstructing flight corridors used by goshawks to obtain forest-associated prey; (2) by suppressing tree growth needed to produce large diameter trees for nest sites; and (3) by reducing the growth of an herbaceous understory that supports potential prey species (Reynolds et al.1992, cited in Wisdom 2000).

Wisdom et al. (2000) listed several issues, strategies and management practices pertaining to northern goshawks in the Interior Columbia Basin assessment. There have been large transitions from shade-intolerant to shade-tolerant tree species leading to possible unsustainable conditions of old forests resulting from fire exclusion. This has resulted in an increased susceptibility to stand-replacing fires. He also stated that long-term maintenance of foraging areas is as important for successful reproduction as protection of the immediate nest stand. To address these issues he recommends a variety of cover types and structural stages within the home range of each active nest. Management practices that would assist in habitat risk reduction include prescribed fire and thinning to reduce fuel loading and to encourage the development of forest openings, shrub openings, and shade-intolerant and fire-, insect-, and disease resistant tree species. The activities planned with the Five Buttes project are consistent with the recommendations above. The removal of 8 percent of the potential nesting habitat would likely have little long-term effect on goshawks. Nesting habitat would still be well distributed across the entire project area with the exception of the Davis Fire area. Within the treatment units a minimum of 15 percent of each unit's acreage would be untouched and capable of providing a goshawk nest stand where appropriate structure exists.

Alternative C

Direct and Indirect Effects

Implementation of this alternative would result in management activities in 4,499 acres of goshawk nesting habitat in the project area. While Alternative B proposes commercial thinning as the primary treatment, Alternative C proposes 4,234 acres of commercial thinning and 3,563 acres of fuels only treatment. The fuels treatments would focus on small tree removal of 3 inches in diameter for stands classified as northern spotted owl nesting habitat and 6 inches and smaller in those units not classified as northern spotted owl nesting habitat. Because commercial thinning would remove live trees up to 21 inches in diameter, post-harvest canopy cover in treatment units may fall below the 40 percent level described by Reynolds et al (1991) as suitable goshawk nesting habitat. These stands would be converted to foraging habitat for goshawks. Similar to Alternative B, commercial thinning units with a single-story late-seral objective would not return to suitable nesting habitat in the foreseeable future. Because the objective in those units is to develop and maintain bald eagle nesting habitat, repeated silvicultural and fuels treatment entries would be scheduled as needed. This would be a long-term effect. The single-story commercial thinnings are designed for stands on the east side of Davis Lake and the north slope of Davis Mountain near Wickiup Reservoir, primarily within bald eagle management areas designated in the LRMP.

The fuels treatment units would still function as goshawk nesting habitat post harvest because only the smaller diameter trees would be removed. There will likely be little change in the overstory canopy cover and goshawk nesting capability would be maintained.

The two documented goshawk nest sites would be unaffected by any scheduled activities because nearest planned harvest units are at least 1 ¼ mile from the Ringo Butte territory and greater than 3 ½ miles from the Willamette Pass territory.

As described for Alternative B the vegetation management activities proposed are consistent with recommendations by Reynolds et al. (1992) to reduce small tree densities to improve foraging habitat and increase the growth of residual trees. Because Alternative C proposes fewer acres of commercial thinning as compared to Alternative B, more acreage would be maintained with greater canopy cover available for nesting goshawks. While several thousands acres of fuels treatments are proposed in Alternative C this small diameter thinning would not negatively affect the ability of goshawks to nests in these stands. This alternative would also contribute to having a diversity of cover types and seral stages across the landscape described by Wisdom et al (2000). Over 36,000 acres of the planning area would still be maintained in nesting habitat. In addition, a minimum of 15 percent of each harvest unit (silvicultural or fuels) would be maintained in its present condition and provide goshawk nest structure where suitable.

Cumulative Effects

Within the Davis LSR (which is the majority of the Five Buttes area of activity), the goshawk is a selected species for management. Table 3-1 was reviewed for past and current vegetation management projects having effects that would overlap in space and time with those of the Five Buttes project. The zone of influence is the Crescent Ranger District. The regeneration timber harvests that were conducted from the 1960s through the early 1990s likely removed stands described as nesting and/or foraging habitat for this species. Because these stands have been replanted, the older plantations are currently capable of providing foraging habitat. Over the last 15 years, the majority of the vegetation treatments have been commercial thinning (Seven Buttes EA, Baja 58 EA, Seven Buttes Return EA, and the Crescent Lake WUI EA). Approximately 20,000 acres of mid-and late-successional stands have been thinned to meet forest health objectives and reduce the risk and severity of large scale disturbance processes. Nesting habitat has been converted to foraging habitat on these acres. However, interspersed within activity units are 15-20 percent areas retained in a condition capable of providing nest stands for goshawks.

Within the Deschutes National Forest in the last 6-8 years, a series of stand replacement fires have occurred, particularly on the northern end of the forest where an estimated 26,700 acres of mixed conifer forest experienced a stand replacement event (Davis Fire Recovery Project, USDA, 2005). In addition, 16,900 acres of accipiter nesting and foraging habitat was removed by a stand replacement fire on the Crescent District in 2003 (USDA 2003). While not all of this acreage was considered goshawk nesting habitat, the majority has provided foraging habitat.

Past projects have been incorporated into the existing condition discussion. Foreseeable actions on the Crescent Ranger District include several wildland urban interface (WUI) fuel reductions. These projects propose small tree removal and fuels reduction actions including underburning where appropriate and/or piling and burning of slash. Based on post-sale reconnaissance of treated stands with similar prescriptions on the District, the WUI stands would continue to provide foraging and nesting habitat after implementation. Nesting habitat would also be maintained in suitable sites within areas retained within activity units (typically 15-20 percent) where no active management occurs. An environmental impact statement (EIS) is also being prepared for the BLT project, which proposes vegetation management activities in the southwestern portion of the Crescent District, outside the Five Buttes boundary. At this time, details for the project are not specific enough to consider effects for the northern goshawk.

Breeding bird surveys provided insufficient data to determine population trends within any state or physiographic province in the Interior Columbia Basin. However, it is anticipated that goshawk populations on the Deschutes National Forest would decline in response to the loss of habitat due to wildfires over the last 6-8 years. The Oregon Natural Heritage Information Center maintains a list of the most current information available on the distribution and abundance of animals native to Oregon. They rank the northern goshawk population as demonstrably wide-spread, abundant, and secure.

Because of the forest management that has occurred on most of the private land within the project area boundary, few if any privately owned stands have the structure and canopy cover necessary to support nesting goshawks. However, it is possible a goshawk pair may nest on National Forest systsem lands adjacent to private lands and forage on nearby private lands. It is unknown if industrial timberlands would be managed to provide goshawk nesting habitat in the foreseeable future.

There would be no timber harvest or burning conducted within known northern goshawk nest stands or nest stands discovered in the future. Mitigation has been provided to prohibit disturbance to nesting pairs if located in the project area. There would be no tree removal or burning conducted with the Five Buttes project within known goshawk nest stands or post-fledgling areas based on current knowledge of nest locations. Nest stands would also be available in the blocks of habitat within activity units where no active management occurs.

In summary, goshawk habitat is generally located on federal lands in and around the project area. In combination with wildfires, past, present, and foreseeable actions are expected to reduce populations on the Deschutes National Forest. However, habitat would continue to be provided and risk to loss from a wide-scale disturbance would be reduced. The Oregon population remains abundant and secure.

Osprey

Ecology

Ospreys are good biological indicators of ecosystem health because they are long-lived and are the top predator of aquatic food webs (USGS 2002). Various fish species comprise 99 percent of their diet. Ospreys dramatically declined in abundance through the mid-1970s as a side effect of pesticide use, but have since recovered and become a common nesting species along the Columbia and Willamette waterways in western Oregon (USGS 2002). They nest within two miles of fish-bearing bodies of water and generally nest in larger broken top live trees or snags, but also utilize utility poles, man-made Canada goose nest boxes, channel markers and other man-made structures where natural structures are lacking (Marshall et al. 2003). The primary habitat requirements of osprey include a dependable source of fish that can be captured near the surface and an elevated nesting platform within a few kilometers of their food supply. Ospreys are migratory, typically arriving on the Crescent Ranger District in April and May and stay into early autumn until fall migration. While a pair will mate for life, ospreys migrate separately and re-unite at their nest site the following spring. The birds winter in central California south into Central and South America. They are currently ranked as S4, apparently secure (Natureserve 2003).

Existing Condition

There are at least 40 known osprey nests in the project area though not all are active each year. The greatest concentration of nests is west and north of Davis Lake but there are also several nests along the shoreline of Odell Lake.

Environmental Consequences

Alternative A – No Action
Direct and Indirect Effects

Implementation of this alternative would result in no short-term effect to the osprey since no vegetative manipulations would occur. The seasonal occurrence of ospreys would still be expected with nesting habitat provided on lands surrounding Davis, Odell, and Crescent Lakes and Wickiup Reservoir.

Alternatives B and C
Direct and Indirect Effects

Implementation of either Alternative B or C would result in mostly similar effects to ospreys. Stand density reductions are scheduled on lands adjacent to Davis Lake and the Crescent District side of Wickiup Reservoir. The trees to be removed are generally less than 21 inches in diameter and no snags would intentionally be removed unless they are determined to be a safety issue or where a temporary road may be placed. Over the long-term this will result in forested stands with larger diameter live trees and limbs capable of supporting a nest structure. Proposed unit #10 adjacent to the Cascade Lakes Highway has an osprey nest within the unit and mitigation has been proposed for a seasonal restriction and to leave the dominant overstory trees consistent with forest plan direction. In addition, units #25, #155, #265, #765 and #811 are within ¼ mile of osprey nests; a seasonal restriction would apply in these units as described in Chapter 2 of this EIS (see the section titled “Mitigations Common to all Action Alternatives”). The restriction would be waived if surveys determine the site(s) are not occupied by nesting ospreys in the year activities are proposed.

Cumulative Effects
Table 3-1 was reviewed for projects that in conjunction with Five Buttes would have the potential for overlap in time and space for potential cumulative effects. The Crescent Ranger District would be the zone of influence. Seven Buttes EA, Baja 58 EA, Seven Buttes Return EA, Crescent Lake Wildland Urban Interface Fuels Reduction EA and the Davis Fire Recovery EIS were considered past projects and were included in the analysis for the existing condition.

Foreseeable actions include the Lakeside Wildland Urban Interface Fuels Reduction Project, Wagontrail Wildland Urban Interface Fuels Reduction, Wickiup Estates Wildland Urban Interface Fuels Reduction, and BLT. These projects would retain the largest trees on the landscape and focus on thinning and fuels reduction in smaller diameter size classes. As described for Davis Lake and Wickiup Reservoir, the additive effects would result in a District-wide benefit osprey because the prescriptions promote large tree structure and larger diameter limbs capable of supporting a nest structure. In the short-term, there are no effects. Seasonal restrictions have been implemented Forest-wide for known nests have proven effective in reducing or eliminating disturbance for numerous projects where osprey may be found. Osprey nests are large and are relatively easy to identify.

There are no known osprey nests located on private lands in the planning area. Nesting habitat on private lands is unlikely because the private lands are located away from the lakes and reservoir in the project area.

Great Blue Heron

Ecology

The great blue heron is one of the most wide-spread waterbirds in Oregon (Marshall et al. 2003). Oregon State Heritage rates the great blue heron as S4, apparently secure (NatureServe 2003). Highly adaptable, it is found along estuaries, streams, marshes and lakes throughout the state. Nest locations are in the proximity of available food. They nest in colonies in shrubs, trees and river channel markers where there is little disturbance (Marshall et al. 2003). Tree species in the project area that herons might use for nesting include ponderosa pine and Douglas-fir. Herons select a wide range of tree sizes (from 1.5 to 6 feet in diameter) for nest trees; nest trees average about 4.5 feet in diameter (Marshall 2003). Herons hunt shallow waters of lakes and streams and wet or dry meadows; the feed on fish, amphibians, aquatic invertebrates, reptiles, mammals and birds. Foraging habitat in the project area includes the shallow water of Davis Lake, Odell Creek, Ranger Creek and their associated marshes and riparian habitat.

Existing Conditions

District records show one heron rookery in the Moore Creek drainage west of Davis Lake. However, this site has been vacant since 2001 when a breeding pair of redtail hawks moved into the rookery. Great blue herons are commonly seen at Davis Lake and it is assumed there is a new rookery in the project area, but it has not been located at this time.

Environmental Consequences

Effects Common to All Alternatives
There are no silvicultural or fuels treatments planned within the riparian reserves of any alternative that would have the capability to directly, indirectly, or cumulatively affect any wetland habitat that may provide foraging habitat for the great blue heron. Because this species is documented to occur on Davis Lake it is assumed a nesting rookery is present somewhere in the project area. If a new rookery is discovered, a limited operating period would be placed on all activities determined to be disturbing to nesting herons. This restriction would apply to activities located within ¼ mile of the rookery, and may include timber harvest, road construction, underburning and small-tree thinning or any combination of the above depending on the site conditions. There are no silvicultural or fuels treatments areas within ¼ mile of the known heron rookery.

Waterfowl

Existing Condition

Many species of waterfowl are commonly seen on the lakes in the project area. Confirmed breeding species include puddle ducks such as mallards, pintails, green-wing teal, cinnamon teal, shovelers, wigeon, and diving species such as buffleheads, lesser scaup, ring-necks, hooded mergansers, and Barrow's goldeneyes. Buffleheads, goldeneyes, and wood ducks all use natural tree cavities and constructed nest boxes for nesting purposes. Waterfowl populations increase during the fall migration, particularly on Wickiup Reservoir and Davis Lake until freeze-up. However, during most winters several hundred to several thousand waterfowl spend the winter on the ice-free portions of Davis Lake, Wickiup Reservoir, and Odell Lake.

Environmental Consequences

Alternative A – No Action
Direct and Indirect Effects

Implementation of this alternative would have no effect on waterfowl populations that nest or overwinter within the project area or Crescent District. There would be no tree thinning or fuels reduction work in the project area including the riparian reserve zones surrounding Odell Creek, Odell Lake, Crescent Lake, or Davis Lake that could influence those waterfowl species that require tree cavities for nesting or those that nest on the ground near water sources. The Oregon Department of Fish and Wildlife would continue to monitor their constructed nest boxes placed along the perimeter of Davis Lake.

Alternatives B and C
Direct and Indirect Effects

Implementation of either Alternative B or C would have little long-term negative effect on waterfowl habitat. While both alternatives propose commercial thinning and removal of the slash material along the east side of Davis Lake, no work would occur within the wetlands. There may be a couple snags removed above the high water mark to meet OSHA safety issues. The largest green trees, primarily ponderosa pine, would be retained and capable of becoming future snag habitat. Because some of this acreage is within the Lava Flow campground and is already subject to high levels of human disturbance, the commercial thinning operations would likely have little additional effect. Mitigation measures to protect nesting bald eagles on the east side of Davis Lake would also benefit ground nesting waterfowl species because no disturbance would occur.

Cumulative Effects
Table 3-1 was reviewed for projects that in conjunction with Five Buttes would have the potential for cumulative effects. Over the last 15 years the majority of the vegetation work planned and completed on the Crescent District has focused on understory green tree thinning (Seven Buttes EA, Baja 58 EA, Seven Buttes Return EA, and the Crescent Lake WUI EA) with the exception of the Davis Fire Recovery EIS (USDA 2004). The green tree projects were designed to maintain and/or enhance the development of younger stands to promote large tree structure. Future planned projects such as the Lakeside Wildland Urban Interface, Wagontrail Wildland Urban Interface, and Wickiup Estates Wildland Urban Interface Fuels Reduction Project are also scheduled for commercial thinning and fuels treatments with the same overall objective of promoting late and old structure forests. This should meet the needs of wood ducks and buffleheads that nest in tree cavities.

Fishing for rainbow trout and large mouth bass is a popular activity in waterfowl habitat, plus there are several dispersed campsites on the west side of Davis Lake that are heavily used, especially on the weekends. Recreation activities in waterfowl habitat likely cause some disturbance to adult waterfowl, which can lead to mortality or unsuccessful reproduction. However, there are areas remaining that provide sufficient solitude. Very limited waterfowl habitat may be present on private lands along Crescent Creek, although it is unknown how many birds of what species may be using this stream corridor. The Five Buttes project would not create any additive cumulative effect to waterfowl populations or habitat.

Golden Eagle

Ecology

Gilligan et al. (1994) describes the golden eagle as an uncommon to fairly common summer resident in open country east of the Cascade Mountains and a very uncommon summer resident high in the Cascades. Clowers (pers comm. 2005) reported no observations of golden eagles in the vicinity of Wickiup Reservoir immediately north of the project area while monitoring bald eagles in 2004-2005. The golden eagle nests in open large (>30 inch dbh) live ponderosa pine or cliff ledges that support its 3-10 foot tall nest (Marshall et al. 2003).

Existing Condition

Because the majority of the project area is dominated by forested stands with 2 or 3 canopy layers of green trees, suitable nesting and foraging habitat may be limited. Nesting habitat would most likely occur within the lava flow northeast of Davis Lake or outside the project area in the eastern portion of the district where more open habitat types occur. The Davis Fire opened 16,900 acres of forested stands that may provide foraging habitat in the future as small mammals re-populate the burn. There are no known golden eagle nest sites in the project area. The Natural Heritage program rank golden eagles as S4, apparently secure.

District wildlife sighting records list eleven reports of golden eagles, one of which was a nesting pair confirmed in 1994 near the vicinity of Little Walker Mountain in the southeast corner of the district. There are no known golden eagle nests and only one incidental sighting in the Five Buttes project area has been recorded.

Environmental Consequences

Effects Common to All Alternatives

The selection of any alternative would have no direct, indirect, or cumulative effect on the golden eagle. There are no known nests and only one reported observation in the project area. An adult golden eagle was reported to be feeding on a road-killed mammal along Highway 58 in January 2006 about 5 miles east of the project area (Henshaw pers comm. 2006). The Davis Fire of 2003 created approximately 16,900 acres of early-seral conditions that may have increased the potential for golden eagle occupancy and nesting in the project area. The prescription for thinning proposed would not remove trees greater than 30 inches diameter described by Marshall et al. (2003) as potential nest habitat structure. In the event that nesting golden eagles are discovered in the project area and would be affected by the project, project design criteria would protect the nest site as described in the Deschutes LRMP p. 4-52 (WL-2 and WL-3). These measures have been used as routine on the Forest and are proven to be effective.

Redtail Hawk

Ecology

Redtail hawks are widely distributed across North America and winter from southern Canada south into the United States and Central America. The redtail hawk has increased in numbers and expanded its range since Euro-American settlement (Marshall et al. 2003). While it was selected as a management indicator species for large trees in mixed habitat, it uses any habitat that has perches to hunt from and is open enough to access prey on the ground. Small mammals such as rabbits, hares, and mice provide the bulk of their diet but redtail hawks are also known to capture birds, reptiles, and amphibians. Redtails also use a wide variety of structures for nests, including trees, utility poles and cliffs (Marshall et al. 2003). Because they place their nests higher in trees than other buteos do, they generally select larger trees or smaller deformed trees where branch structure supports this higher placement. Redtail hawks are ranked S5, secure in Oregon (NatureServe 2003).

Existing Condition

District wildlife sighting records list twelve redtail hawk nests widely scattered across the project area and an additional 12 nests concentrated on the very southern portion of the Crescent Ranger District. Suitable nesting habitat within the project area is in the mixed conifer and ponderosa pine plant associations.

Environmental Consequences

Alternative A
Direct and Indirect Effects

The selection of this alternative would have no effect on the redtail hawk. Existing known nest trees and nest stands would not be affected directly, indirectly, or cumulatively with the Five Buttes project.

Alternative B
Direct and Indirect Effects

The implementation of this alternative would result in the commercial thinning of approximately 5,490 acres of mid- and late-successional stands. Density reduction, especially the removal of trees smaller than 21 inches in diameter, would tend to provide more foraging habitat for this species by opening up stands, allowing greater access to the forest floor when pursuing prey. Retaining the largest trees with the largest diameter limbs would also be beneficial in maintaining nesting capability in forested stands. This activity would also reduce the mortality risk to the largest trees in affected stands. Because this alternative proposes the greatest amount of commercial thinning, Alternative B provides the best long-term nesting habitat protection. Mitigation measures have been provided to protect active nest sites during the nesting season by prohibiting disturbing activities such as timber harvest, road re-construction, temporary road construction, and all fuel reduction activities.

Alternative C
Direct and Indirect Effects

This alternative would commercial thin 4,219 acres with the same effects as described for Alternative B, except on fewer acres. Less commercial thinning would occur on the north side of Davis Mountain and on the far eastern end of the project area near Ringo and Cryder Buttes as compared to Alternative B. This results in more acreage that is still susceptible to large tree loss from density competition, which could lead to less nesting habitat for redtails in each area. While the fuels treatment acreage added in this alternative would reduce risk of large tree loss to fire, density competition mortality is still a possibility. Alternative C would provide less habitat protection for the redtail hawk than Alternative B.

Cumulative Effects
Table 3-1 was reviewed for projects with potential overlap in time and space with the Five Buttes project. The zone of influence is district-wide. Forest-wide, monitoring has shown that measures to protect known nests have been effective. Redtail hawks are widely scattered on the district and the Nature Heritage program lists them as secure in Oregon. In general, prescriptions for past, present, and foreseeable actions for vegetation manipulation promotes and maintains nesting habitat; tending to remove understory trees and retain the largest and healthiest tree species. There are no adverse effects identified.

It is assumed private industrial forestlands in the project area are not managed for redtail hawks. Any nesting capability for redtails would be incidental and would not be expected to persist for the long-term.

Sharp-shinned and Cooper's Hawks

Ecology

Sharp-shinned and Cooper's hawks are both ranked ranked S4, apparently secure. Both species are closely associated with deciduous and mixed coniferous forests, open woodlands, and riparian woodlands. They can occur in large forests but are more likely to be found near forest edges and clearings near lakes or streams. Reynolds (1983) in a study in eastern Oregon found nesting sharp-shinned hawks used 25-50 year-old even-aged conifer stands while Cooper's hawks used 30-70 year-old even-aged conifer stands with somewhat larger and more widely spaced trees than those stands used by sharp-shinned hawks. Reynolds (1983) also reported the mean distance between nearest nesting neighbor was 4.1 km. (2.5 miles) for sharp-shinned hawks and 4.7 km (2.8 miles) for Cooper's hawks. Both species are adapted to catch avian prey but each will also capture small mammals, lizards, various large insects, and amphibians (Johnsgard 1990). Home range estimates were 1,590 hectares (3,975 acres) for Cooper's hawks and 460 hectares (1,150 acres) for sharp-shinned hawks in Oregon (Reynolds 1983).

Existing Condition

The Crescent Ranger District wildlife sighting database lists twenty-five records of Cooper's hawks and fourteen of sharp-shins. The sightings came from general observations during other forest management activities as well as during surveys for northern goshawks. Only four Cooper's hawk nests have ever been located on the Crescent District, one of which was discovered in the Five Buttes project area near Ringo Butte in 2006. The only known sharp-shin nest is east of Big Marsh and outside the project area. Table 3-40 below displays the acres of potentially suitable nesting habitat for each accipiter. There is considerable overlap of habitat for each species and habitat is generally well distributed across the entire project area with the exception of the Davis Fire, young plantations, meadow complexes, rock outcrops and lava fields.

Environmental Consequences

Table 3-43 summarizes effects to existing sharp-shinned and Cooper's hawk habitat from the proposed alternatives.

Table 3-43. Acres of potential sharp-shined hawk and Cooper's hawk nesting habitat affected by the Five Buttes project (National Forest System lands only).

Alternative	Sharp-Shin Hawk		Cooper's Hawk	
	Pre-Treatment	Acres / % Treated	Pre-Treatment	Acres / % Treated
A	60,507	0	64,601	0
B	60,507	1,438 (2%)	64,601	1,536 (2%)
C	60,507	1,536 (3%)	64,601	3,665 (6%)

Alternative A
Direct and Indirect Effects

The selection of this alternative would have no immediate direct effect on sharp-shin and Cooper's hawks. In the short term, the existing territories would likely continue to be occupied by nesting pairs. However, as identified earlier, many forested stands are still at risk of catastrophic wildfire events similar to the Davis Fire. This alternative would not allow for understory tree removal and underburning to reduce stand competition and fuel loadings to maintain desired late- and old structural habitats across the project area. This may result in additional habitat loss to catastrophic events.

Effects Common to Alternatives B and C
Direct and Indirect Effects

The selection of either action alternative would likely result in the reduction of suitable nesting habitat for each species. Reynolds et al. (1982) studied accipiter nest sites in eastern Oregon and determined the mean canopy cover for sharp-shinned hawk nests was 68 percent and 64 percent for Cooper's hawks, although the range extends from 20-95 percent for sharp-shinned hawks and from 15-100 percent for Cooper's hawks. Most sharp-shinned hawk nests were in even-aged stands of white fir, Douglas-fir, or ponderosa pine, but one nest was in an aspen stand. The combination of proposed understory treatments, including commercial and small-tree thinning and underburning, would reduce the canopy cover of most, if not all, treated units below mean percentage level for each species. Post-treatment canopy levels will likely not exceed 45-50 percent in harvest units designed to maintain a multi-storied objective. Where single storied stands are the objective for nesting bald eagle habitat, post-treatment canopy cover may range from 40-45 percent.

Both species select nest placement well up in the tree canopy to conceal nests and provide shading during warm temperatures (Moore and Henny 1983, Reynolds et al. 1982). Dense vegetation provides screening cover and physical protection from predators; avoidance of predation may account for the high foliage density in the immediate vicinity of the nests of sharp-shinned hawks and Cooper's hawks (Reynolds et al.

1982). The treatments scheduled for the Five Buttes would likely reduce the probability of stands that are currently suitable for nesting being occupied post-harvest. Reynolds et al. (1983) stated that observations of foraging hawks indicated they utilized a variety of habitats from openings to dense forests. All treated stands should still function as foraging habitat for both species.

While project activities will reduce the amount of potential nesting acreage for each species, Reynolds et al. (1982) noted that nest sites contain the appropriate vegetative structure for a limited number of years and that turnover of nest sites must be accounted for. Within the Five Buttes project area, potentially suitable nest sites would be maintained in harvest unit retention areas and other unmanaged stands in Five Buttes planning area.

The one known Cooper's hawk nest near Ringo Butte would not be affected because the nearest planned harvest or treatment site is greater than 1 mile away.

Cumulative Effects

Table 3-1 was reviewed for past and present federal actions that have the potential to overlap the Five Buttes project in time and space. The zone of influence is District-wide. All (including the Davis Fire) have been included into the existing condition analysis. Regeneration timber harvests that were conducted across the district from the 1960s through the early 1990s likely removed stands that were suitable as nesting and/or foraging habitat for these species. Because these stands have been replanted, the older plantations are probably currently capable of providing foraging habitat.

Over the last 15 years, within approximately 20,000 acres of mid-and late-successional stands, the vegetation prescriptions have been mostly smaller diameter thinning with the goal of reducing risk to large-scale disturbance processes. Since these species nesting habitat is associated with dense stand conditions, these actions have been assumed to convert nesting to foraging habitat. However, interspersed within activity units, the Crescent Ranger District routinely includes approximately 15 percent of the area in a condition where no active management occurs to provide stand diversity for species such as the sharp-shinned and Cooper's hawks.

On the Deschutes National Forest in the last 6-8 years, a series of stand replacement fires have occurred, particularly on the northern end of the forest where an estimated 26,700 acres of mixed conifer forest experienced a stand replacement event (USDA 2005). The distribution of nesting Cooper's and sharp-shinned hawks on the forest has been diminished as a result of these events. In addition, another 16,900 acres of accipiter nesting and foraging habitat was removed by a stand replacement fire on the Crescent District in 2003 (Davis Fire Recovery Project, USDA 2004). While the entire wildfire area was not considered sharp-shinned and/or Cooper's hawk nesting habitat, the majority of the acres provided foraging habitat as a minimum. However, both species are capable of nesting within younger aged stands. Over the next several decades, thousands of acres of forest will reach the age and structural requirements that sharp-shinned and Cooper's hawks tend to select as nesting habitat. This will help offset the loss from wildfires which will be decades until they provide suitable nesting habitat once again.

Foreseeable actions on the Crescent Ranger District include several wildland urban interface (WUI) fuel reduction projects and BLT. Each project (in general) would thin the smaller trees on site and include prescribed underburning where appropriate. Based on the best information available at this time and post-sale reconnaissance of treated stands with similar prescriptions, the WUI stands would remain as foraging areas with suitable nesting habitat maintained. For BLT and its potential for an incremental effect to the Five Buttes project, there are insufficient details to determine the additive effect, if any, to the Five Buttes project. In consideration of past, present and foreseeable actions in combination with the Five Buttes project, nesting habitat availability would be reduced overall in most actively-managed stands that are thinned. However, nesting habitat would be maintained in appropriate areas with each individual project. This strategy would lessen the risk from complete removal of nesting habitat in any one area on the district due to a wide-scale disturbance, and maintain local populations at current levels.

It is unknown if Cooper's and/or sharp-shinned hawks are nesting on private lands in the project area. It is assumed that hawk habitat is provided on an incident basis on the majority of private lands. Commercial thinning conducted on surrounding private lands managed for industrial forestry has likely removed nesting habitat.

Survey and Manage Species

In 1994 the Northwest Forest Plan (NWFP) developed a system of reserves, Aquatic Conservation Strategy, and various standards and guidelines for the protection of old growth associated species. Mitigation measures were also included for species that were rare, or thought to be rare due to a lack of information about them. It was unknown whether the major elements of the NWFP would protect these species. These species, collectively known as Survey and Manage species, were included in standards and guidelines under Survey and Manage, Protection Buffers, and Protect Sites from Grazing.

In January 2001, a Record of Decision for Amendments to the Survey and Manage, Protection Buffer and other Mitigation Measures Standards and Guidelines (2001 amendment) was signed. This decision amended the NWFP Survey and Manage and related standards and guidelines to add clarity, remove duplication, increase or decrease levels of management for specific species based on new information, and established a process for making changes to management for individual species in the future (USDA 2001 pgs ROD-1-3).

The 2001amendment put into place a review process that would allow for the adding or dropping of species, based on new information. The 2001 amendment also grouped the species into six categories (A-F) based on level of relative rarity, ability to reasonably and consistently locate occupied sites during surveys prior to habitat disturbing activities, and the level of information known about the species or group of species. A complete description of the categories can be found in the 2001 amendment Standards and Guidelines (S&G) pages 6 through 14.

In 2004 a Final Supplemental Environmental Impact Statement was prepared and a Record of Decision signed to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines from the Northwest Forest Plan. The proposed action amended 28 land and resource management plans within the range of the northern spotted owl by removing the Survey and Manage Mitigation Measure Standards and Guidelines. The conservation of rare and little known species would rely on other elements of the Northwest Forest Plan and the BLM Special Status Species Policies and the Forest Service Sensitive Species Policies. The Agencies' reviewed the 296 Survey and Manage species to determine their eligibility for inclusion in the Agencies' existing Special Status Species Programs. Eighty-one species were deemed eligible for inclusion on the Forest Service R6 Sensitive Species list and the Region 6 Sensitive Species list was updated in 2004 to include the new eligible species.

The 2004 ROD did not eliminate the portion of the Survey and Manage Mitigation Measure Standards and Guidelines that contain provisions for some non-Survey and Manage Species (certain cavity-nesting birds, some bat roosts, and the Canada lynx). Based on a recent court decision, the 2004 Survey and Manage ROD has been set aside and the January 2001 ROD has been reinstated with any amendments or modifications to the 2001 ROD that were in effect as of March 21, 2004.

Additional Protection Species (White-headed woodpecker, Black-backed woodpecker, Pygmy nuthatch, Flammulated owl)

The 1994 Record of Decision for the Northwest Forest Plan listed this group of species to be managed under the Protection Buffer Standards and Guidelines as applied to Riparian Reserves and Matrix lands. The 2001 Record of Decision for Survey and Manage removed this group of species to a separate standard and guideline that applies to all land allocations. The new standard also included three changes (1) allow snag removal deemed to be in excess of the number needed to provide for 100 percent of the potential population levels for each species; (2) include a specific adaptive management clause that encourages timely adoption of new information; and, (3) provide clarification to management of even-aged, young stands with regards to these species. Discussion on the effects of the white-headed woodpecker, black-backed woodpecker, pygmy nuthatch and the flammulated owl is provided in the snag and down wood section of this report.

Protection Buffer Species (Fringed myotis, Silver-haired bat, Long-eared myotis, Long-legged myotis, Pallid bat, and Townsend's big-eared bat)

Most bat species roost and hibernate in crevices in protected sites. Sites commonly used by bats include caves, mines, snags and decadent trees, wooden bridges, and old buildings (USDA 1994 ROD C-43). While snag management guidelines were provided (USDA and USDI 2001 S&G-37-38) the authors of the plan determined that additional protection was needed for caves, mines, abandoned wooden bridges and buildings. Surveys of these structures were recommended to determine bat presence including the fringed myotis, silver-haired bat, long-eared myotis, long-legged myotis, pallid bat, and Townsend's big-eared bat. The purpose of the standard and guideline is to protect these sites from destruction, vandalism, disturbance from road construction, blasting or any other activity that could change cave or mine temperatures or drainage patterns.

Ecology

Sites commonly used by bats include caves, mines, snags and decadent trees, wooden bridges and old buildings. The bats in this group vary slightly on habitat use. The fringed myotis and the Townsend's big-eared bat focus on caves, mines, and rock crevice habitat while the long-legged myotis, long-eared myotis, and the pallid bat will utilize buildings, caves, snags and hollow trees. The silver-haired bat relies heavily on standing snags and hollow trees in and adjacent to riparian areas that are used for foraging (Natureserve 2005).

Most of the myotis species and Townsend's big-eared bats are colonial breeders which can range from 12 to 500 individual individuals but generally contain less than 100 (Christy and West 1993). Silver-haired bats are generally considered solitary breeders though a few nursery colonies have been reported (Christy and West 1993). Most bat species are aerial foragers but a few (long-eared and fringed myotis) also glean insects from the ground or foliage and rely on vision as well as echolocation when hunting (van Zyll de Jong cited in Christy and West 1993). Most bat species in the Pacific Northwest probably undergo relatively short migrations to and from hibernacula each year although silver-haired bats are believed to migrate fairly long distances (Shump and Shump cited in Christy and West 1993). Pacific Northwest bat species have many predators but are not a major prey item for any animal group; consequently, predation is not a major mortality factor. However, the influence of people may have negative effects on bats from disturbances to hibernacula from cave exploration. Pesticide spraying to control insects may also negatively affect bats by reducing prey populations as well as contaminating their prey.

Preliminary data from a research study of bat use in the Davis Fire area shows the presence of the following species: little brown bat, long-legged myotis, western small-footed myotis, and long-eared myotis. Other species detected but not positively identified at this time include the silver-haired bat, California myotis, Yuma myotis, and the big brown bat.

Table 3-44 displays the bat species that are known to occur or may potentially occur within the Five Buttes project. Data from the table below is from Perlmeter 1996-1997, Christy and West 1993, Natureserve 2005, and preliminary data results from T. Manning, Oregon State University 2005.

Table 3-44. Bat species known or suspected to occur and habitat requirements within the Five Buttes project area.

Species	Forage Substrate	Roost Site	Main Prey Species	Comments
California Myotis	Forest edges and over water	Cliff faces, tree crevices, caves and structures	Moths	One offspring per female/season
Western Small-footed Myotis	Ponderosa pine and mixed conifer forests	Rock crevices, under boulders, and beneath bark	Small insects	Will also forage over rocks
Yuma Myotis	Riparian, moist woodlands, and open forests	Buildings, caves and bridges	Moths, midges, flies and termites	Closely associated with water and very sensitive to disturbance
Little Brown Myotis	Moist forests and riparian areas	Buildings, bridges, caves, mines, rock crevices, snags	Flies	Closely associated with water
Long-legged Myotis	Coniferous forests and riparian areas	Crevices, buildings and caves	Moths	Closely associated with forests
Long-eared Myotis	Forested habitats and forested edges	Snags, hollow trees or rock features	Moths	One offspring per female/season
Silver-haired Bat	Forested areas and over ponds and streams	Under bark	Wide variety of insects	Deforestation and loss of snags is a threat
Big Brown Bat	More common in deciduous forests versus coniferous forests	Structures	Beetles	Forages over open areas and uses hollow trees
Hoary Bat	Riparian and brushy areas	Trees	Moths	Solitary breeder and only foliage roosting bat in Pac. Northwest
Pallid Bat	Arid regions and open forest types	Cliff faces, caves, and buildings	Moths and grasshoppers	Forages on ground and very intolerant to disturbance
Townsend's Big-eared Bat	Arid regions and open forest types	Buildings, caves, and bridges	Moths primarily, flies, bugs and beetles	Presence of suitable roosts more important than vegetation type; very intolerant of human disturbance
Fringed Myotis	Along forest edges, roads or open areas	Caves, mines, rock crevices, buildings	Primarily moths	One offspring per season

Existing Condition

There are no abandoned structures or known caves or mines in the Five Buttes project area. However, the lava flow on the north side of Davis Lake, the Black Rock lava pit north of Crescent Creek and numerous small <1.0 acre lava pressure ridges west of Davis Lake could provide rock crevices for day roosts. Snags for bat roosting habitat variy considerably across the project area with the highest snag densities per acre located in the Davis Fire area.

There were no bat surveys conducted for this project and only limited surveys have ever been conducted on the Crescent Ranger District. Perlmeter (1996 and 1997) conducted bat surveys under several bridges of the Crescent Ranger District. Included bridges were a wooden bridge on Odell Creek and concrete and wooden bridges over Crescent Creek and the Little Deschutes River on Highway 58. One long-eared myotis was detected day roosting under the Odell Creek concrete and wooden bridge during the 1996 survey. In 1997 there were no bats observed roosting under these bridges although foraging activity was noted on both evenings mist nets were set up (Perlmeter 1997). A research study is currently underway in the Davis fire area of Five Buttes to determine bat response to salvage logging.

Environmental Consequences

Alternative A
Direct and Indirect Effects

Implementation of the no action alternative would result in no vegetative treatments including commercial and small diameter thinning and fuels reduction activities and would retain snags, lava flows, lava pressure ridges and other potential roost sites in their present condition. For the Townsend's big-eared bat and the pallid bat (Natureserve 2005), plus the Yuma myotis, long-legged myotis, big brown bat, and the fringed myotis there would not be an expected change in occupancy of roost sites since activities would not occur near these features. For the California myotis, western small-footed myotis, little brown myotis, long-eared myotis, silver-haired bat, and the hoary bat, species associated with snags, sloughing bark, hollow trees or tree cavities, the Davis Fire of 2003 created tens of thousands of new snags of varying species and diameter and decay classes. These sites would continue to provide for roosting and foraging bats for the next several decades. Eventually most snags will be lost within the Davis Fire area and snags will be in short supply after about 30 years. Within forested stands in the planning area, snag presence will be maintained as new snags will be generated due to tree competition, disease problems or future wildfire events.

Effects Common to Alternatives B and C
Bats tend to use more than one snag or tree for roosting and may show fidelity to roost areas, rather than specific roosts (Ormsbee, pers. comm. 2005). Active management objectives are to maintain and enhance late and old structured forests, focusing on the retention of large diameter trees. These alternatives are the most likely to sustain large diameter trees on the landscape, which are important to future snag recruitment. There would be no intentional felling of snags although a small percentage may have to be removed to meet OSHA safety requirements and/or where the placement of temporary roads may necessitate the removal of a limited number of snags. This short-term effect would be offset by snags created by prescribed burning and ongoing snag recruitment from natural successional process on adjacent areas. For a discussion on the existing condition and projected levels into the future, reference the section titled "Snags and Down Wood" in Chapter 3 of this EIS.

In addition to bat species association with caves, they also tend to use rock features such as outcrops or lava pressure ridges, which provide roosting and maternity habitat. In the Five Buttes project area, there are numerous pressure ridges within some units. For this reason, timber harvest is restricted in these areas. Without this mitigation, bats could awaken while resting, which would interfere with their ability to conserve energy. This could have consequences dependent on the time of year. If they have young, it could potentially cause mortality as the bats move their pups and search for another suitable area. Also, disturbance would hamper the adults in storing fat reserves which are critical for surviving hibernation.

Prescribed underburning activities also have potential to disturb bats and remove habitat (snag and bark). A mitigation measure has been designed to restrict prescribed burning around rock outcrops and lava pressure ridges to fall months when bats are relatively fit and able to withstand disturbance (Ormsbee, pers. comm. 2005). In addition, prescribed burning has the potential to disturb bats that may be roosting under the bark of snags, or remove the habitat all together. Another mitigation measure would utilize the prescribed fire "burn plan" that protects snags by various methods such as building handline, or including snags within areas that are avoided. These measures for snag protection have been used extensively on the district and have proven to be effective.

The 2001 Record of Decision for the Amendment to the Protection Buffer and other Mitigation Measures, Standards and Guidelines (USDA and USDI 2001) made several adjustments for bat protection. The standard and guideline for protection of caves, mines, and abandoned wooden bridges and buildings used as bat roosts became an applicable standard and guideline common to all land allocations. This standard would apply to all bat species that would benefit. The 2001 ROD also acknowledged that provisions for the retention of large snags and decadent trees included as a standard and guideline provision for green tree patches would accommodate the bat species listed above with roost sites associated with snags, sloughing bark, hollow trees or other cavities. All activities are designed to be consistent with the 2001 ROD.

Cumulative Effects

Table 3-1 was reviewed for past, present, and foreseeable actions that, in combination with the Five Buttes project, may have an incremental effect. The zone of influence is District-wide. For bats, the most relevant discussion to assess effects from management activities is snag removal, since rock outcroppings have been protected in the past and would continue to be protected in the future. There are no known caves, mines, or wooden bridges within the project area, and the few buildings that may provide suitable roosting habitat would not be affected by actions planned within this project.

Rather than cataloging each individual project and assessing the incremental effect on snags, it is more informative for the public and responsible official to review the section titled "Snags and Down Wood" (in Chapter 3 of this EIS), which discloses the existing condition for snags (accounting for all management activities that may have removed snags), as well of the effects of this project. Foreseeable actions with the greatest potential effect for snag removal include Lakeside Wildland Urban Interface small diameter thinning, Wagontrail Wildland Urban Interface Fuels Reduction project in the La Pine basin, Wickiup Acres Wildland Urban Interface Fuels Reduction project, and Seven Buttes Return projects to be implemented, such as the Bucky timber sale. Intentional snag removal with these projects may occur in limited circumstances, and would be restricted to those occasions where occupational safety would conflict with retention.

The majority of the private lands in the planning area are industrial forest timberlands. Generally speaking, snag densities are relatively low on this acreage and any bat habitat provided is incidental and may not last for the long-term.

With these assumptions in place and the best habitat existing on federal ands, there would be no additive effects as incidental snag removal would be offset by natural and management activity-caused recruitment, such as prescribed underburning and snags provided buy the Davis Fire.

Canada lynx

The Canada lynx was included as a Protection Buffer species in the NWFP (USDA 1994). In March 2000 the U.S. Fish and Wildlife Service listed the Canada lynx as a federal Threatened species under the Endangered Species Act. Effects to the Canada lynx are discussed in the Threatened, Endangered, and Sensitive species section of this document.

Great Gray Owl

The 2001 Record of Decision for the Amendment to the Protection Buffer and other Mitigation Measures, Standards and Guidelines (USDA and USDI 2001) made several changes to the status of the great gray owl. The great gray owl was formerly a "Protection Buffer" category species in the 1994 Northwest Forest Plan. With the 2001 decision its status was changed to a "Survey and Manage" standard and guideline species and surveys are deemed practical. The latest version of the great gray owl survey protocol was prepared in January 2004 (Quintana-Coyer et al 2004).

Ecology

This species is associated with mature stands of mixed conifer/lodgepole pine/mountain hemlock near meadow complexes. Great gray owls do not build their own nests but rely on other raptor nests, mistletoe platforms, broken topped snags or artificial nest platforms. Bull and Henjum (1990) found that great gray owls tended to nest in unlogged, mature or older stands with a fairly open understory and dense overstory (60 percent or greater). They have been documented using alternative nest sites and may nest more than 0.5 mile from the previous year's nest (Bull and Henjum 1990). A great gray owl study conducted by Bryan and Forsman (1987) in southcentral Oregon suggested that forest/meadow associations are a preferred habitat. In fact, their research located 63 sites with great gray owls; 60 sites were in forests less than 0.3 km from meadows and three were in forest areas 0.30-0.8 km from the nearest meadow. Fifty-nine sites were dominated by lodgepole pine or mixtures of lodgepole pine and ponderosa pine. Four sites were in mixed coniferous forests. Bryan and Forsman (1987) stated that all sites where great gray owls were located were in old-growth (45 sites) or mature (15 sites) characterized by large overstory trees. They defined old-growth lodgepole pine as any stand greater than 70 years of age and old-growth ponderosa pine or mixed coniferous forests as any stand over 200 years of age. Elevations at occupied sites ranged from 1270 to 1650 m., although great gray owls have been documented to occur at elevations up to 1890 m. in eastern Oregon (Bryan and Forsman 1987).

Home ranges for breeding adults in northeastern Oregon averaged 1,112 acres and ranged from 324 acres to 1,606 acres although they have been observed foraging up to 2 miles from the nest (Bull and Henjum 1990). Foraging habitat is typically defined as natural meadows greater than 10 acres in size, riparian areas, clear-cut and selectively logged areas where they forage on voles, pocket gophers, shrews, chipmunks, squirrels, and snowshoe hares.

Existing Condition

Potential nesting habitat in the project area may occur along the unburned fringes of Davis Lake and within the Odell and Crescent Creek drainages. Great gray owls surveys were conducted in the Five Buttes project area in 1999 and 2000; no great gray owls were detected. In 2004 and 2006, additional surveys were conducted in the Five Buttes project area along Crescent Creek, Davis Lake, Dell Springs and Odell Creek but there were no detections. At the present time there is only one confirmed great gray owl nesting territory on the district located outside the project area in the Refrigerator Creek drainage near Big Marsh.

Environmental Consequences

Table 3-45 summarizes effects of proposed alternatives to potential great gray owl nesting habitat.

Table 3-45. Acres of potential great gray owl nesting habitat affected by the Five Buttes project.

Alternative	Existing Nesting Acres	Acres of Commercial Thinning and Fuels Treatments Within Potential Nesting Habitat	Nesting Acres Remaining
A	6,057	0	6,057
B	6,057	27 (<1%)	6,038
C	6,057	255 (4%)	5,802

Alternative A
Direct and Indirect Effects

At the present time great gray owls are not known to occur in the project area based on surveys conducted in 1999, 2000, 2004 and 2006. However, as previously mentioned, Bryan and Forsman (1987) located great gray owls in the Little Deschutes River corridor within several miles of the northeastern project area boundary. Additional surveys are scheduled for 2007.

The selection of this alternative would result in no change in habitat conditions for great gray owls that may be using the planning area. The Davis Fire of 2003 may have increased the amount of foraging habitat at the lower elevations of the fire where great gray owls may be found (USDA 2004). Nesting habitat in the planning area would still be maintained in late and old structure stands with broken topped trees and/or where other raptors have created stick built nests suitable for great gray owl nesting use.

The following table displays the amount of potentially suitable great gray owl nesting habitat is present in the Five Buttes project area. Habitat definitions were taken from the great gray owl protocol (Quintana-Coyer et al. 2004).

Alternative B
Direct and Indirect Effects

The selection of alternative B would result in the commercial thinning of 27 acres or less than 1 percent of the total estimated great gray owl nesting habitat in the project area. The habitat affected is located along a segment of Odell Creek (units #370 and #810) and Crescent Creek (units #460, #690, and #695). No treatments would occur within 150 feet of either stream where high quality potential nesting habitat is available. Nesting habitat would be reduced by a relatively small amount compared to the availability in the entire project area. Also, there would be many stands outside the project area that remain overstocked with high canopy cover and continue to provide potential nesting habitat.

Proposed management activities (generally removing green trees less than 21 inches in diameter) would reduce canopy cover below the 60 percent level described as great gray owl nesting habitat by Bull and Henjum (1990) in northeastern Oregon, but would retain the largest dominant trees in management units. While nesting capability would be reduced, active management would reduce stem densities and improve great gray owl foraging opportunity because visibility and access to the ground for prey capture would be enhanced.

Bull and Henjum (1990) stated partial cuts are generally suitable foraging habitat because the stand is open enough for maneuvering, adequate perches are available and dead and down material would be left for cover for voles. Passive management on areas adjacent to thinning activities would maintain sufficient nesting habitat. There would be no long-term negative effect on the great gray owl's ability to successfully locate suitable nest platforms and adjacent foraging areas if nesting habitat is maintained over the long-term in the planning area. Bull and Henjum (1990) also state that managing habitat for northern goshawks will provide nest sites over time for great gray owls because the owls used old goshawk nests more than any other type of nest in the northeastern Oregon study sites.

Alternative C
Direct and Indirect Effects

Alternative C is very similar in effects as discussed for Alternative B. This alternative would thin and reduce fuels within 255 acres (4%) of the potential nesting habitat in the project area, though there is ample potential nesting habitat within and outside the project area. This alternative would implement additional fuels reduction activities that are more responsive to reducing the risk of landscape-scale wildfire. These activities include trimming limbs, small diameter thinning, and disposal of fuels. Some of the additional fuels activities would be located (mainly) along Crescent Creek and tributaries of Odell Creek. The project design criteria to maintain riparian buffers of 150 feet on either side of the streams would also serve to maintain nesting habitat.

Cumulative Effects
Table 3-1 was reviewed for past, present and future projects that in combination with Five Buttes, have the potential to overlap in time and space. The zone of influence is the Crescent Ranger District and the La Pine basin. All past and present federal activities is included into the existing condition analysis. The most recent vegetation management projects include Seven Buttes (USDA 1996) Baja 58 (USDA 1998) and Seven Buttes Return (USDA 2001). Vegetative prescriptions for these projects have tended to retain large trees on the landscape, one of the most important elements for nesting habitat and great gray owls on the landscape. Prior to the 1990s, thinning prescriptions through regeneration harvest converted the forest to early-seral conditions, which likely removed nesting habitat, but provided foraging. The more recent commercial thinning activities that may have overlapped activities in nesting habitat, have maintained by avoidance ample habitat where it is most likely found along riparian reserves. Outside of reserves and the 15 percent within activity units where no active management occurs likely converted stands to foraging habitat. The Davis Fire of 2003 has now increased the potential foraging habitat around Davis Lake (Davis Fire recovery Project, USDA, 2004).

While great gray owls can be somewhat secretive, human-induced mortality (shooting) has been documented on nesting great gray owls near the Deschutes River downstream of Wickiup Reservoir just outside the project area (Clowers personal communication 2005). This is the only known occurrence and none are known on the Crescent Ranger District.

Several future vegetation management projects are foreseeable actions that have potential to overlap in time and space include the Lakeside WUI (Crescent and Odell Lakes), Wagontrail WUI on federal lands southwest of La Pine, Oregon, the Greater La Pine Basin Fuels reduction Project on BLM lands, and Wickiup Estates which are located on several small parcels of occupied, rural private lands within the project area. These projects are generally close to meadow habitats and will generally focus on fuels reduction activities near rural subdivisions and residences on Crescent and Odell Lakes. Except for the activities on the BLM, prescriptions would thin small diameter trees and dispose of material from fuels reduction activities adjacent to private residences. The Greater La Pine project would maintain or restore meadow habitats on approximately 550 acres, ultimately benefiting great gray owls. At this time, there is insufficient detail to evaluate the BLT project. All projects would be designed to maintain a well distributed network of nesting habitat near forage openings such as meadows and riparian areas. Private lands are not managed for great gray owl habitat. Any suitable nesting or foraging habitat is assumed to be incidental and may not be provided for the long-term.

In addition to those effects described for direct and indirect effects, implementation of these overlapping projects would have a beneficial effect by creating additional meadow habitat in the La Pine basin, reduce risk of wide-scale loss of nesting habitat on a landscape scale, and create foraging habitat. This would more than offset reductions in nesting habitat from active management.

From a global perspective, great gray owl populations are stable (Natureserve 2006). The Interior Columbia Basin Ecosystem Management Project found populations to be widely distributed, although at low levels. Suitable habitat has been shown to be increasing and more than 50 percent of it is within the southern Cascades (Wisdom et al. 2000), including the Five Buttes project area. Since 1995, survey results have shown available nesting habitat to be found in wider bands of elevation as more nests are found region-wide.

Crater Lake Tightcoil Snail

The Crater Lake tightcoil snail remains a Category A (rare, pre-disturbance surveys practical) survey and manage animal species based on a recent court decision that vacated the 2004 ROD "To Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl. The Record of decision dated January 2001 entitled "Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines was reinstated, including any amendments or modifications to the 2001 ROD that were in effect as of March 21, 2004.

Pre-disturbance surveys are to be conducted prior to signing NEPA decisions or decision documents for habitat-disturbing activities (USDA and USDI 2001 p S&G-21). "Habitat disturbing activities are defined as those likely to have a significant negative impact on the species' habitat, its life cycle, microclimate, or life support requirements." The evaluation of the scale, scope, and intensity of the anticipated negative impact of the project on habitat or life requirements should include an assessment of the type, timing, and intensity of the disturbing activity. "Habitat-disturbing" is not necessarily the same as "ground-disturbing"; helicopter logging or logging over snow-pack, for example, may not disturb the ground but might clearly affect microclimate or life cycle habitat factors. Conversely, an activity having soil-disturbing effects might not have a large enough scope to trigger a need to survey (USDA and USDI 2001 S&G-22).

On April 26, 2004 the Crater Lake Tightcoil snail was designated a sensitive species on the Region 6 sensitive species list.

Ecology

"The Crater Lake Tightcoil may be found in perennially wet situations in mature conifer forests, among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 meters of open water in wetlands, springs, seeps and riparian areas, generally in areas which remain under snow for long periods of time during the winter. Riparian habitats in the eastern Oregon Cascades may be limited to the extent of permanent surface moisture, which is often less than 10 meters from open water" (Duncan et al. 2003). Threats to the species include activities that compact soils, reduce litter and/or vegetative cover, or affect potential food sources.

Existing Condition

Due to the well draining pumice soils on the Crescent Ranger District, areas that retain permanent surface moisture are very narrow margins along the edge of springs, seeps, or streams. Within the project area Ranger Creek, Odell Creek, Maklaks Creek, Crescent Creek, Little Deschutes River, Trapper Creek, Dell Springs, and the shorelines of Odell Lake, Crescent Lake, and Davis Lake provide permanent sources of water. Surveys for the Crater Lake Tightcoil snail were conducted according to protocol within potentially suitable habitats in the project area in 1999 and 2001 as part of the Seven Buttes Return vegetation management environmental assessment that includes most of the treatment units that are proposed for the Five Buttes project. At the present time there is only one confirmed population of Crater Lake Tightcoil snails on the Crescent Ranger District. That population was located in the project area near the confluence of Princess Creek and Odell Lake in June 1999.

Environmental Consequences

Effects Common to All Alternatives

There are no silvicultural or fuels treatments planned within 10 meters (30 feet) of any permanent water source that is defined as potentially suitable habitat for the Crater Lake Tightcoil snail. Cumulatively, it is unknown what effect past regeneration timber harvests within 30 feet of a permanent water source may have had on the Crater Lake Tightcoil snail within the project area and Crescent Ranger District. At the present time there is only one confirmed population near the shoreline of Princess Creek and its confluence with Odell Lake and there are no activities scheduled with Five Buttes that would affect the known site or any permanent wet area of any riparian zone. A future scheduled project, Lakeside Wildland Urban Interface, does propose to reduce fuel loadings around the perimeter of Odell Lake and Crescent Lake. Mitigation has been proposed to protect the known site on Odell Lake. There are also no known locations of this snail species on private lands in the project area and no anticipated additive effects are expected.

Cumulative Effects

There is no active management planned within 10 meters (30 feet) of a permanent water source that is defined as potentially suitable habitat for the Crater Lake Tightcoil snail. Further, there would be no activities within riparian-associated vegetation. Therefore, there would be no effect from this federal action and no possible cumulative effects from past, present, or future actions.

Determination

Based on the level of surveys previously conducted and mitigation to avoid activities within the permanent wetted portion of any riparian zone, implementation of any Five Buttes project alternative would have "**No Impact**" on the Crater Lake Tightcoil snail.

Birds of Conservation Concern

In January 2001, President Clinton issued an executive order on migratory birds directing federal agencies to avoid or minimize the negative effect of their actions on migratory birds, and to take active steps to protect birds and their habitat. Within two years, federal agencies are required to develop a Memorandum of Understanding (MOU) with the U.S. Fish and Wildlife Service to conserve migratory birds including taking steps to restore and enhance habitat, prevent or abate pollution affecting birds, and incorporating migratory bird conservation into agency planning processes whenever possible. Toward meeting this goal, the U.S. Fish and Wildlife Service developed the Birds of Conservation Concern released in 2002 and recently released the U.S. Shorebird Conservation Plan (2004).

The "Birds of Conservation Concern 2002" (BCC) identifies species, subspecies, and populations of all migratory non-game birds that without additional conservation protection actions, are likely to become candidates for listing under the Endangered Species Act of 1973. While all of the bird species included in the BCC are priorities for conservation action, the list makes no finding with 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 plans. The U.S. Shorebird Conservation Plan (USFWS 2004) revised the 2001 Plan with new information and developed a list of U.S. and Canadian shorebirds considered highly imperiled or of high conservation concern. Conservation measures were not included, but these lists should be consulted to determine reasons for conservation concern.

Bird Conservation Regions (BCRs) were developed based on similar geographic parameters. One BCR encompasses the Five Buttes project area – BCR 9, Great Basin. Table 3-46 displays the BCR species for this area, preferred habitat and whether suitable habitat is present in the project area. Birds appearing in **bold** type are those considered highly imperiled or of high conservation concern by the U.S. Shorebird Conservation Plan as of August 2004.

Table 3-46. Bird Conservation Region 9 (Great Basin).

Bird Species	Preferred Habitat	Habitat in Project Area
Swainson's Hawk	Open lands with scattered trees	No
Ferruginous Hawk	Sagebrush-shrub steppe	No
Golden Eagle	Elevated nest sites in open country	Yes
Peregrine Falcon	Cliffs	Yes
Prairie Falcon	Cliffs in open country	Yes
Greater Sage Grouse	Sagebrush dominated rangelands	No
Yellow Rail	Dense sedge marshes	No
American Golden-Plover	Burned meadows/mudflats	Yes
Snowy Plover	Dry sandy beaches	No
American Avocet	Wet meadows	Yes
Solitary Sandpiper	Meadow/Marsh/Bogs	Yes
Whimbrel	Marsh/Mudflats	Yes
Long-billed Curlew	Grasslands	No
Marbled Godwit	Marsh/Wet Meadows	Yes
Sanderling	Sandbars and beaches	No
Wilson's Phalarope	Marsh/Meadows	Yes
Yellow-billed Cuckoo	Dense riparian/cottonwoods	No
Flammulated Owl	Ponderosa pine forests	Yes
Burrowing Owl	Non-forested grasslands	No
Black Swift	Cliffs associated with waterfalls	No
Lewis's Woodpecker	Ponderosa pine forests	Yes
Williamson's Sapsucker	Ponderosa pine forests	Yes
White-headed Woodpecker	Ponderosa pine forests	Yes
Loggerhead Shrike	Open country with scattered trees/shrubs	No
Gray Vireo	Pine/juniper woodland/sagebrush scrubland	No
Virginia's Warbler	Mountain Mahogany groves	No
Brewer's Sparrow	Sagebrush clearings in coniferous forests/bitterbrush	Yes
Sage Sparrow	Sagebrush	No
Tricolored Blackbird	Cattails or tules	Yes

The golden eagle, peregrine falcon, flammulated owl, Lewis's woodpecker, Williamson's sapsucker, white-headed woodpecker, yellow rail and tricolored blackbird have been discussed in previous sections of this report. The following species have not been documented to occur and there is no suitable habitat present in the project area:

- Grassland species include: Swainson's hawk, Long-Billed Curlew, Loggerhead Shrike, Burrowing Owl.
- Sagebrush, shrub-steppe habitat species include: Ferruginous Hawk, Greater Sage-Grouse, Sage Sparrow.

- Pinyon-juniper forest habitat species include: Gray Vireo and Virginia's Warbler.
- Sandy beaches or alkaline lakeshore species include: Snowy Plover and Sanderling.
- Riparian hardwood species include: Yellow-Billed Cuckoo.
- Waterfalls in true fir/mountain hemlock forests species: Black Swift.

The following species may occur based on the presence of potentially suitable habitat in the project area:

American Golden-Plover, American Avocet, Solitary Sandpiper, Whimbrel, Marbled Godwit, and Wilson's Phalarope

Ecology and Existing Condition

This group of species is associated with wetland habitats surrounding lakes or ponds. Mudflats and boggy areas are also favored habitats. The most suitable habitat present in the project area for these species would be the shoreline of Davis Lake. Davis Lake is shallow with mudflats present, and the water levels drop during the summer months providing increasing amounts of foraging acreage. At the present time, shorebird surveys have been very limited and these species have not been confirmed at Davis Lake. However, they are known to occur in south central and eastern Oregon counties (Marshal et al. 2003). Wilson's Phalaropes are the only species presently know, to occur on the Crescent Ranger District in Big Marsh outside the project area.

Environmental Consequences

Effects Common to All Alternatives

None of the alternatives propose to conduct thinning or underburning activities within wetlands including boggy areas or mudflats that comprise suitable habitat for this group of species. The only work planned within the riparian zone is located along the eastern side of Davis Lake though no activities would occur within the zone that is seasonally or permanently wet. Because of the presence of two bald eagle territories on this side of the lake, seasonal restrictions would be in place for the protection of nesting eagles from January 1 through August 31 of each year. Existing road closures on the 4600.850 and 855 spurs on the east side of Davis Lake also restrict the amount of human access that is present on this end of the lake. With these measures in place there should be no direct, indirect or cumulative effects to this group of wetland associated species if they occur on Davis Lake. There is no known nesting habitat for this species on private land in the project area and no additive effects are anticipated.

Prairie Falcon

Ecology and Existing Condition

Gilligan et al. (1994) described prairie falcons as an uncommon to locally fairly common permanent resident in open country east of the Cascade Mountains and a rare fall and winter visitant west of the Cascades. Marshall et al. (2003) describes breeding habitat throughout the open country east of the Cascades Mountains in Oregon wherever cliffs and outcrops provide opportunities for nesting. A combination of rimrock or other outcrops and adjacent open country provides ideal breeding habitat and they usually nest on cliffs. However, they will also nest using natural depressions and old nests of other birds, most often those of the common raven. Small mammals and birds are the most common prey species.

Within the project area prairie falcons have been observed stooping Belding ground squirrel colonies along the Little Deschutes River in Crescent, Oregon. Potential nesting habitat is present in the lava flow north of Davis Lake and possibly Maiden Peak in the Roadless Area. There are no known prairie falcon eyries in the project area.

Environmental Consequences

Effects Common to All Alternatives

At the present time there are no known prairie falcon nesting eyries in the planning area. There are also no potentially suitable cliffs or rock outcrops within any planned treatment area that could provide a nest eyrie. The nearest suitable nest habitat to treatment areas is located on the Lava Flow on the north end of Davis

Lake. If a nest eyrie for prairie falcons is confirmed in the lava flow and has the potential to be negatively affected by project activities, a limited operating period would be in effect from February 15 to August 15 to coincide with nesting and fledging season. With this measure in place there would be no direct, indirect, or cumulative effects expected to this species. There is no known nesting habitat for this species on private land in the project area and no additive effects are anticipated

Landbird Strategic Plan

The Forest Service has prepared a Landbird Strategic Plan (January 2000) to maintain, restore, and protect habitats necessary to sustain healthy migratory and resident bird populations to achieve biological objectives. The primary purpose of the strategic plan is to provide guidance for the Landbird Conservation Program and to focus efforts in a common direction. On a more local level, individuals from multiple agencies and organizations within the Oregon-Washington Chapter of Partners in Flight participated in developing a publication for conserving landbirds in this region. *A Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington* was published in June 2000 (Altman 2000). This strategy has been used since its development in planning and projects analysis. The Crescent Ranger District falls within the Central Oregon/Klamath Basin subprovince. The species selected in the conservation strategy represent focal species for habitat types or features considered at risk. Table 3-45 shows the focal species for the habitats that occur within the project area.

Existing habitat conditions and potential effects to the white-headed woodpecker, pygmy nuthatch, Lewis' woodpecker, Williamson sapsucker, flammulated owl, and the black-backed woodpecker are discussed in the snag and down portion of this document. The remaining species in Table 3-47 are discussed below.

Table 3-47. Landbird Focal Species for Central Oregon

Habitat	Habitat Feature	Focal Species for Central Oregon
Ponderosa Pine	Large patches of old forest with large trees	White-headed woodpecker
	Large trees	Pygmy nuthatch
	Open understory with regenerating pines	Chipping sparrow
	Patches of burned old forest	Lewis' woodpecker
Mixed Conifer Late-Successional	Large trees	Brown creeper
	Large snags	Williamson sapsucker
	Interspersed grassy openings/dense thickets	Flammulated owl
	Multi-layered/dense canopy	Hermit thrush
	Edges and openings created by wildfire	Olive-sided flycatcher
Lodgepole pine	Old growth	Black-backed woodpecker
Meadows	Wet/dry	Sandhill crane
Aspen	Large trees with regeneration	Red-naped sapsucker
Subalpine fir	Patchy presence	Blue grouse
Whitebark pine	Old growth	Clark's nutcracker

Open Habitats/Open Understories with Regenerating Pine – Chipping Sparrow and Brewer's Sparrow

Ecology and Existing Condition

Both species are summer residents preferring open habitats with a shrub or grass component. Chipping sparrows occupy successional habitats after logging and burning; because of an affinity for open stands, they also occupy older stands of western mixed conifer forest (DeGraaf and Rappole 1995). In central Oregon they can be found in open coniferous forests or stands of trees interspersed with grassy openings or low foliage and are found in good numbers in central Oregon in juniper, ponderosa pine, and lodgepole pine forests (Marshall et al. 2003). Both species seem to be associated with higher elevations, with the Brewer's sparrow occupying the widest elevational band, up to 6,000 feet in the Cascades. The primary plant association used by the Brewer's sparrow is big sagebrush; however, they are not limited to sagebrush habitats and utilize a variety of shrub habitats (Marshall et al. 2003). Brewer's have also been observed along the Cascade summit in stunted mountain hemlock (Marshall et al. 2003). Breeding bird surveys have shown an annual 2.6 percent population decline in Brewer's populations from 1966-1998. The reasons for the decline are unknown, but habitat loss to agriculture, cattle grazing and invasion of exotic plants has been implicated. Annual population declines of chipping sparrow have averaged 3.9 percent annually in Oregon due to decrease in wildfire to maintain open woodlands but also due to cowbird brood parasitism and competition with house sparrows and house finches (Marshall et al. 2003). Chipping sparrows have been documented to occur in the project area and habitat suitability is expected to increase as a result of the Davis Fire creating more grassy openings adjacent to open forested stands. Brewer's sparrows may be more likely to occur in the high elevation meadows in the Diamond Peak Wilderness and OCRA where stunted mountain hemlock stands are present.

Environmental Consequences

Alternative A – No Action
Direct and Indirect Effects

Implementation of Alternative A would have no direct effects on the chipping sparrow and Brewer's sparrow at least in the short-term. Both species are associated with habitats of relatively open overstories with regenerating pine trees and patches of grasses or shrubs. Suitable habitat within the project area would likely gradually decrease in the absence of vegetation management or major disturbances because of increased tree growth and canopy cover converting openings to more closed forest conditions.

Effects Common to Alternatives B and C
Direct and Indirect Effects

The selection of either action alternative would result in improved habitat conditions for both species. The commercial and small-tree thinning plus the fuels treatments would decrease canopy cover, especially in the mid- and understory tree layers. Plus, where underburning is proposed more grassy openings and/or pockets of low shrubs would exist. Altman (2000) recommended as a biological objective for chipping sparrow within ponderosa pine forests the creation of an interspersion of herabaceous ground cover with shrub and regenerating pine patches. As a conservation strategy Altman (2000) also recommended that thinning and/or understory removal occur to provide suitable open conditions for chipping sparrows. These actions would be consistent with those proposed for the Five Buttes project. These same actions would also benefit the Brewer's sparrow which occurs in similar habitat conditions. Both alternatives would benefit these species by creating more suitable habitat scattered across the project area.

It is possible that any operations conducted during the nesting season may affect breeding pairs of chipping sparrows and Brewer's sparrows. This may result in pairs being displaced into adjacent habitats. However, the 5,000 to 7,000 acres of treatments planned represents a small portion of the 143,307 acres of federal land in the project area and not all sales would be active at the same time. Undisturbed nesting habitat would be present widely distributed across the planning area.

Cumulative Effects
Table 3-1 was reviewed for projects that have potential for overlapping in time and space and past and present projects are included in the existing condition analysis. The zone of influence is the Crescent Ranger District. Over the last 10 years, active vegetation management on the Crescent Ranger District has focused on understory commercial thinning and an increase in underburning particularly in the ponderosa pine forests. The Seven Buttes EA 1996, Baja 58 EA 1998, Seven Buttes Return EA 2001, and Crescent Lake WUI EA 2004 have reduced stem densities and increased suitable habitat conditions for both the chipping and Brewer's sparrow. This is consistent with the conservation strategy for these species.

Foreseeable vegetation projects include the Lakeside Wildland Urban Interface Fuels Reduction project, Wickiup Estate Wildland Urban Interface Fuels Reduction project, and the Wagontrail Wildland Urban Interface Fuels Reduction project located in the La Pine, Oregon basin. The small-diameter tree thinning proposed in these projects would also be consistent with the conservation strategies for these species.

The majority of the private lands in the project area boundary are industrial timberlands. Recent commercial thinning harvests on the interface with national forest system lands may have created additional suitable habitat for the chipping sparrow and Brewer's sparrow. The more open private lands would permit foraging habitat in close proximity to nesting habitat on federal lands. This habitat may last for several decades or more depending on forest growth on private lands.

The Davis Fire of 2003 created thousands of acres of edge habitat favorable to these species, and district-wide, habitat suitability is on an increasing trend for the chipping sparrow and Brewer's sparrow. Therefore, even though some birds may be displaced by activities in conjunction with the Five Buttes project, but there is a widely distributed network of nesting habitat that provides solitude on federal lands and habitat suitability is on an upward trend.

Mixed Conifer, Edges and Openings Created by Wildfire – Olive-sided Flycatcher

Ecology and Existing Condition

The olive-sided flycatcher inhabits montane and northern coniferous forests up to 3,000 meters in elevation, especially in burned-over forest areas with tall standing dead trees (DeGraaf and Rappole 1995). In Oregon this flycatcher is a summer resident that breeds in low densities throughout coniferous forests. The olive-sided flycatcher is an aerial insectivore that prefers forest openings or edge habitats where forest meets meadows, timber harvest units, rivers, bogs or marshes (Marshall et al. 2003). This species has been documented to occur in the project area.

Environmental Consequences

Alternative A
Direct and Indirect Effects

Implementation of this alternative would have no direct effects on the olive-sided flycatcher. This flycatcher is considered a contrast species; it uses old forests for nesting and either openings or gaps in old forests for foraging. Olive-sided flycatchers are positively associated with recent burns (Hejl 1994 cited by Wisdom et al. 2000). Habitat conditions in the planning area would not change at least in the short-term. Early-seral conditions within existing plantations would gradually close over as trees growth and develop more canopy cover. The Davis fire would continue to provide foraging habitat and nesting capability would be available in older stands adjacent to the fire. Breeding bird surveys (Sauer et al. 1996 cited in Wisdom et al. 2000) indicated a significant decline of 2.5 percent per year from 1966 to 1994 for olive-sided flycatchers in eastern Oregon and Washington. Marshall (1988 cited by Wisdom 2000) suggested that changes in winter habitat have had a negative effect on olive-sided flycatchers. However, Hann and others (1997 cited by Wisdom 2000) stated that late-seral montane forest, which provides source habitat for this species, was tending to increase in more than 50 percent of the watersheds in the Southern Cascades (the Five Buttes project area is located in the Southern Cascades).

Effects Common to Alternatives B and C
Direct and Indirect Effects

Both action alternatives propose a combination of commercial thinning, small-tree thinning, and fuels reduction activities to maintain stand health and reduce the risk of large scale loss of large trees to wildfire, insects and disease. These activities would be consistent with strategies of thinning from below, burning, and uneven-aged management cited by Wisdom (2000) to help accelerate the development of old-forest conditions and the juxtaposition of early-seral and late-seral habitats used by olive-sided flycatchers. Wisdom (2000) stated that changes in fire regime has resulted in fewer, larger, and more destructive fires, thereby reducing the areas of juxtaposed early- and late-seral forests. Altman (2000) recommended the use of underburning to promote a shrubby understory for insect production, retain standing dead or diseased trees where they occur, and that selective logging can be used to increase suitability of habitat as long as sufficient large living and dead trees are retained. These conditions would be promoted in either action alternative, and should result in improved habitat conditions for olive-sided flycatchers in the project area.

It is possible that any operations conducted during the nesting season may affect breeding pairs of olive-sided flycatchers. This may result in pairs being displaced into adjacent habitats. However, the 5,000 to 7,000 acres of treatments planned represents a small portion of the 143,307 acres of federal land in the project area and not all sales would be active at the same time. Undisturbed nesting habitat would be present widely distributed across the planning area.

Cumulative Effects

Table 3-1 was reviewed for projects that have potential to overlap the Five Buttes project in space and time. The zone of influence is the Crescent Ranger District and the La Pine basin. All past and present activities are included in the existing condition analysis. Over the last 10 years, active vegetation management on the Crescent Ranger District has focused on understory commercial thinning and an increase in underburning, particularly in the ponderosa pine plant associations. The Seven Buttes EA 1996, Baja 58 EA 1998, Seven Buttes Return EA 2001, and Crescent Lake WUI EA 2004 have all prescribed understory commercial thinning which have reduced stem densities and increased suitable habitat conditions for these species. These activities would be consistent with strategies of thinning from below, burning, and uneven-aged management cited by Wisdom (2000) to help accelerate the development of old-forest conditions and the juxtaposition of early-seral and late-seral habitats used by olive-sided flycatchers.

Foreseeable vegetation projects with potential for overlapping Five Buttes include Lakeside Wildland Urban Interface Fuels Reduction, Wickiup Estate Wildland Urban Interface Fuels Reduction, the Greater La Pine Fuels Reduction Project, and the Wagontrail Wildland Urban Interface Fuels Reduction. Thinning and prescribed fire proposed in these projects would also be consistent with the conservation strategies described for these species.

The majority of the private lands in the project area boundary are industrial timberlands. Recent commercial thinning on the interface of National Forest system lands may have created more suitable habitat for the olive-sided flycatcher. More open conditions on private lands provides foraging habitat in close proximity to nesting habitat (standing dead trees or snags) which is found on adjacent federal lands. This habitat condition may last for several decades or more depending on urbanization of local private lands.

The Davis Fire of 2003 created thousands of acres of edge habitat favorable to the olive-sided flycatcher. The combination of understory thinning, underburning, and the 21,000 acre Davis Fire on the district would reflect an increasing improvement of habitat for this species. Some displacement of individuals and pairs may occur if activities are scheduled during the nesting season. However, due to the abundance and distribution of suitable habitats, as well as timing of activities that are staggered, nesting stands that are undisturbed are widely distributed and available on the Crescent Ranger District and Federal lands within the La pine basin.

Mixed Conifer, Large trees – Brown Creeper

Ecology and Existing Condition

The brown creeper is a common but inconspicuous permanent resident in most of Oregon (Gilligan et al. 1994). The brown creeper is the only North American bird that relies on both the trunk and bark of trees for nesting and foraging. It is found predominately in the coniferous forests but can be located in hardwood stands as well. It nests under loose sloughing bark of large diameter snags with little to moderate decay. Nesting in Oregon can occur from near sea level to high in the mountains (Gilligan et al. 1994). The diameter of nest trees ranges from 16 inches to 42 inches dbh. Threats to this species include the loss of large diameter snags and live trees. This species has been observed in the older mixed conifer forests of the project area.

Environmental Consequences

Alternative A
Direct and Indirect Effects

Implementation of this alternative would have no immediate effect on the brown creeper and their habitats. Mixed conifer plant associations with large diameter trees and snags would continue to provide habitat for this species within the project area, particularly on the buttes and adjacent to Odell and Crescent Lakes where stands contain late-successional and old growth Douglas-fir. Altman (2000) stated the brown creeper shows a preference for Douglas-fir which offers better foraging opportunities in the deeply fissured bark. Sauer et al. (1999 cited by Altman 2000) stated there was a non-significant short-term (1980-1998) increasing trend of 3.1 percent per year for the brown creeper in the Cascade Mountains Breeding Bird Survey Physiographic Region.

Effects Common to Alternatives B and C
Direct and Indirect Effects

Both action alternatives propose commercial thinning and post-sale work including small tree thinning and slash removal. In addition, Alternative C proposes several thousand acres of fuels reduction focusing on green trees less than 6 inches in diameter. The vast majority of all thinning work proposed would occur within stands defined as having late-successional trees present. However, thinning would generally only remove trees less than 21 inches in diameter and less than 5 percent of all trees removed would exceed 21 inches in diameter. The larger than 21 inch removal would only occur to meet basal area objectives or to lessen disease spread. Altman (2000) stated several studies have shown that 60 cm (24 inch) diameter was the mean nest tree diameter used by brown creepers. Removal of trees of this size would occur very infrequently in the Five Buttes project.

Weikel (1997 cited by Altman 2000) found brown creepers significantly decreased their use of stands with heavy thinning, but found no change in moderately thinned stands. Thinning intensity within proposed units would vary depending on stand objectives. The area south of Wickiup Reservoir extending upslope onto Davis Mountain is allocated as a bald eagle management area (BEMA). The stand objective for this acreage is to provide large tree habitat for nesting bald eagles and areas of dense multi-story late-successional stands as winter roosting habitat. The thinning planned in this area is more intensive as compared to other portions of the project area. Generally, this will move affected stands towards a single story condition with unmanaged areas maintained to provide eagle roosting habitat. While large diameter trees and snags will be present post-harvest, these stands will have a more open forest appearance compared to units with a multi-story harvest prescription. This prescription is proposed on approximately 470 acres of mixed conifer stands with mid- and late-seral structure ponderosa pine and Douglas-fir. In addition, approximately 213 acres immediately south and outside the BEMA boundary would have a single story prescription to favor ponderosa pine and Douglas-fir. Brown creeper habitat would be reduced on these acreages, but 15-25 percent of each unit’s acreage would be left unmanaged and capable of maintaining brown creeper presence.

Wisdom (2000) and Altman (2000) listed some management recommendations for the brown creeper. The retention of blocks of late-successional habitat and retention of snags, particularly those greater than 21 inches in diameter, would be appropriate. Wisdom (2000) also recommended the retention of sufficient habitat to support this species while restoring forest conditions that are more resistant to catastrophic fire, insect and disease problems. This could require management activities, including prescribed fire, that reduce the dominance of shade-tolerant tree species and increase the presence of shade-intolerant tree species (i.e., those most resistant to catastrophic fire and insect and disease problems). The actions proposed in the Five Buttes project would be consistent with these recommendations by conducting thinning to reduce the amount of fire intolerant species but also provide blocks of habitat suitable for the brown creeper.

It is possible that any operations conducted during the nesting season may affect breeding pairs of brown creepers. This may result in pairs being displaced into adjacent habitats. However, the 5,000 to 7,000 acres of treatments planned represents a small portion of the 143,307 acres of federal land in the project area and not all sales would be active at the same time. Undisturbed nesting habitat would be present widely distributed across the planning area

To summarize, Alternative B treats more acreage with commercial thinning prescriptions which will provide more protection to older mixed conifer stands from wildfire, insects, and disease issues. However, Alternative C treats more total acres even though several thousand acres are strictly small diameter thinning (<3 inches or <6 inches depending on the site). While this will allow additional time for fire suppression crews to reach a fire start, the small diameter thinning would not appreciably reduce the risk of large tree loss to competition. This may result in large tree loss in older mixed conifer stands that are suitable brown creeper habitat.

Cumulative Effects
Table 3-1 was reviewed for projects that overlap the Five Buttes project in time and space. The zone of influence is the Crescent Ranger District. Approximately over the last 10 years, most active vegetation management has been commercial thinning with the exception of the Davis Fire Recovery Project (USDA 2004). Approximately 20,000 acres of mid-and late-successional stands have been thinned to meet forest health objectives and reduce the risks of wide-scale disturbance process. These projects have been included in the existing condition analysis.

Foreseeable actions include the Wickiup Estates Wildland Urban Interface Fuels Reduction Project, Lakeside Wildland Urban Interface Fuels Reduction Project, and the Wagontrail Wildland Urban Interface Fuels Reduction Project which is located in the LaPine, Oregon basin. These projects also will focus on small diameter live tree removal to lessen the risk of a large wildfire in the urban interface. The prescription and likely effects for these projects is similar to the “fuels only” activities discussed for Alternatives B and C in Five Buttes. With an emphasis on understory thinning, retention of the largest trees, retention of snags and incorporating 15-20 percent passively-managed areas, a network of habitat for the brown creeper would be maintained across the district.

The approximately 18,278 acres of private land in the project area likely provide very little habitat for this species. The industrial forest lands have been recently harvested with relatively few trees are left in the size class used by brown creepers as nest trees. It is assumed these lands would not contain habitat for the brown creeper.

Due to large scale wildfires (included in the existing condition analysis) that have occurred on the Deschutes National Forest over the last 5-6 years, the amount and distribution of late-seral mixed conifer habitat is on a declining trend. This trend is expected to continue unless strategic risk reduction is implemented on a landscape scale. Active management proposed in the Five Buttes project in conjunction with other landscape-scale foreseeable actions, such as BLT, would reduce this risk and benefit the brown creeper by potentially keeping brown creeper habitat on the landscape in the long-term. This is consistent with the recommendations stated by Wisdom to restore forest habitat conditions that are more resistant to disturbance processes. Although the Five Buttes project in conjunction with foreseeable actions would reduce some habitat capability, brown creeper distribution would not change across the District, and would not lead to a trend toward federal listing.

Mixed Conifer, Multi-layered/Dense Canopy – Hermit Thrush

Ecology and Existing Condition

The hermit thrush is a summer resident preferring mid to high elevation mature and old growth forests. It breeds in mature forests of all types especially those with a shaded understory of brush and small trees ranging from aspen groves to juniper woodlands to moderately open coniferous forests. Gilligan et al. (1994) described the hermit thrush as a fairly common summer resident in the Cascade, Siskiyou and Blue Mountains and uncommon in the Coast Range of Oregon. Hermit thrushes nest on the ground, in brush or small trees. It is an opportunistic ground forager, feeding on insects and an occasional reptile or amphibian (Marshall et al. 2003). During the winter months they are rarely seen east of the Cascades and tend to winter in the west-side lowlands and foothills along the coast. They are considered S4, apparently stable in

Oregon (Natureserve 2004). There appear to be no serious conservation problems at this time (Marshall et al. 2003).

Habitat for the hermit thrush is extremely variable across the planning area. Riparian areas are generally multi-storied coniferous stands with limited hardwoods of alder and aspen though dense shrubs are common. The exception to this is along Odell Creek which experienced a stand replacement fire in 2003. Shunk (2001) conducted a bird survey, which included forest dwelling thrushes, in several campgrounds and control points in the project area. Lava Flow and East and West Davis campgrounds were surveyed with no detections, although they were present in Crescent Creek campground (Shunk 2001). Mature and old growth forest is also well distributed across the project area with the exception of the 21,000 acre Davis Fire of 2003.

Environmental Consequences

Alternative A
Direct and Indirect Effects

Implementation of this alternative would likely have no effect on the hermit thrush and their habitats in the short-term. Nesting habitat would be maintained and well distributed in the multi-layered, dense canopy stands of ponderosa pine and mixed conifer forests found on the buttes and within the stream-side riparian zones of Odell Creek, Crescent Creek, and the numerous small drainages that feed into Odell Lake. As noted in other sections of this EIS, many forested stands in the project area are overstocked and may be subject to future events that may include large scale loss of the overstory to competition and/or an uncharacteristic fire event similar to the Davis Fire.

Effects Common to Alternatives B and C
Direct and Indirect Effects

Both alternatives propose several thousand acres of commercial thinning to improve overall stand health and maintain the presence of the dominant large overstory trees of Douglas-fir, ponderosa pine, white fir, and Shasta red fir. The removal of smaller diameter trees would tend to decrease canopy layering and the vertical structure that provides habitat to species that show a positive association with areas of dense understory shrubs and small trees. The East Slope Cascade Mountains Land Bird Conservation Plan (Altman 2000) recommended as a conservation strategy to “retain tracts of forest unmanaged or lightly managed to ensure structural diversity” in mixed conifer forest. This strategy would benefit the hermit thrush and other species associated with multi-layered, dense canopy stands with vertical cover such as the varied thrush, chestnut-backed chickadee, blue grouse, winter wren, and Townsend’s warbler (Altman 2000). Fuels treatments, including underburning and the removal of small diameter green trees, would affect habitat but would also result in more resilient landscapes less susceptible to uncharacteristic wildfire events, insect attack, and disease problems.

A minimum of 15 percent of each treatment unit would be left in its existing condition; where dense, multi-layered stands exist, retention areas would provide habitat for the hermit thrush. The retention areas would also be off-limits to fuels treatments, including underburning operations, and would maintain dense shrub layers where available. This measure plus blocks of dense, multi-layered stands of mixed conifer late-successional forest that were not proposed for stand treatment would be consistent with the strategy proposed by Altman (2000).

Cumulative Effects
Table 3-1 was reviewed for projects that overlap in space and time. The zone of influence is the Crescent Ranger District. Past regeneration timber harvests (included in the existing condition analysis) eliminated habitat for this species in the project area. Over the last 10 years or so, most active vegetation management has been commercial thinning with the exception of the Davis Fire Recovery Project (USDA 2004). During this timeframe, approximately 20,000 acres of mid- and late-successional stands have been thinned to meet forest health objectives and reduce the risks of wide-scale disturbance processes.

Foreseeable actions (Wickiup Estates Wildland Urban Interface Fuels Reduction Project, Lakeside Wildland Urban Interface Fuels Reduction Project, and the Wagontrail Wildland Urban Interface Fuels Reduction Project) are planned to occur within this project area with mostly small diameter tree removal. Vegetation prescriptions would be similar to “fuels only” in the Five Buttes project. Adjacent areas where no active management occurs, including within activity units themselves, would provide for a network of suitable habitat for this species district-wide.

Potentially suitable habitat on private lands is likely limited to areas along Crescent Creek. This is based on the confirmed hermit thrush observation on National Forest system lands at Crescent Creek Campground (Shunk 2001). The presence of riparian hardwood species and understory shrubs may more likely be retained on private lands than conifer stands on upland sites. However, hermit thrush habitat maintained on private lands in the project area is likely incidental and it is assumed it would not remain.

Across the forest, habitat for the hermit thrush is declining primarily because of the loss to wildfires over the last 6-8 years (included in the existing condition analysis). On the Crescent District, the Davis Fire, understory thinning of mature and late-seral stands planned for Five Buttes, and foreseeable projects would contribute to a downward trend in multi-storied mature forests with shrub presence in the project area. However, this is consistent with objectives of restoring wildlife habitats that are less susceptible to wide-scale disturbance processes. The strategic placement of activity units around stands of dense multi-storied late-seral stands in Five Buttes and the upcoming BLT projects, in conjunction with the WUI prescriptions, should lessen the risk of wildfire impacting remaining stands that provide habitat for the hermit thrush. Islands of dense multi-storied forested stands created and maintained by the risk reduction strategy would provide for many associated species, including the hermit thrush, and would help counterbalance the loss of habitat that has been occurring on the district. While hermit thrush populations may decline in the short-term, populations should stabilize as strategic risk reduction begins to succeed in reducing loss of forest from wildfire. This would be consistent with the conservation strategies recommended by Altman (2000) for the hermit thrush and other mixed conifer associated species. Five Buttes and past, present, and future projects would not lead to a trend toward federal listing for the hermit thrush.

Meadows – Sandhill Crane and Solitary Sandpiper

Ecology and Existing Condition

Both species are rare residents associated with freshwater, high elevation meadow/marsh habitats. The sandhill crane utilizes floating nests while the solitary sandpiper is the only arboreal nesting sandpiper using the nests of other bird species. Both feed on aquatic and terrestrial invertebrates as well as small vertebrates. Little is known about the solitary sandpiper due to its solitary nature and limited occurrence on the landscape. Sandhill crane populations seem to be fairly stable in Deschutes County. However, conversion of wetlands and predation continue to be major threats to this species (Marshall et al. 2003). There are no documented sightings of solitary sandpipers on the Crescent Ranger District. Nesting sandhill cranes have been documented to occur in Big Marsh (outside the project area) and pairs and individuals have been observed at Davis Lake during the breeding season.

Environmental Consequences

Alternative A
Direct and Indirect Effects

The selection of this alternative would have no effect to either species because no work would occur within the Davis Lake meadow complex and adjacent forested acreage. Nesting and foraging habitat would be maintained as it currently exists.

Alternatives B and C
Direct, Indirect and Cumulative Effects

Because the Davis Fire started in late June 2003 and burned across most of the Davis Lake meadow area, it likely interrupted or may have caused either species to abandon their nesting attempt that year. Since then, marsh grasses, rushes and sedges have grown and nesting capability is likely back to pre-fire conditions for the sandhill crane. It is unknown if the solitary sandpiper was present prior to the fire and there is no information to confirm its presence at the current time.

The selection of either action alternative would not result in any activity planned in the Davis Lake meadow area although both alternatives propose commercial tree thinning along the east side of Davis Lake near Lava Flow campground south to just beyond the boat launch. Because the majority of this thinning is under a limited operating period to protect nesting bald eagles from January 1 through August 31, there is no effect expected to either the sandhill crane known to occur or to solitary sandpipers if they are present. In addition, the 4600.855 road that parallels the southeast side of Davis Lake was subsoiled in 2005 which also greatly restricts human access to this portion of the lake reducing the potential for disturbance.

The Five Buttes project would not result in any cumulative effects to the sandhill crane and solitary sandpiper and would not lead to a trend toward federal listing for either species.

Aspen – Red-naped Sapsucker

Ecology and Existing Condition

The red-naped sapsucker is a common summer resident from the eastern slopes of the Cascades eastward throughout the Blue Mountains and Wallowa Mountains but very rare west of the Cascades (Gilligan et al. 1994). It winters in the southern United States to central Panama including southern California (DeGraaf and Rappole 1995). In western montane riparian habitats, the red-naped is the most abundant woodpecker and is a key provider of nest sites for secondary cavity nesters (DeGraaf and Rappole 1995). It breeds in deciduous and mixed deciduous-coniferous forests especially in woodlands with aspen. Dead or live trees with a central decay column are needed to excavate cavities. Threats to this species include long-term degradation of aspen and other riparian forest habitats from fire suppression and the lack of hardwood regeneration (Marshall et al. 2003).

Nesting red-naped sapsuckers have been documented to occur in several aspen stands on the district. The largest aspen site on the district is about 16 acres in size located north of Davis Lake in a mixed stand of ponderosa pine and lodgepole pine. Conifer encroachment, big game browsing, and the lack of fire have all contributed to aspen decline on the Crescent Ranger District. Beginning in 1999 the district began aspen regeneration projects that have reduced conifer encroachment, fenced out big game, and have conducted small scale underburns to enhance aspen sprouting.

Environmental Consequences

Effects Common to All Alternatives
Direct, Indirect, and Cumulative Effects

Aspen and alder stands are very limited on the district. In 2004 the district prepared a NEPA document (Aspen Stand Enhancement, USDA 2004) for the enhancement of 28 acres of aspen stands scattered across the district including areas within the Five Buttes project area. Conifer removal and aspen fencing was prescribed to restore this unique habitat type. The district is currently implementing the decision with most of the restoration work planned for calendar year 2006. This should result in an improved habitat condition over the long-term for the red-naped sapsucker.

The selection of any alternative would have no impact on the red-naped sapsucker. Because this species is associated with hardwood forests or mixed hardwoods and conifers, habitat is very limited habitat within the project area and across the entire district. No alternative would impact red-naped sapsucker habitat directly, indirectly, or cumulatively because no active management would occur within hardwoods or mixed hardwood and conifer forest.

Subalpine Fir – Blue Grouse

Ecology and Existing Condition

The blue grouse is the largest of the three forest grouse species found in Oregon and is fairly common in the coniferous forests from the Cascade crest to the coast, but is also found in the Blue and Wallowa

Mountains of eastern Oregon. They utilize a variety of habitats in the spring and summer months with insects, berries and seeds of various forbs and shrubs providing the bulk of their diet. Pelgren (1996 cited in Marshall et al. 2003) stated open park-like stands of mature ponderosa pine and Douglas-fir were selected for wintering habitat where the grouse eat needles and buds. Pelgren (1996) also stated that prescribed burning and other methods that maintain open park-like stands would likely benefit this species. Other winter range habitat includes stands dominated by spruce, lodgepole pine, limber pine, western hemlock, and mountain hemlock (Zwickel 1992 cited in Marshall et al. 2003). Nesting habitat ranges from nearly bare ground with no overhead cover to dense vegetation beneath full forest canopies (Zwickel 1992, Pelgren and Crawford 1999 cited in Marshall et al. 2003) with most successful nests beneath logs.

While blue grouse are not common on the Crescent District they can be observed in the project area on Maklaks Mountain, Royce Mountain, and Hamner Butte. The mostly stand replacement Davis fire resulted in a loss of wintering habitat on much of Davis Mountain and portions of Hamner Butte. However, unburned late-successional mixed conifer stands are still present within and adjacent to the fire perimeter and blue grouse have been observed using these stands post-fire.

Environmental Consequences

Alternative A
Direct and Indirect Effects

Implementation of this alternative would likely have little impact on blue grouse summer or wintering habitats at least in the short-term. Mid- and late-seral stands with large trees in the ponderosa pine and mixed conifer plant associations would continue to provide winter habitat for this species. Summer range lands would also not be expected to change appreciably. Current vegetative openings would experience natural successional development and increased levels of shade tolerant species if conifers are present. The interface between the Davis fire and adjacent forests would continue to provide a range of habitat conditions favorable for this species.

Alternatives B and C
Direct, Indirect and Cumulative Effects

Both alternatives propose a mix of activities on 5,522 acres in Alternative B and 7,797 in Alternative C. Because the largest conifers would be retained in both alternatives, wintering habitat would be maintained for this species. Wisdom et al. (2000 Vol. 2 p. 37) described wintering habitat as old-forest single story, old-forest multi-story, and understory reinitiation stages of interior Douglas-fir, western larch, Sierra Nevada mixed conifer, Pacific ponderosa pine, and interior ponderosa pine and mixed conifer woodlands. While Wisdom et al. (2000 Vol. 2. p. 38) noted that almost 40 percent of the watersheds in the southern Cascades experienced greater than 60 percent decline in wintering habitat from historical periods. Implementation of the Five Buttes project would not change wintering habitat conditions. Wisdom recommended the following strategies to improve wintering habitat for blue grouse: (1) retention of interior ponderosa pine, interior Douglas-fir and western larch old forests, (2) management of early-seral and mid-seral montane and lower montane forests to accelerate restoration of late-seral conditions of the previous species groupings and (3) retain remnant, large trees in all seral stages of montane forests. Pelgren (1996 cited in Marshall et al. 2003) stated in eastern Oregon, prescribed burning and other methods that maintain mature park-like stands would likely benefit the species. All of these strategy recommendations would be implemented in the Five Buttes project in either action alternative scenario.

Blue grouse during the summer months are considered a contrast species typically found at the interface of forest and open areas (Zwickel 1992 cited in Wisdom et al. 2000 Vol 2. p.82). In the southern Cascades summer range is on an increasing trend (Wisdom et al 2000). The following strategies were recommended to address summer habitat issues: (1) maintain and restore late-seral montane and lower montane forest, (2) increase the representation of shrub dominated early seral forests, (3) restore fire as an ecological process in the montane and lower montane community groups, and (4) maintain and restore riparian shrubland habitats (Wisdom et al. 2000). Pelgren (1996 cited in Marshall et al. 2003) stated in eastern Oregon, prescribed burning and other methods that maintain mature park-like stands would likely benefit the species. The Five Buttes project would likely have little to no impact on summer habitat, since no regeneration harvest is proposed and the only active management in riparian buffers is along the east side of Davis Lake (Lava Flow Campground). No management activity would be removed in riparian associated shrubs. Incidental disturbance to nesting blue grouse may occur if activities happen to be conducted near nest sites in late spring (late April – through early June). Because this disturbance is localized and incidental, no foreseeable actions would be in the zone of influence. All past and present actions have been accounted for in this analysis. Therefore, there are no cumulative effects.

The abundance and widespread distribution of the blue grouse population is likely the reason the Oregon Heritage Information Center does not rank them. Project implementation of any alternative would not lead to a trend toward federal listing.

Clark's Nutcracker

Ecology and Existing Condition

The Clark's nutcracker is a resident along the crest of the Cascade Mountains, usually above elevations of 4,000 feet although lower on the east slopes. They breed in open coniferous forests of pine, spruce, fir and adjacent Douglas-fir, and less often in juniper and ponderosa pine east of the Cascades (Marshall et al. 2003). In Oregon their diet includes ripe and unripe seeds of whitebark, limber, Jeffrey, and ponderosa pines, and Douglas-fir and Shasta red fir plus spiders, insects, small mammals, carrion, garbage, and offerings from people. Large wingless seeds of white pines are preferred (Lanner 1996, Tomback 1998 in Marshall et al. 2003).

Environmental Consequences

Alternative A
Direct and Indirect Effects

The selection of this alternative would have no impact on the Clark's nutcracker. No tree removal would occur that could negatively impact their ability to find conifer seed sources within the planning area. Clark's nutcracker breeding attempts, nest success and seasonal movements would still be dependent on the size of the annual cone crops (Tomback 1998 cited by Marshall et al. 2003).

Effects Common to Alternatives B and C
Direct, Indirect and Cumulative Effects

The selection of either action alternative proposes to conduct active management within mid- and late-seral stands of ponderosa pine and mixed conifer. While the thinning would remove primarily understory conifers, it improves seed production, and the dominant overstory conifers would be retained and provide a seed source for Clark's nutcrackers. There are no known whitebark pine trees in the proposed harvest units. However, if they are present they would be a preferred tree species for retention vegetative prescriptions would be designed to maximize the long-term health of this uncommon tree. Clark's nutcracker's diet would also be supplemented by insects, small mammals and carrion.

If the project activity occurs during the nesting season, there is the potential for disturbance to breeding pairs which may result in pair relocation. As identified for other species, a beneficial long-term effect would be the reduction of risk of a landscape scale disturbance that could remove habitat over large areas as demonstrated by the Davis Fire. There are no long-term adverse effects identified.

The abundance and widespread distribution of the Clark's nutcracker population is likely the reason the Oregon Heritage Information Center does not rank them. Adverse effects to the local population would be so small, effects from foreseeable actions that may occur in the same time and space would not have an additive effect. All past and present activities have been accounted in the existing condition analysis. Project implementation of any alternative would not lead to a trend toward federal listing.

Big Game - Deer and Elk

The 160,000 acre Five Buttes project area provides summer range habitat for mule deer and Rocky Mountain elk. Summering mule deer in the Five Buttes project area primarily migrate easterly to winter ranges in the desert beyond the district and Deschutes National Forest boundary. Rocky Mountain elk that summer in the project area scatter to several winter ranges including moving westerly into the Umpqua and Willamette River drainages, easterly into the desert, and some will move northerly following the Deschutes River downstream of Wickiup Reservoir. Depending on weather conditions the animals usually return to summer range beginning in March and April. The Five Buttes project area is within the 885,000 acre Upper Deschutes Big Game Management Unit that extends west of Highway 97 to the Cascade crest from Crescent, Oregon to near Sisters, Oregon**.**

Big game management objectives (MO) for this management unit are 2,200 wintering deer and 700 wintering elk (Heath, pers comm. 2005). The Oregon Department of Fish and Wildlife (ODFW) estimates the current deer population is only about 60 percent of the MO and is on a downward trend. Factors that could limit the population include Adenovirus Hemorrhagic Disease, Highway 97 development and interruption of seasonal migration, urban development in and near winter ranges, predation, and potential future hazardous fuels treatments on winter range in the urban interface environment (Jeffries, pers comm. 2004). The current elk population estimate is about 500 animals but may be expected to increase somewhat as a result of improved foraging conditions within the 21,000 acre Davis wildfire of 2003. In December 2004 Forest Wildlife Biologists for the Deschutes National Forest, Ochoco National Forest and Crooked River National Grasslands participated in a working group that reviewed ODFW's big game management objectives for the Upper Deschutes Management Unit. There were no management objective population adjustments recommended for the Upper Deschutes management unit for either species.

The Deschutes National Forest Land and Resource Management Plan (DLRMP) provides habitat management direction for big game animals. On mule deer summer range, hiding areas must be present over at least 30 percent of each National Forest implementation unit. For this analysis subwatersheds will be used as implementation units. Because subwatersheds average 5,000 to 20,000 acres each, they represent a reasonable area to analyze for hiding cover. To be a suitable hiding area, forested stands must meet one of several conditions including: being six acres or larger capable of hiding 90 percent of a standing adult deer from view of a human at a distance of 200 feet, or six acres or larger with an average height of 6 feet and which has not been thinned in 15 years, or residual clumps of one half acre or larger stands within units with advanced regeneration (trees including whips up to 7" dbh) and at least 12 greater than 7 inch trees per acre remaining after harvest (DLRMP WL-54). Target open road densities are 2.5 miles per square mile to achieve deer summer range habitat effectiveness targets, unless impacts on deer can be avoided or the proposed project would result in a net benefit to deer habitat. The density will be applied as an average for the implementation unit and will be used as a threshold requiring further analysis. The final judgment on open road density will be based on the further evaluation rather than the density guideline (DLRMP WL-53).

The LRMP specifies habitat conditions to be provided for elk and identified key habitat areas across the forest. Two Key Elk Areas (KEAs) are within the Five Buttes planning area, Davis Lake and Maklaks. The Davis Lake KEA is located south and west of Davis Lake and encompasses 2,083 acres. Maklaks KEA is located south of Maklaks Mountain and totals 1,616 acres. The LRMP states that road densities should not exceed an overall average between 0.5–1.5 miles per square mile within each KEA, unless impacts on elk can be avoided or the proposed project would result in a net benefit to elk habitat. The road density will be applied as an average over a KEA and will be used as threshold for further evaluation. The final judgment on open road density will be based on the further evaluation rather than the density guideline (LRMP WL-46). Hiding areas must be present over at least 30 percent of each KEA. To be a suitable hiding area, forested stands must meet one of several conditions including: being six acres or larger capable of hiding 90 percent of a standing adult elk from view of a human at a distance of 200 feet, or six acres or larger with an average height of 10 feet and which has not been thinned in 20 years, or residual clumps of two acres or larger stands within units with advanced regeneration (trees up to 7 inches in diameter) and at least 12 greater than 7 inch trees per acre remaining after harvest (DLRMP WL-47). In addition, thermal cover must be present over at least 20 percent of KEA in blocks at least 10 acres in size and have an average height of at least 40 feet. As a minimum, canopy cover must be at least 40 percent (LRMP WL-50).

Existing Condition

Roads

Roads have long been identified as having impacts on big game populations. Recent studies at the Starkey Project in northeast Oregon (Wisdom 2005) have disclosed even more information on the effects of roads and road densities on deer and elk. Rowland et al. (2005) summarized the direct impacts of roads and associated traffic on elk, in addition to outright mortality from vehicular collisions as follows: (1) Elk avoid areas near open roads but varies in response to traffic rates; (2) Elk vulnerability to mortality from hunter harvest, both legal and illegal, increases as open road density increases; and (3) In areas of higher road density, elk exhibit higher levels of stress and increased movement rates. Rowland (2005) also noted that elk use increased proportionally to farther distances between open roads. He also suggested judicious closing of certain road segments (particularly road spurs) while providing sufficient access for management activities, may retain or create blocks of habitat that serve as security areas for elk. Hillis et al. (1991 cited in Wisdom 2005) suggested security areas be a non-linear block of hiding cover at least 250 acres in size and at least one-half mile from roads open to motorized traffic.

Table 3-48 displays road densities in the Five Buttes project area expressed in miles of road per square mile of land base within each subwatershed. This is the most informative and useful way to display effects from access. In the table, operational open road density refers to the current condition while the objective open road density is the desired level based on all resource concerns including wildlife, vegetation management, fire suppression access, and providing public access. Road closures could be utilized to bring the densities down to the stated objective, however none are included in the Five Buttes project. The Deschutes LRMP states that target open road densities are 2.5 miles per square mile to achieve deer summer range habitat effectiveness targets unless impacts can be avoided or the proposed project would result in a net benefit to deer habitat. The density will be applied as an average for an implementation unit and will be used as a threshold requiring a further analysis (WL-53). For the purposes of this analysis, an implementation unit will be defined as a sixth-field subwatershed.

Table 3-48. Five Buttes Road Densities by Subwatershed

Subwatershed Name	Operational Open Road Density	Objective Open Road Density
Cold Creek (**All Roads**)	2.30	2.17
Cold Creek (**FS Roads Only**)	1.49	1.37
Cryder (**All Roads**)	4.48	4.45
Cryder (**FS Roads Only**)	1.78	1.48
Davis Creek*	3.45	2.91
Davis Lake*	2.63	2.63
Hamner	3.33	2.49
Lower Crescent Cr. (**All Roads**)	4.35	4.09
Lower Crescent Cr. (**FS Roads Only**)	0.18	0.14
Middle Crescent Cr.	3.21	2.81
Moore Creek	0.86	0.55
Odell Creek	2.31	2.20

Subwatershed Name	Operational Open Road Density	Objective Open Road Density
Odell Lake*	0.56	0.55
Wickiup* (**All Roads**)	5.09	3.73
Wickiup * (**FS Roads Only**)	4.69	3.33

*Acres of lakes and reservoirs have been deducted from the road density calculations

The road density levels described in Table 3-48 reflect conditions averaged over entire subwatersheds. Some watersheds include areas with very low road densities because they include wilderness, roadless area, and/or concentrated riparian acreage where roads are non-existent or at low levels. An example would be the Moore Creek subwatershed, which contains a significant portion of its acreage in roadless area. There are also subwatersheds where road densities are much higher in some portions of the subwatershed. An example is the Wickiup subwatershed, where open road densities are much greater on the north end of the unit but reduced on the remainder of the subwatershed.

Currently, 33 miles of roads are closed under a Road Closure Order. It is likely that the order will be made permanent as part of the Forest-Wide Transportation Analysis currently underway. The closure order affected public access within the seven subwatersheds in the Davis Fire including Davis Creek, Davis Lake, Odell Creek, Middle Crescent Creek, Lower Crescent Creek, Hamner Buttes and Wickiup. While the public is generally restricted from accessing closed roads within the fire perimeter, administrative access is allowed by signed permit. In addition, contractors are also allowed access with a signed permit to specified areas to perform work activities within the fire perimeter. This may include researchers, tree planting crews, and/or county corrections crews. While open road densities have been reduced in the fire area, limited use does occur as mentioned.

Table 3-49 displays the current road densities by Key Elk Area within the project area.

Table 3-49. Open road densities within the Key Elk Areas.

Key Elk Area	Operational Open Road Density	Objective Open Road Density
Davis Key Elk Area	1.99	1.87
Maklaks Key Elk Area	0.92	0.82

As displayed in Table 3-49, the road density for the Davis Key Elk Area exceeds the LRMP recommendation of 0.5 -1.5 miles per square mile of land. Because this KEA contains road segments to access East Davis campground, West Davis picnic area, plus about 2 miles of the 4660 road that parallels Davis Lake, the theshold 1.5 mile per square mile open road density objective in this KEA is probably unattainable for the foreseeable future. There are no plans at this time to close any of these road segments. However, road 4660.400 parallels Ranger Creek for approximately 0.5 mile and was closed in 2006. The operational objective in Table 3-49 for the Davis KEA reflects this closed road segment.

Vegetative Condition

Generally speaking, cover and forage areas are well distributed within each subwatershed outside the Davis Fire area and within specified limits identified in the Deschutes LRMP. Antelope bitterbrush is the dominant browse species for mule deer in this area. This shrub is most commonly found in the lodgepole pine plant association but may also be found in stands of mixed ponderosa pine and lodgepole pine. Riparian habitat is found in the Moore Creek, Odell Creek, Ranger Creek, Crescent Creek, and Maklaks Creek drainages. Within the perimeter of the Davis Fire, browse species are becoming re-established with snowbrush ceanothus, bitterbrush, currant, wild strawberry, various forbs and native grasses providing a somewhat limited forage base at this time. Forage levels are expected to increase on an annual basis as the current plants distribute seeds and more sprouting occurs.

Hiding cover remains limited within the 21,000-acre Davis Fire perimeter. Where fire was of moderate to low intensity, hiding cover is present. However, over 16,000 acres of the fire acreage was stand replacement and cover is very limited. Some patches of ceanothus are 3 feet in height and capable of providing some screening for mule deer. The subwatersheds most affected by the fire include Davis Lake, Odell Creek, Hamner Butte and Wickiup. Approximately 12,700 acres of the fire area has been planted with tree seedlings. In about 10-12 years, the planted areas will develop into big game hiding cover and improve the distribution of cover inside the fire perimeter.

While mule deer can be found virtually over the entire project area, the greatest densities tend to occur in the lodgepole pine or mixed lodgepole pine/ponderosa pine plant associations at lower elevations. The bands of elk in the project area tend to be closely associated with riparian habitats and wet meadow complexes. Small groups of elk can be found along the stream drainages, in the roadless area, near Davis Lake and on the buttes.

Table 3-50 displays the current cover/forage conditions within each KEA.

Table 3-50. Current cover/forage conditions within the Key Elk Areas.

Key Elk Area		Forage		Cover	
	Total Acres	Acres	% of Area	Acres	% of Area
Davis Key Elk Area	2,083	1,698*	81	385	19
Maklaks Key Elk Area	1,616	337	20	1,286	80

* Including 1,375 acres within the Davis Fire where browse is becoming established 3 years after the fire.

Davis KEA

Within the Davis Key Elk Area, hiding cover acreage does not meet the 30 percent minimum prescribed in the LRMP. The Davis Fire removed much of the hiding and thermal cover that was present in the KEA prior to the fire. Most of the remaining hiding cover is located on the western end of the KEA near Ranger Butte. In the spring of 2006, approximately 350 acres within the KEA were planted with tree seedlings. It will take about 10-12 years for these seedlings to grow tall enough to provide deer and elk hiding cover. The lack of cover blocks in the KEA has probably shifted big game use of this area to more of a nocturnal pattern with the animals returning to patches of hiding cover outside the KEA during the day. As cover becomes established this pattern of use may return to pre-fire conditions with animals widely distributed in the flats surrounding the southern and western portions of Davis Lake.

Maklaks KEA

This KEA is dominated by riparian habitat, including forested stands of Engleman spruce and lodgepole pine in the stream drainages, as well as shrubs such as willow, serviceberry, and several species of currant. Wet stringer meadows are a common feature and the variety of habitats provide excellent forage, hiding and thermal cover, and calving areas.

Environmental Consequences

Table 3-51 displays the expected change in cover/forage condition by subwatershed by alternative. Acreages of lakes and lava fields have been removed to calculate existing conditions. In addition, within the Odell Lake subwatershed, only the eastern third of the subwatershed has been populated with a cover/forage value. The majority of the remaining acreage of Odell Lake subwatershed includes the Diamond Peak Wilderness and the Oregon Cascades Recreation Area (OCRA). Because the majority of this acreage is forested, an assumption was made that the cover percentage would remain very high, likely exceeding 90 percent, if measured across the entire subwatershed. There are no actions proposed in the Odell Lake subwatershed and the existing condition would remain the same regardless of alternative selected for implementation. Table 3-52 summarizes remaining hiding and thermal cover by Key Elk Area.

Table 3-51. Change in Cover/forage Condition by Subwatershed by Alternative

Lower Crescent Subwatershed Cover/Forage Ratio (9,019 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	7,475	1,544	83/17
B	6,267	2,753	70/30
C	6,505	2,515	72/28
Middle Crescent Subwatershed Cover/Forage Ratio (16,122 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	13,841	2,281	86/14
B	12,719	3,403	79/21
C	12,386	3,736	77/23
Moore Creek Subwatershed Cover/Forage Ratio (14,485 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	13,335	1,150	92/8
B	13,240	1,245	91/9
C	13,240	1,245	91/9
Odell Creek Subwatershed Cover/Forage Ratio (13,656 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	9,835	3,821	72/28
B	9,239	4,416	68/32
C	8,805	4,850	64/36
Odell Lake Subwatershed Cover/Forage Ratio (8,752 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	8,715	37	99/1
B	8,715	37	99/1
C	8,715	37	99/1
Hamner Subwatershed Cover/Forage Ratio (11,793 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	7,776	4,017	66/34
B	7,714	4,079	65/35
C	7,714	4,079	65/35
Davis Lake Subwatershed Cover/Forage Ratio (18,468 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	11,328	7,140	61/39
B	10,769	7,699	58/42
C	10,854	7,614	59/41
Davis Creek Subwatershed Cover/Forage Ratio (10,695 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	8,483	2,212	79/21
B	7,456	3,239	70/30
C	7,280	3,415	68/32
Wickiup Subwatershed Cover/Forage Ratio (7,070 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	3,212	3,858	45/55
B	2,954	4,116	42/58
C	2,823	4,247	40/60
Cold Creek Subwatershed Cover/Forage Ratio (10,861 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	9,997	864	92/8
B	9,921	941	91/9
C	9,598	1,263	88/12
Cryder Subwatershed Cover/Forage Ratio (1,404 ac.)			
Alternative	**Cover Acres**	**Forage Acres**	**Cover/Forage Ratio %**
A	1,062	342	76/24
B	837	567	60/40
C	960	444	68/32

Table 3-52. Summary of Remaining Hiding and Thermal Cover by Key Elk Area

Davis Key Elk Area (2,083 acres)		
Alternative	Hiding Cover Acres Remaining	Thermal Cover Acres Remaining
A	385 (19%)	385 (19%)
B	385 (19%)	385 (19%)
C	385 (19%)	385 (19%)
Maklaks Key Elk Area (1,616 acres)		
Alternative	Hiding Cover Acres Remaining	Thermal Cover Acres Remaining
A	1,286 (80%)	1,191 (74%)
B	1,286 (80%)	1,191 (74%)
C	1,261 (78%)	1,166 (72%)

For clarification, in Table 3-52 some stands may possess both hiding cover and thermal cover characteristics or may provide just one cover type. For example, in the Maklaks KEA there are 1,286 acres of existing hiding cover of which 1,191 acres are also defined as thermal cover.

Alternative A
Direct and Indirect Effects

Roads
The selection of this alternative would result in no change in the number of miles of existing open road densities within each subwatershed of the project area or either key elk area. The Davis Fire Travel Management Closure Order would remain in effect, restricting vehicle access within the fire area. This would continue to have positive benefits to summering big game animals by restricting vehicle use and resultant human disturbance where hiding cover is lacking.

Vegetation
Implementation of this alternative would result in no immediate change in the current cover/forage condition within each sixth-field subwatershed and KEA. Within a ten year period there would be a gradual increase in the amount and distribution of cover present within most subwatersheds. This is the result of tree growth in young forested plantations and older stands with multiple canopy layers that would provide increased capability to hide deer and elk from view. In addition, hiding cover will become established in Davis Fire area. Approximately 12,700 acres of the Davis Fire was planted with conifer seedlings. Riparian habitat acreage along Odell Creek (Davis KEA) is also scheduled for planting of Engleman spruce in 2008 or 2009. In 10-12 years, these replanted stands will also function as big game hiding cover.

Improved foraging conditions within the Davis fire will benefit deer and elk on the summer range for several decades and allow animals to enter the winter period in better body condition. However, deer and elk would remain subject to off district winter range habitat conditions, winter weather severity, predation, and previously mentioned factors (in the existing condition discussion) affecting the Upper Deschutes Big Game Management Unit.

Effects Common to Alternatives B and C

Roads
Neither alternative would change permanent road access in the project area, so a road analysis was not required. Implementation of either alternative will require the construction of temporary roads (5.94 miles Alt. B and 6.36 miles Alt. C) to access treatment units. These will be relatively short segments needed on Maklaks and Royce Mountain, the lower south slope of Hamner Butte, and on the lower north slope of Odell Butte. In addition, some currently closed roads (27 miles Alt. B and 34 miles Alt. C) would be re-opened to provide access to units. Road re-openings will occur in ten of the eleven subwatersheds where

silvicultural and/or fuels reduction activities are proposed and would result in a short-term increase in existing open road density. For Alternative B, re-opened road miles range from 0.27 miles in the Cryder subwatershed to 6.78 miles in the Middle Crescent Creek subwatershed. In alternative C the number of miles of road to be re-opened ranges 0.04 miles in the Cryder Butte subwatershed to a high of 7.4 miles in the Middle Crescent Creek subwatershed. The temporary increase in open road density during project operations would likely result in some animal displacement. The displacement could result in abandonment of the calf/fawn during critical times of the year. Seasonal restrictions as described in Table 2-1 will be applied to known mule deer fawning and elk calving habitat located in units 265, 370, 371, 676, 691, 692, 757 and 811. Without these mitigations, there potentially would be a higher potential for mortality. These measures have proven to be effective forest-wide.

In a study of elk use and roads within the Blue Mountains of eastern Oregon, Rowland et al. (2005) noted elk will tend to avoid areas near open roads. Because most sales generally operate for several years, this effect on elk may last several seasons. However, not all sales would be operating at the same time nor would every herd or band of elk in the project area be affected since many tens of thousands of acres would not be exposed to new roads, timber harvest or fuels reduction work. After the completion of all sale work, temporary roads would be subsoiled and those roads opened for commodity extraction or fuels work would be closed once again to vehicular traffic. There would be no net increase in open road densities in any subwatershed after project work has been completed and roads have been re-closed. To minimize disturbance to deer and elk during the fawning/calving season, a limited operating period would be applied to treatment areas near water sources during the period of May 1 through June 30 (See Mitigation Measures listed in Chapter 2 of this EIS for specific units).

No activity would occur in the Davis KEA and approximately 25 acres of small tree thinning (6 inches or less) would occur in the Maklaks KEA. There would be no increase in open road density in the Maklaks KEA and as displayed in Table 3-49, existing road densities are within the Deschutes LRMP recommended levels. With mitigation measures in place, the potential for mortality from fawn/calf abandonment would be considered low and displacement of animals would be a temporary short-term effect for approximately 2-3 years. During that time, displaced animals would avoid the disturbance and seek cover and forage in adjacent areas.

Road Density Further Evaluation

The Deschutes LRMP requires further evaluation if a project is above target open road densities (WL-53). As displayed in Table 3-50, four of the eleven subwatersheds (Wickiup, Davis Creek, Davis Lake, and Middle Crescent Creek) have objective open road densities that range from 2.63 to 3.3 miles per square mile of land, which exceeds the 2.5 mile target. Therefore, these subwatersheds require further evaluation. Both action alternatives propose the construction of temporary roads and the re-opening of currently closed roads to access treatment sites. As displayed in the alternative maps, unit placements are generally consolidated, particularly in the Wickiup and Davis Creek subwatersheds, which have the highest open road objectives (3.3 and 2.91 miles, respectively). Consequently, active management would occur on approximately 15 percent of the land base in both subwatersheds and 85 percent of the subwatersheds would not be impacted by project activities. While big game animals, especially elk, would tend to move away from the logging and road use disturbance. There are security areas available in the Wickiup and Davis Creek subwatersheds. Within the Wickiup subwatershed, the hiding cover security blocks are generally in the southern and eastern portion of the subwatershed where open road densities are reduced as compared to the north end. In the Davis Creek subwatershed, elk security cover blocks are present in the southern and northwestern portions of the subwatershed and also in areas of much lower open road density. In the Davis Lake subwatershed, the largest blocks of security cover are in the roadless area about 2 miles west of the lake. Within the Middle Crescent Creek subwatershed, elk security cover is present in the Crescent Creek canyon northwest of Odell Butte. These security cover blocks are greater than the 250 acres in size described by Hillis et al (1991) as providing suitable security areas for elk. Logging and fuels reduction activities would have much less of an effect on mule deer since they do not rely on large blocks of security cover.

Actions designed in Alternatives B and C would have a net benefit to deer habitat.

Because the project's purpose and need is to reduce the risk of large-scale loss of forest loss to disturbance processes, the proposed activities would be consistent with managing big game habitats for the long-term. Maintaining a well distributed mix of forage and cover blocks for the long-term in each subwatershed is a desired objective, as is reducing risk of losing these habitat components in a large event similar to the Davis Fire. For example, the Davis fire created over 16,000 acres of early-seral habitats, mostly in one consolidated block extending from south of Davis Lake northeast to the south side of Wickiup Reservoir. While early-seral stages will provide abundant forage for several decades, an event of this magnitude and intensity did not leave blocks of cover scattered within the interior of the fire. This results in much of the forage base being hundreds of yards from the nearest security cover though topographic features provide some screening in animal visibility. The Five Buttes project, while converting some stands from hiding and security cover to a more open forest condition, would reduce the likelihood of another event of this magnitude from occurring. Either alternative would provide balanced habitat conditions for deer and elk on their summer range.

This evaluation concludes that the net effect of the Five Buttes proposed activities on big game is consistent with Forest Plan wildlife objectives for the following reasons:

1. While the subwatersheds may exceed the 2.5 miles per square mile target averaged over all subwatersheds, there are areas within each subwatershed with lower road densities that are capable of providing large security blocks of cover.
2. The temporary roads will be obliterated after the completion of all harvest and fuels related activities.
3. All currently closed roads re-opened for access to treatment units will be closed to vehicular traffic after the completion of forest management activities.
4. Implementation of the Five Buttes project would result in no net increase in open road densities after project completion.
5. While the action alternatives propose 5,000 to 7,000 acres of treatments, not all of this would be ongoing at the same time so big game security acreage would be available in all subwatersheds.
6. Seasonal restrictions as described in Table 2-1 will be applied to known mule deer fawning and elk calving habitat located in units 265, 370, 371, 676, 691, 692, 757 and 811. The efficacy for these measures is considered high.

Vegetation Effects

<u>Subwatersheds</u>

Each action alternative proposes a combination of commercial thinning and post-sale activities including small-tree thinning, post and pole sales, and fuels activities that would change the vegetative character of affected stands. In most instances, the reduction in tree densities would open the forested stands and create more open conditions near the ground, resulting in increased visibility and less effective hiding cover for big game. Opening these stands would increase the amount of sunlight reaching the forest floor and result in increased growth to forage species, particularly bitterbrush. In those harvest units where the desired condition is to move toward a late-successional single story habitat, viewing distances into affected stands would generally be greater than in multi-story prescriptions. Most single story treatments would occur within bald eagle management areas where the focus is the retention of large ponderosa pine and Douglas-fir for future nest platforms. Single story objectives would also apply to treatment units within lodgepole pine plant associations. Single story treatments would result in stands being reclassified as foraging habitat in place of hiding cover. The fuels activites proposed for Alternative C include approximately 1,341 acres of thinning live trees less than 3 inches in diameter. This relatively minor amount of thinning is not expected to reduce cover capability within these stands. Because Alternative C would implement fewer acres of commercial thinning than Alternative B, more hiding cover would be maintained in the Wickiup, Davis Creek, Odell Creek, and Middle Crescent Subwatersheds, where small tree thinning less than 3 inch in diameter is proposed.

Table 3-51 displays the change in forage/cover ratios as a result of implementing each action alternative. None of the subwatersheds would fall below the 30 percent cover level recommended in the LRMP. For this analysis, an assumption is made that active management within stands that are classified as hiding cover would be reclassified as foraging. The exception would be salvage activities in unit #370 and the "fuels only" activities that would remove 3 inch and smaller diameter trees. This condition may be a long-term effect if the site objective is to maintain a relatively open forested condition. Because a minimum of 15 percent of each activity unit would be passively managed, well-distributed patches of hiding cover would be maintained in each harvest unit. The distribution of hiding cover and foraging areas is constantly changing as stands that have been thinned grow back into effective hiding cover and the Davis Fire re-vegetates.

Key Elk Areas

There are no silvicultural or fuels treatments planned for the ***Davis*** KEA in either action alternative. There is one proposed "fuels only" activity unit in alternative C that would enter the ***Maklaks*** KEA. Approximately 25 acres of small tree thinning less than 6 inches in diameter would occur in the very northwest tip of the Maklaks KEA. Because spacing of trees may range from 15-20 feet, the hiding and thermal cover capability would be removed and the stand would function more as a foraging area for big game after harvest. This may result in the long-term loss of hiding and thermal cover along the Odell Creek drainage because this area has been identified as strategic and would be maintained in a condition that modifies fire behavior. Even though 25 acres are converted to foraging habitat, hiding and thermal cover acreages in the KEA still exceed the minimum levels specified in the LRMP. There would be no long-term negative effect on elk with this proposal. There are no activites planned in alternative B for the Maklaks KEA.

Cumulative Effects

Table 3-1 was reviewed for overlap in space and time for projects that in combination with Five Buttes would have the potential for cumulative effects. The zone of influence is the Subwatersheds within the analysis area for Five Buttes. The current existing condition accounts for all past actions on federal lands because that is the format most informative and useful for the public and Deciding Official. In addition, natural events such as windstorms and lighting and human-caused wildfires have also contributed to the current forage and cover distribution across the project area.

Foreseeable actions on federal lands which overlap the zone of influence are the Lakeside Wildland Urban Interface Fuels Reduction Project portion around Odell Lake and the Wickiup Estates Fuels Reduction Project. Out-year small diameter thinning is not considered a foreseeable action because the details are not known and scoping has not begun. All other small diameter thinning projects were included in the existing condition analysis. The incremental effect of past, present and foreseeable actions on cover are negligible and would not appreciably change. Active management within the Wildland Urban interface that overlaps the Five Buttes project would reduce cover on a relatively small area compared to the cover available within the zone of influence.

The Deschutes National Forest is currently in the process of conducting a Forest-wide Travel Management Plan to review and make recommendations to our current motorized access system. This process will do three things:

- Designate specific conditions, if any, under which existing routes or areas will continue to provide for sustainable motorized use considering a variety of societal and resource factors
- Identify existing roads, trails, and areas that will continue to support sustainable motorized use
- Identify potential motorized routes and/or areas that could be added to the forests and grassland transportation system for motorized use.

This process will also consider the Deschutes LRMP guidelines for open road densities on big game summer range.

The majority of the approximate 18,278 acres of private land in the project area is composed of industrial forest timberlands. While hiding cover is somewhat limited at the present time, there is an abundance of open foraging habitat on private lands. Most of this acreage has experienced intensive management in the last 7-8 years. At the present time, the distribution of effective hiding cover is highly variable. Where dense patches of younger aged lodgepole pine and ponderosa pine are present, effective cover is available. However, most of this acreage is located west of the Little Deschutes River. On the remaining acreage, it is assumed the seedlings and saplings currently present would rapidly develop enough vertical and horizontal structure to providing hiding cover within the next 5-6 years.

Industrial timberlands tend to have high open road densities unless closed to reduce liability, illegal dumping or other issues. These lands are located in the southeastern portion of the Five Buttes project area. The current combination of high open road densities and reduced hiding cover capability, lower the effectiveness of this land for big game, especially elk. It is likely that big game cover has been reduced to a level that will go no lower. Dependent somewhat upon short and long-term goals of the company, cover would likely be on an increasing trend.

The additive effect of past, present, and foreseeable vegetative management activities on private and federal lands will not change appreciably from those levels disclosed in the direct and indirect effects. The Forest Plan standards for the maintenance of hiding cover would be met. It is assumed that there is plenty of cover available on federal lands within the Five Buttes analysis area; regardless of the selected alternative the project is not expected to have long-term adverse effects to summering big game populations. The vegetation management activities proposed in Five Buttes would reduce the risk of large-scale wildfire event similar to the Davis Fire, and it is designed to maintain an evenly distributed mix of forage openings and hiding cover areas which benefit deer and elk. Therefore, no cumulative effects are expected to big game animals and their habitat as a result of project implementation.

Wildlife Habitat

Snags and Down Wood

Introduction

Dead wood (standing or down) plays an important role in overall ecosystem health, soil productivity and numerous species' habitat. It is crucial in the continuation of species that depend on snags for all or parts of their life cycle (Laudenslayer 2002). Bird and mammal species rely on the structure for dens, nests, resting, roosting, and/or feeding on the animals and organisms that use dead wood for all or parts of their life cycle. Snags come in all sizes and go through breakdown and decay processes that change them from standing hard to soft, then on the ground to continue decaying into soil nutrients. Not every stage of the snag's demise is utilized by the same species, but rather a whole array of species at various stages or conditions (Rose et al 2001).

Stand structure often influences species that utilize snags. Frenzel (2002) noted snag density may be less important for white-headed woodpeckers than other woodpeckers since they forage mostly in live trees. He found the mean snag densities at nest sites to be 1.5 trees per acre. Nesting success was greatly influenced by the number of large green trees available at the nest site; specifically there was greatest success in stands where there were at least 12 ponderosa pines per acre greater than 21 inches diameter. Development of dense understories due to fire suppression is one cause of reduced white-headed woodpecker habitat (Frenzel 2002).

Goggans and others (1989) found nests excavated by three-toed and black-backed woodpeckers were in portions of green lodgepole pine trees with heart-rot. Three-toed woodpecker habitat was predominately mixed conifer forest stands above 4500 ft elevation and black-backs predominately lodgepole pine forest stands below 4500 ft elevation. Both are associated with stands that are susceptible to attacks by bark beetles, generally mature and over-mature with high tree densities.

Much of the literature suggests to manage for a variety of densities of dead wood in live stands and post-fire situations, as well as to analyze at a scale larger than the stand level (Rose et al 2001, Mellon et al 2006, Laudenslayer 2002, Saab and Dudley 1998, Haggard and Gaines 2001). Management guidelines for snags and down wood on the Crescent Ranger District are wide-ranging. The Davis LSR Assessment (LSRA) set snag and down wood levels for the Davis LSR. Other direction includes:

- Retain snags that are likely to persist until late-successional condition (greater than 80 years old) has developed and large snags are being produced (NWFP S&G C-14);
- Retain coarse woody debris in quantities so that in the future it will still contain amounts similar to naturally regenerating stands (NWFP S&G C-14);
- In matrix… a minimum of 120 linear feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long should be retained. (NWFP S&G C-40);
- In matrix.. as a minimum retain snags within the harvest unit at levels sufficient to support species of cavity-nesting birds at 40 percent of potential population levels based on published guidelines and models (NWFP S&G-C-42);
- In matrix …for white-headed woodpecker, black-backed woodpecker, pygmy nuthatch and flammulated owl snags over 20 inches dbh may be marked for cutting only after retaining the best available snags (considering size, longevity, etc.) in sufficient numbers to meet 100 percent of the potential population levels of these four species (2001 amendment page S&G-34, 35);
- East of the range of the spotted owl… maintain snags of ≥ 21 inches dbh at 100% potential population levels of primary cavity excavators (1995 Regional Forester's Amendment No. 2, Appendix B p11); and
- Use the best available science on species requirements (2001 amendment page S&G-34, 35 and 1995 Regional Forester's Amendment No. 2, Appendix B p11).

Analysis Process

To determine existing condition and assess effects of the alternatives on dead wood and the species that depend on them (Table 3-53), a variety of sources of information were used. Information was gathered from scientific journal articles, research papers, source books and DecAID (Mellen et al. 2006). Data came from a variety of sources also, including district and forest GIS layers, stand exams, dead wood surveys and DecAID.

This analysis will disclose habitat for focal species over time and acres of activity by treatment type as the measures for comparison. The focal species in this analysis are representative primary cavity excavators and secondary cavity users. They include: white-headed woodpecker, pygmy nuthatch, flammulated owl, three-toed woodpecker, black-back woodpecker, Lewis' woodpecker, pileated woodpecker, hairy woodpecker, northern flicker, northern flying squirrel, southern red-back vole, bushy-tailed woodrat and American marten. Species were chosen from a variety of sources; NWFP survey and manage species (USDA 2001), Deschutes Forest Plan management indicator species (USDA 1990), USFWS Species of Conservation Concern (USFWS 2002), *A Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon* (Altman 2000). Also, focal species were chosen to represent important prey species of the northern spotted owl.

When compromising habitat for one species in order to develop habitat for another, it is important to know the status of each species; and to target conservation towards those species and habitats in greatest need (NatureServe, 2006). NatureServe was used to determine the conservation status of each of the species. Rankings are based on the Oregon Natural Heritage program. With member programs across the country, it developed a consistent method for evaluating the "relative imperilment" of species. The rankings were taken from NatureServe and explained as follows from their website:

> Conservation status ranks are based on a one to five scale, ranging from critically imperiled (G1) to demonstrably secure (G5). Status is assessed and documented at three distinct geographic scales-global (G), national (N), and state/province (S). These status assessments are based on the best available information, and consider a variety of factors such as abundance, distribution, population trends, and threats.

The numbers have the following meaning:

1 = critically imperiled	B=breeding population
2 = imperiled	N= nonbreeding population
3 = vulnerable to extirpation or extinction	M=aggregating migrant population
4 = apparently secure	
5 = demonstrably widespread, abundant, and secure.	

For species, the following factors are considered in assessing conservation status:

- total number and condition of occurrences (e.g., populations)
- population size
- range extent and area of occupancy
- short- and long-term trends in the above factors
- scope, severity, and immediacy of threats
- number of protected and managed occurrences
- intrinsic vulnerability
- environmental specificity

(For more information on NatureServe, visit the website at: www.natureserve.org)

Table 3-53. Species with dead wood as a primary habitat feature.

Species	Status	Behavior	Habitat Feature/ Conservation Focus	Habitat	Presence in Project Area	Oregon State Heritage Status Ranking
Lewis' Woodpecker	Migratory Focal Species, Bird of Conservation Concern	primary cavity excavator	Patches of burned old forest	Old Growth Ponderosa Pine	Unknown	W-OR S2 C-OR S3
Flammulated Owl	Migratory Focal Species, NWFP Survey & Manage, Bird of Conservation Concern	secondary cavity nester	Large snags	Old Growth Ponderosa Pine	Documented	S3
White-Headed Woodpecker	NWFP Survey & Manage, Migratory Bird Focal Species, Bird of Conservation Concern	primary cavity excavator	Large patches of old forest with large snags	Old Growth Ponderosa Pine	Documented	W-OR S2 E-OR S3
Pygmy Nuthatch	NWFP Survey & Manage	primary cavity excavator	Large trees	Pine Forest	Documented	S4
Williamson's Sapsucker	Migratory Focal Species, Bird of Conservation Concern	primary cavity excavator	Large snags	Mixed Conifer	Documented	S4B, S3N
Pileated Woodpecker	MIS	primary cavity excavator	Large snags/down wood	Mixed Conifer	Documented	S4
Black-back Woodpecker	NWFP Survey & Manage, MIS, Migratory Focal Species	primary cavity excavator	Old Growth	Lodgepole Pine	Documented	S3
Three-toed Woodpecker	MIS	primary cavity excavator	Snags and down wood	Mixed	Documented	S3
American Marten	MIS	secondary cavity user, preys on rodents found in abundant down wood	Snags and down wood	Mixed, Complex	Documented	W-OR S3 E-OR S4
Hairy Woodpecker	MIS	Primary cavity excavator	Snags and down wood	Mixed, Complex	Documented	S4
Northern flicker	MIS	primary cavity excavator	Snags and down wood	Mixed, Complex	Documented	S5
Northern flying squirrel	None-primary prey for Northern Spotted Owl	Secondary cavity user	Snags and down wood	Mixed, Complex	Documented	S4
Southern red-back vole	None-secondary prey for NSO		Down wood	Mixed, complex	Documented	S4
Bushy-tailed woodrat	None- secondary prey for NSO		Rock out crops Down wood	Mixed complex	Documented	S5

According to these data, the pygmy nuthatch, Williamson's sapsucker, pileated woodpecker, American marten, northern flicker, northern flying squirrel, southern red-back vole and bushy-tailed woodrat are secure or apparently secure in central Oregon. The Lewis' woodpecker, flammulated owl, white-headed woodpecker, black-backed woodpecker and three-toed woodpecker are vulnerable.

These species have habitat preferences; for instance, black-backed woodpeckers prefer lodgepole pine and white-headed woodpeckers prefer ponderosa pine. There is not always a clear distinction between where one habitat type ends and another begins. There is a gradation of habitat depending on the site, slope, aspect, and elevation. Ponderosa pine/Douglas-fir habitat types may contain an understory of lodgepole that would be used by black-backed woodpeckers. At the drier end of the mixed conifer habitat types, ponderosa pine may dominate the stand and provide habitat for the white-headed woodpecker. This analysis identifies habitats by using plant association groups (PAG). While the species are mentioned where they occur in other PAGs, only the preferred habitat is used for this existing condition analysis.

The white-headed woodpecker is used as an example of where this analysis may underestimate total available habitat for any given species. Its habitat preference is determined to be within ponderosa pine plant association groups which meet the description of ponderosa pine/Douglas Fir (PP/DF) habitats. However, what is not accounted for in this existing condition discussion, are those acres in mixed conifer plant association groups that contain sufficient attributes for becoming primary white-headed woodpecker habitat, if prescriptive management removed certain tree species and opened the stand to retain the large ponderosa pine trees. In this condition, those acres that have the potential to be habitat in mixed conifer are not accounted for in the existing condition, but would be discussed later on in the effects discussion.

Information on species habitat needs and dead wood preferences, as well as snag and down wood densities on landscapes were obtained from species-specific research articles and landscape analysis including Wisdom et al. (2000) "Source habitats for terrestrial vertebrates of focus in the Interior Columbia Basin." Two web-based tools, NatureServe and DecAID, provide a synthesis of research data. NatureServe's focus is on species distribution, over-all habitat needs, and population trends. DecAID information is limited to species use and dead wood requirements. It catalogues current research/studies on wildlife use of dead wood (snags, down wood, dead portions of live trees) in various habitat types. From this, tolerance levels are generated. Table 3-54 provides an example of information from DecAID.

Tolerance level (t.l.) is the percent of a population that would use a density of snags or down wood cover percentage. For example, the following table shows the tolerance levels for white-headed woodpeckers. For a population of 100 individual white-headed woodpeckers, at the 80% t.l., 80 of them would use habitat with at least 3.7 snags per acre greater than or equal to10 inches dbh.

Tolerance intervals were used to determine habitat levels in the planning area. A tolerance interval includes the range of snag density between tolerance levels. Using the example below, the 30-50% tolerance interval would be habitat with at least 0.3 snags per acre and less than 1.7 snags per acre.

Table 3-54. Example table from DecAID.

Minimum DBH		10"				20"		
Habitat type and Table used from DecAID	Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)		30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
Table PPDF_S/L.sp-22	White-headed woodpecker	0.3	1.7	3.7		0.5	1.8	3.8

Often, the only available data DecAID used came from only one study. While applying standards from a single research site to another area is not always a good idea, currently these tolerance levels are the best available science (in addition to professional judgment) to determine effects to a species. Used as a comparison for effects across all alternatives, it can be a useful tool. Tolerance levels do not equate to population potential, nor imply viability, but they are assumed to provide habitat at varying snag densities.

Snag data used in the existing condition description came from modeling of 1997/1998 stand exams and surveys performed within and outside the 2003 Davis Fire. Plots estimated snag and large tree densities across the landscape using the Bate et al. (1999) protocol. The survey data sampled various habitat types using approximately 50 plots in each except for montane mixed conifer (MMC), which only had 9 plots. The plot data was expanded to a "per acre" basis. Each data set was converted to percent cover and then weighted to the area that it represented. For instance, the snag densities for eastside mixed conifer (EMC) found in Davis Fire post-salvage (2006) represented 24% of the analysis area, therefore the information from that data was weighted at 24%; the EMC data from outside the fire was weighted to represent 76% of the analysis area. Lodgepole pine data from the Davis Fire represented 9% of the total analysis area and outside 91% each was weighted accordingly as was the rest of the habitat types. The density categories used were meant as an equalizer between the data types.

Down wood data used in existing condition was from the same data sets as used for snag densities. Surveys were completed using a belt transect along the same transects as the snag protocol. Similarly, the data was calculated to percent cover over the representative area and weighted when it was combined.

A different data set was used in the modeling of dead wood over time. In order to provide consistent data across the planning area for modeling, a "most similar neighbor" program was used to populate fields with missing data. Called "INFORMS," it links information from various sources, using attributes such as tree density, spotted owl habitat, fuels, snag and down wood density, and vegetative condition for each stand across the planning area. This information was then used in the Forest Vegetation Simulator with the Fire and Fuels Extension (FVS-FFE) to model snag and down wood changes over time. This model was calibrated to provide development of snags and snag fall down rates for Central Oregon. FVS is a modeling tool based on the best information available and 1997/1998 stand exams were used. It gives conditions that may occur given the assumptions of the model. Used the same for all alternatives, it gives a basis for comparison, although the modeled data is not directly comparable to the survey data. The survey data captures the diversity of densities within each stand. The modeled data averages snag densities across the stand and tends to lump the densities in a middle range, underestimating the very low and very high densities. See the Vegetation and Fuels sections for more details on how INFORMS and FVS-FFE were used in this analysis.

The reference condition used for this analysis is the same used for the Davis LSRA. It was developed from information from DecAID and the Odell Pilot Watershed Analysis. DecAID synthesized data come from established vegetation plots across all ownerships in Oregon and Washington. Data from unharvested stands provide a reference condition in the various habitat types for distribution of snag and down wood size and densities across a large landscape. These data were used along with historical range of variability (HRV) information from the Odell Pilot Watershed Analysis to develop the local HRV or reference condition of snag densities across a habitat type, with all structural stages lumped. The reference condition is compared to existing condition to determine how close existing conditions match with historic. Managing within HRV should provide for those species that survived to the present with those densities. Fire ecosystems have been altered due to fire suppression over the years. Mellen et al. (2006) state that dead wood levels may be above historical conditions due to fire suppression and increased mortality, and may be depleted below historical levels locally due to areas burned by intense fire or salvage and firewood cutting. The vegetation data is used for this analysis understanding that the information from unharvested plots may not accurately reflect "natural conditions." They are comparable to historic dead wood densities in recent research (comparison of Harrod et al. 1998, Agee 2002, Ohmann and Waddell 2002 in DecAID 2.0 narratives). Until new information becomes accessible, DecAID vegetation data provides the most current, empirical data available for dead wood evaluations. For more information on the development of the reference condition for the planning area see Appendix C. More information on DecAID can be found on the website at: www.fs.fed.us/wildecology/decaid/decaid_background/decaid_home.htm

Existing Condition

There is a variable range of conditions across the Five Buttes planning area. The Odell Pilot Watershed Assessment determined historically in the mixed conifer plant groups (EMC):

1. There was anywhere from 0-50 percent of the landscape in an early structural condition;
2. Mid-structural condition would occur in a range of 7 to 55 percent; and
3. Late-structural conditions would generally range from 8-60 percent of the landscape.

Similar historical range of variability (HRV) was determined for each plant group. Table 3-55 shows the structural condition currently found within each subwatershed[16] by habitat type. The Davis Creek subwatershed is within HRV in eastside mixed conifer habitat types. Even though a small portion of that subwatershed was within the Davis fire it still has more late structural condition in PP/DF and LP habitat types then was present historically.

Table 3-55. Structural condition by habitat type within subwatersheds in and around Five Buttes.

HABITAT TYPE	EMC			PPDF			LP			MMC*		
HRV Range (from Odell Pilot WA)	**Early 0-50**	**Mid 7-55**	**Late 8-60**	**Early 0-30**	**Mid 0-60**	**Late 0-50**	**Early 0-70**	**Mid 0-50**	**Late 0-30**	**Early**	**Mid**	**Late**
Subwatershed	%E	%M	%L	%E	%M	%L	%E	%M	%L	%E	%M	%L
Brown's Creek	11%	16%	73%	8%	27%	66%	18%	35%	47%	2%	16%	82%
Cold Creek	7%	29%	64%	36%	46%	17%	13%	53%	34%	3%	24%	73%
Cryder Butte	29%	14%	57%	33%	19%	48%	18%	25%	57%	0%	0%	0%
Davis Creek	33%	8%	60%	14%	29%	57%	22%	40%	37%	6%	37%	57%
Davis Lake	53%	8%	39%	33%	18%	49%	43%	30%	27%	5%	21%	75%
Hamner Butte	46%	11%	43%	24%	23%	53%	47%	26%	26%	9%	46%	46%
Lower Crescent Creek	25%	14%	61%	16%	22%	62%	38%	23%	39%	0%	0%	0%
Middle Crescent Creek	15%	13%	72%	20%	28%	53%	24%	46%	31%	6%	25%	69%
Moore Creek	14%	26%	60%	9%	26%	65%	22%	42%	36%	2%	18%	80%
Odell Creek	26%	12%	62%	93%	3%	4%	36%	44%	20%	8%	17%	75%
Odell Lake	5%	19%	76%	0%	0%	0%	5%	62%	34%	3%	14%	84%
Wickiup	42%	8%	50%	29%	22%	50%	26%	31%	43%	0%	0%	0%
All Subwatersheds	*30%*	*13%*	*57%*	*23%*	*23%*	*54%*	*26%*	*38%*	*36%*	*3%*	*17%*	*80%*

Davis Fire within all or portions of the subwatershed

=outside HRV

*No HRV information available for MMC

The larger landscape of all subwatersheds (180,737 acres) falls close to the historic range of variability. The Five Buttes Planning area (160,000 acres) includes 16,693 acres of privately owned lands. They were included in the HRV analysis. Early-seral stages have resulted from regeneration harvest, or fire. Mid-seral stages are a result of historic disturbances of fire and insects or logging in the 1940s and 1950s and Late-seral stands generally have received no active management.

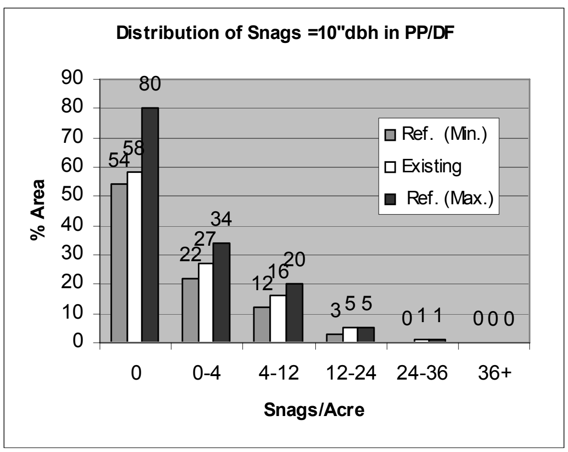
Evidence of forest management policies vary across the planning area, from removal of the largest trees in the early 1900s, clearcuts in the 1970s, to most recent understory thinning that retains the large trees. Past harvest regimes, along with fire exclusion and recent uncharacteristic wildfire intensities have resulted in variable snag densities across the landscape. Old regeneration harvests generally have few to no snags. Snags levels in wildfires can exceed 100 per acre.

The 2003 Davis Fire burned approximately 21,000 acres, resulting in areas of complete mortality on three-quarters (or 15,600 acres) of the area within the fire perimeter. The remaining portion is a mosaic of light to mixed intensity burns, with live trees and dense patches of snags on 5,400 acres. Approximately one third or 6,355 acres of salvage took place within the stands that experienced 100% mortality. Of those acres, 15 percent was retained in an unsalvaged condition and all snags equal to or greater than 36” were retained. Variable densities of snags are present across the wildfire area. In areas where no active management has occurred, snag densities average 145 per acre greater than 10 inches in diameter with 17 snags per acre with 20-inch diameter and greater. Within salvage units, 2 to 12 snags per acre were retained with the majority of those greater than 20 inches dbh (Davis Fire Recovery Project EIS, Appendix D, 2003).

[16] The Five Buttes project either encompasses or bisects each subwatershed displayed.

The distribution of snags and down wood across the landscape provides the diversity needed for the various dead wood dependent species. The limiting factor could be other vegetation structure. For example, there is less acreage of open ponderosa pine old growth stands then what was likely here historically. This means less habitat acreage for white-headed woodpeckers, even though the distribution of snags appears to support them. The following sections divide the landscape into habitat types and the species that favor those habitats.

Ponderosa Pine Habitats –White-Headed Woodpecker, Pygmy Nuthatch and Lewis's Woodpecker
There have been sightings of white-headed woodpecker, pygmy nuthatch and Lewis's woodpecker in the project area. There are approximately 15,600 acres of ponderosa pine-dominated plant associations in the analysis area. Figure 3-21 displays the variable snag densities across this habitat type. Survey densities varied from 0 to 106 snags per acre. The highest densities occur in unharvested portions of the Davis Fire, where fire intensities caused mortality to entire stands of trees. High densities of small diameter snags occur in areas such as along Wickiup Reservoir where lodgepole pine are in the understories of larger ponderosa pine. Densities are higher than reference conditions, primarily due to the ingrowth of shade-tolerant trees, and the uncharacteristically intense Davis Fire.



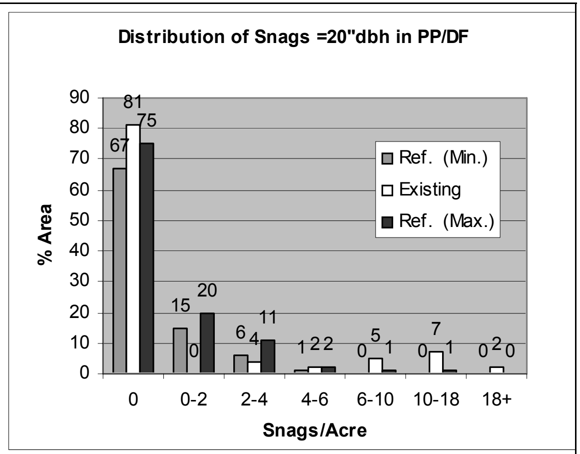


Figure 3-21. Distribution of snag densities across ponderosa pine habitats in the Five Buttes project area.

Information from DecAID Tables PD/DF_O.Inv-14, PP/DF_S.Inv-14, PP/DF_L.Inv-14, ("no active management" plots for snags ≥10" dbh), or PD/DF_O.Inv-15, PP/DF_S.Inv-15, PP/DF_L.Inv-15, ("no active management" plots for snags ≥20" dbh) than modified with HRV information from the Odell Pilot WA. Existing information is from weighted averages of snag surveys, stand exams and Davis Fire analysis modeled to 2006.

Habitat for the Lewis's woodpecker, a migrant in this part of its range, includes old-forest, single-storied ponderosa pine. Burned ponderosa pine forests created by stand-replacing fires provide highly productive habitats as compared to unburned pine (Wisdom et al 2000). Lewis's woodpeckers feed on flying insects and are not strong cavity excavators. They require large snags in an advanced state of decay that are easy to excavate, or they use old cavities created by other woodpeckers. Nest trees generally range from 17 inches to 44 inches (Saab and Dudley 1998, Wisdom et al 2000). White-headed woodpeckers and pygmy nuthatches share similar habitat of large open ponderosa pine, low shrub levels and large snags. The white-headed woodpecker is a primary cavity excavator of soft snags, while the pygmy nuthatch is a secondary cavity nester and can take advantage of natural cavities as well as woodpecker created cavities. Both species prefer larger diameter trees than the Lewis's woodpecker, averaging 23 inches for the pygmy nuthatch and 31 inches for the white-headed woodpecker (Wisdom 2000). The white-headed woodpeckers forage through gleaning and pecking for insects in the bark of older ponderosa pine (Marshal 2003). Pygmy nuthatches forage primarily on the outer branches high in the canopy on needle clusters, cones, and emerging shoots, as well as on the bole. There is also a reliance on pine seed sources for the white-headed, or leaf insects for the nuthatch as seasonal parts of their diet (Marshal 2003). On the Winema National

Forest, south of the project area, white-headed woodpeckers were found to be using small-diameter trees, logs in a slash pile, and upturned roots (6-13" diameter) where large snags were uncommon (Frenzel 2002).

Both the Lewis's and the white-headed woodpecker populations are considered in a downward trend (NatureServe 2006, Frenzel 2002). Removal of large diameter snags and fire exclusion resulting in a reduction of open ponderosa pines stands is thought to contribute to the decline of these species. Table 3-54 displays the tolerance levels for the three species. Information for the white-headed woodpecker is from a declining population (Mellen et al 2006). Pygmy nuthatches utilize greater densities of snags than the white-headed woodpecker. The 50 percent tolerance level for the pygmy nuthatch is 6 snags per acre of snags 10 inch dbh and greater, and 2 for the white-headed woodpecker. Both utilize approximately the same density of snags 20 inch dbh and greater. There was no data for Lewis's woodpecker use of snags in live stands, and no data for pygmy nuthatch use of burned stands. Both the Lewis's and white-headed woodpeckers take advantage of the high densities in recent post-fire habitats.

Generally, habitat is provided at tolerance levels of 30 percent and above. The higher the tolerance level, the more individuals the habitat can support. Approximately 47 percent of the project area is lacking sufficient snags for the pygmy nuthatch, while 53 percent of the project area has sufficient snags to support a population at various levels. Similarly for white-headed woodpeckers, 34 percent of the area provides at the 80 percent and above tolerance level. In addition, a portion of the habitat provided for white-headed and Lewis's woodpecker is within the Davis Fire area, where approximately 1,183 and 1,875 acres (respectively) provides post-fire habitat.

While snag densities may be sufficient on 8,268 acres to provide habitat for the white-headed and Lewis's woodpecker, the quality of habitat may be poor due to the high density of existing live stands. This is mainly due to in-growth of shade-tolerant trees creating multi-canopy conditions, particularly in ponderosa pine dominated stands. Since the early 1990s, active management has begun to open some of these stands up to more of a single story condition with large trees on 2,900 acres (Seven Buttes and Seven Buttes Return Environmental Assessments). The Davis Fire returned approximately 3,000 acres of ponderosa pine and mixed conifer habitat for the Lewis' and white-headed woodpeckers and pygmy nuthatch by burning in a mixed intensity that created single story stands and retained large trees.

Table 3-56. Tolerance levels for pygmy nuthatch, white-headed and Lewis's woodpecker and amount of PP/DF habitat provided.

Habitat type and Table used from DecAID	Species	Snags	Snags/Acre	Tolerance Interval	Existing 15,600 acres	
					Percent	Acres
PP/DF Table PPDF_S/L.sp-22	Pygmy Nuthatch	≥ 10 Inches dbh	0-1	0-29%	47	7332
			1.1-5.5	30-49%	19	2964
			5.6-12.0	50-79%	11	1716
			≥ 12.1	≥ 80%	23	3588
		≥ 20 Inches dbh	0	0-29%	81	12636
			0.1-1.5	30-49%	0	0
			1.6-3.9	50-79%	4	624
			≥ 4	≥ 80%	15	2340
	White-headed woodpecker	≥ 10 Inches dbh	0-0.2	0-29%	47	7332
			0.3-1.6	30-49%	19	2964
			1.7-3.6	50-79%		
			≥ 3.7	≥ 80%	34	5304
		≥ 20 Inches dbh	0-0.4	0-29%	81	12636
			0.5-1.7	30-49%	4	624
			1.8-3.7	50-79%		
			≥ 3.8	≥ 80%	15	2340
	Lewis's Woodpecker	No Data				
PP/DF Post Fire Table PPDF_PF.sp-23	Davis Fire Acres as a % of Five Buttes[1]					
	Pygmy Nuthatch	No Data				
	White-headed woodpecker	≥ 10 Inches dbh	0-18.5	0-29%	5	857
			18.6-51.9	30-49%	8	1183
			52-98.6	50-79%		
			≥ 98.7	≥ 80%		
		≥ 20 Inches dbh	No Data			
	Lewis's Woodpecker	≥ 10 Inches dbh	0-24.3	0-29%	6	918
			24.4-39.5	30-49%	3	510
			39.6-62.8	50-79%	4	612
			≥ 62.9	≥ 80%		
		≥ 20 Inches dbh	0	0-29%	1	163
			0.1-6.1	30-49%	10	1591
			6.2-16	50-79%	1	184
			≥ 16.1	≥ 80%	1	100

[1] New species information from DecAID 2.0 was used. Davis Fire Recovery Project EIS numbers may not match.

Ponderosa Pine Habitats Down Wood

Across the landscape, down wood density in this habitat type is outside of the reference range of conditions due to the in-growth of shade tolerant trees and the uncharacteristic intensity of Davis Fire. Throughout the analysis area, existing down wood levels range from 0 to 7 percent down wood cover (0 to 38 tons per acre) of down wood ≥5 inch dbh. In order to achieve a sustainable condition, fuel loadings in the Davis Fire were manipulated through salvage and small diameter disposal resulting in 15-28 tons per acre. This equates to 3 to 5 percent cover. No down wood that existed prior to the fire was removed.

Figure 3-22 displays 19 percent of the area has densities of down wood ≥5 inches dbh between 4-8% down wood cover. This is higher than the reference of 3-4 percent.

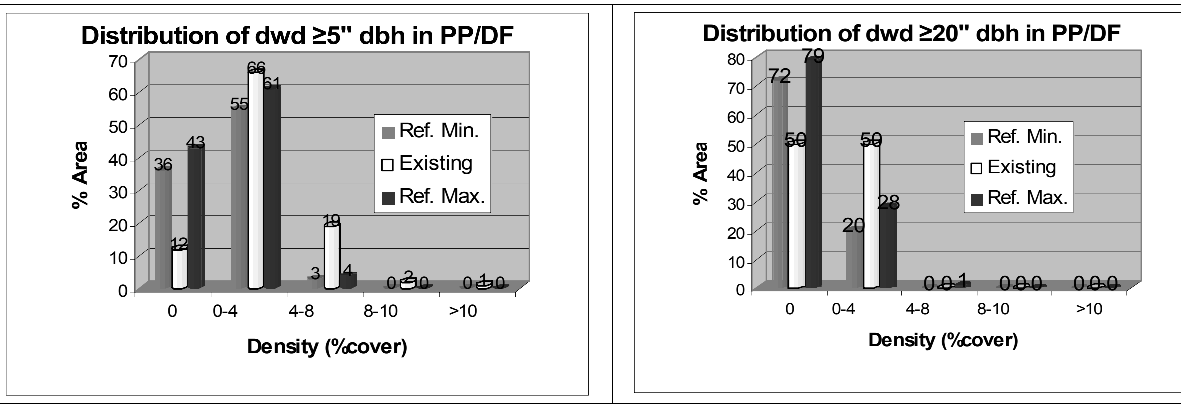


Figure 3-22. Distribution of down woody debris (DWD) percent cover across ponderosa pine habitats in the Five Buttes project area.

Information from DecAID tables ("no active management" plots for down wood ≥5" (12.5cm) dbh) PP/DF_O.Inv-16, PP/DF_S.Inv-16, PP/DF_L.Inv-16, or ("no active management" plots for down wood ≥20" (50cm) dbh) PP/DF_O.Inv-17, PP/DF_S.Inv-17, PP/DF_L.Inv-17, and modified with HRV information from Odell Pilot WA. Existing condition is from modeling and weighted averages of down wood surveys.

East-side Mixed Conifer Habitats –Northern Flying Squirrel, Southern Red-backed Vole, Bushy-tailed Woodrat, Williamson Sapsucker, Pileated Woodpecker,

There was approximately 61,800 acres of mixed conifer habitat across the project area. This habitat type varies greatly across the planning area from drier, less productive sites that tend toward ponderosa pine-dominated stands, to wetter more productive sites with multiple fir species present in higher densities. Figure 3-23 displays the varying densities of snags across the landscape in EMC habitat. Snag densities are at the lower end of the reference condition for the ≥20 inch diameter size class. This is likely due to the abundance of mid-seral stage, where trees have not reached the size and decadence of an older stand.

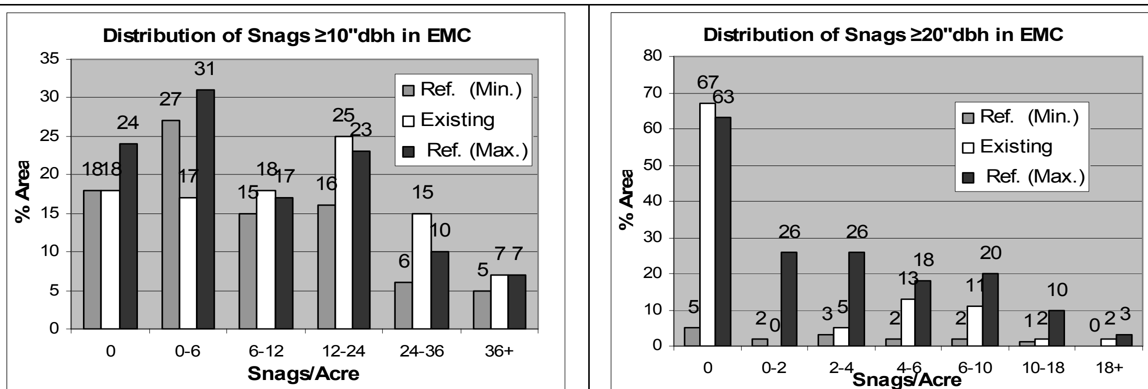


Figure 3-23. Distribution of snag densities across mixed conifer habitats in the Five Buttes project area.

Information from DecAID Tables EMC_ECB_O.Inv-14, EMC_ECB_S.Inv-14, EMC_ECB_L.Inv-14, ("no active management" plots for snags ≥10" dbh), or EMC_ECB_O.Inv-15, EMC_ECB_S.Inv-15, EMC_ECB_L.Inv-15, ("no active management" plots for snags ≥20" dbh) than modified with HRV information from the Odell Pilot WA. Existing information is from stand exams.

Approximately 52,500 acres of mixed conifer within the planning area provides habitat for the northern flying squirrel. They utilize large diameter (18-33"diameter) snags or mistletoe brooms (Buchanan et al

1995, Carey et al 1997, Lehmkuhl et al 2006) for denning or resting. There are no specific snag densities recommended for this species as they also take advantage of live trees with advance decay that have cavities produced by woodpeckers, or large mistletoe brooms. The major food sources for the northern flying squirrel consists largely of fungi, and lichens, as well as nuts, buds, catkins, fruits, insects, and tree sap. Lehmkuhl et al (2006) found higher densities of flying squirrels in mixed conifer forests. Lower densities were found in young mixed conifer ponderosa pine forests. Canopy cover was the best correlate to squirrel density with 55 percent canopy cover an apparent threshold between stands with high density and low density populations, regardless of habitat type. Assuming similar conditions occur in the planning area as in the Lehmkuhl et al study area, the planning area has approximately 26,600 acres with canopy cover of 55 percent or greater. These areas would provide for high density northern flying squirrel populations. Flying squirrels would not be found within the Davis Fire area where 100 percent mortality area occurred, regardless of whether there has been active management, or not.

Both, the Williamson sapsucker and pileated woodpeckers, have been found in the project area as well as in the unburned or lightly burned areas of the Davis Fire. They have not been found in fire areas where the fire caused 100 percent mortality. Williamson sapsuckers, a summer resident, prefer large decadent snags in mixed conifer or ponderosa pine forest. They feed mostly on sap from “wells” they drill in ponderosa pine or Douglas-fir trees, phloem fibers, cambium, and insects. They are not strong cavity excavators and select soft decayed wood in about any tree species for nesting (Marshall et al 2003). They favor larger trees, generally averaging 27 inches in diameter. Pileated woodpeckers share similar habitats of denser mixed conifer forests. They are rarely found in pure ponderosa pine forests. The largest woodpecker in the U.S., it uses large snags for nesting, generally averaging 27-33 inches in diameter. A major food source of the pileated woodpecker includes carpenter ants found in decaying snags and down logs (Aubry and Raley 2002b).

Both species use similar densities of snags. At the 80 percent tolerance level, 49 snags per acre 10 inch in diameter and greater or 18 snags per acre with snags 20 inch in diameter or greater. Table 3-57 displays the amount of habitat type that provides sufficient snag densities at the various tolerance levels. These snag densities would provide for these species at all tolerance levels. Approximately 47 percent of the project area provides habitat at tolerance levels greater than 30 percent for both the pileated woodpecker and the Williamson sapsucker. Snag densities in this habitat type also provide for cavity nesting birds above the 50 percent tolerance level on over 20,000 acres as well as 12,800 acres of post-fire snag habitat.

Table 3-57. Tolerance levels for pileated woodpecker, Williamson's sapsucker and others in the EMC habitat type and existing habitat by tolerance interval.

Habitat type and Table used from DecAID	Species	Snags	Snags/Acre	Tolerance Interval	Existing 61,800 acres	
					Percent	Acres
EMC Table EMC_S/L.sp-22	Pileated Woodpecker	≥ 10 Inches dbh	0-14.8	0-29%	53	32,754
			14.9-30	30-49%	25	15,450
			30.1-49.2	50-79%	22	13,596
			≥ 49.3	≥ 80%		
		≥ 20 Inches dbh	0-3.4	0-29%	67	46,968
			3.5-7.7	30-49%	18	11,124
			7.8-18.3	50-79%	13	8,034
			≥18.4	≥ 80%	2	1,236
	Williamson Sapsucker	≥ 10 Inches dbh	0-13.9	0-29%	53	32,754
			14-28.3	30-49%	25	15,450
			28.4-49.6	50-79%	22	13,596
			≥ 49.6	≥ 80%		
		≥ 20 Inches dbh	0-3.2	0-29%	67	41,406
			3.3-8.5	30-49%	29	17,922
			8.6-16.5	50-79%	2	1,236
			≥ 16.6	≥ 80%	2	1236
	Cavity Nesting Birds	≥ 10 Inches dbh	No Data			
		≥ 20 Inches dbh	0-2.3	0-50%	67	41,406
			≥2.4	≥ 50%	33	20,394
EMC Post Fire Table EMC_PF.sp-23	Davis Fire Acres as a % of Five Buttes					
	Pileated Woodpecker	No Data				
	Williamson Sapsucker	No Data				
	Cavity Nesting Birds	≥ 10 Inches dbh	No Data			
		≥ 20 Inches dbh	0-8.3	0-50%	3	1,749
			≥8.4	≥ 50%	21	12,825

Eastside Mixed Conifer Habitats Down Wood

Existing down wood levels range from 0 to 8 percent cover (0 to 44 tons per acre) outside of the Davis Fire area. Within the fire area, post-fire fuels inventories for mixed conifer range from 7 to 16 tons per acre of fuels greater than 3 inches. This is roughly equivalent to 1-3 percent down wood cover. As within the ponderosa habitats, fuel loadings in the Davis Fire in the EMC habitats were manipulated through salvage and small diameter disposal resulting in 15-28 tons per acre. This equates to 3 to 5 percent cover. No down wood existing prior the fire was removed.

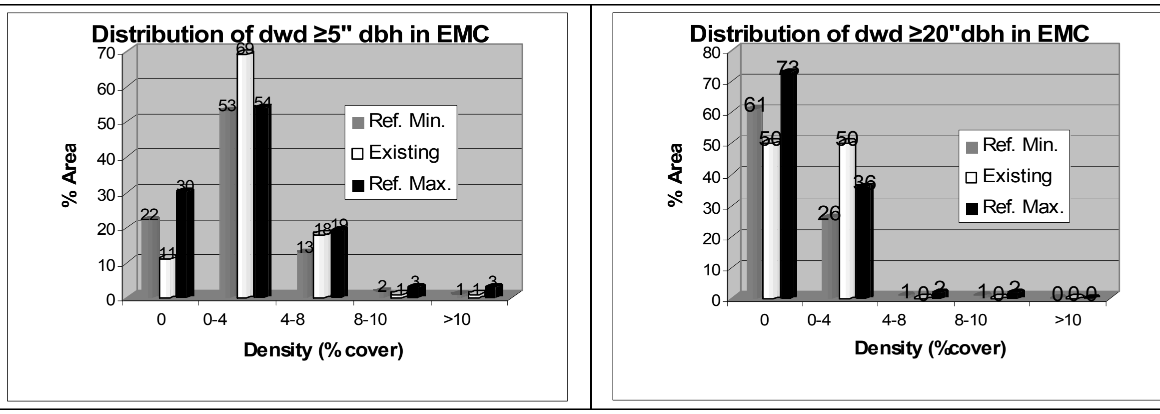


Figure 3-24. Distribution of Down Woody Debris (DWD) Percent Cover Across Eastside Mixed Conifer Habitats Within the Planning Area.

Information from DecAID tables ("no active management" plots for down wood ≥5" (12.5cm) dbh) EMC_ECB_S.Inv-16, EMC_ECB_L.Inv-16, or ("no active management" plots for down wood ≥20" (50cm) dbh) EMC_ECB_O.Inv-17, EMC_ECB_S.Inv-17, EMC_ECB_L.Inv-17 and modified with HRV information from Odell Pilot WA. Existing condition from weighted averages of down wood surveys and modeling.

Bushy-tailed woodrats are generally associated with rock outcrops. Lehmkuhl et al. (2006), in a study of woodrats east of the Cascade range in Washington state, found woodrats could be abundant where snags, logs and mistletoe brooms provide cover. Habitat occurs in patches across the planning area in lava flows and pressure ridges, and pockets of high densities of snags and down wood.

Southern red-backed voles are associated with large amounts of ground cover in deciduous, coniferous or mixed old-growth forests. They also use second growth areas where there is sufficient cover. They nest under stumps, logs, and roots and use the burrows of other small mammals (NatureServe 2006).

Table 3-58. Down wood tolerance levels for fungi, pileated woodpecker, and southern red-backed voles in the EMC habitat type and existing habitat by tolerance interval.

Table Used in DecAID	Species	Percent DWD Cover	Tolerance Interval	Existing	
				Percent	Acres
EMC_S/L.sp-24. (≥6 in diameter)	FUNGI	0-21	0-49%	100	61,800
		>21	≥50%	0	0
	Pileated Woodpecker	0-3.9	0-29%	42	25,805
		4-4.4	30-49%	20	12,145
		4.5-5	50-79%	7	4,430
		≥5.1	> 80%	31	19,420
MMC_L.sp-24(≥5.5in diameter)	Southern Red-backed Vole	0	0-29%	11	6,800
		0-9.6	30-49%	89	54,380
		9.7-25.9	50-79%	1	620
		≥26	> 80%	0	0

As with snags, down wood densities on 58% of the EMC habitat type provide for pileated woodpeckers, 31 percent at the 80 percent tolerance level and above. Fungus grows in micro habitats afforded by pockets of large concentrations of down wood. Reference conditions from DecAID shows 21 percent down wood cover equates to approximately 88 tons per acre. It is likely this condition exists in the Five Buttes area within these parameters, but the intensity of the sampling did not encounter these levels.

Lodgepole Pine Habitats – Black-backed Woodpecker.
There is approximately 35,500 acres of lodgepole pine habitat across the project area. Figure 3-25 displays the varying densities of snags across the landscape. Unlike the previous habitats, the lodgepole pine habitat is outside or at the low end of reference conditions across the landscape. This is due to a large infestation

of pine beetle in the 1980s, which killed thousands of acres of lodgepole pine, much of which was salvaged.

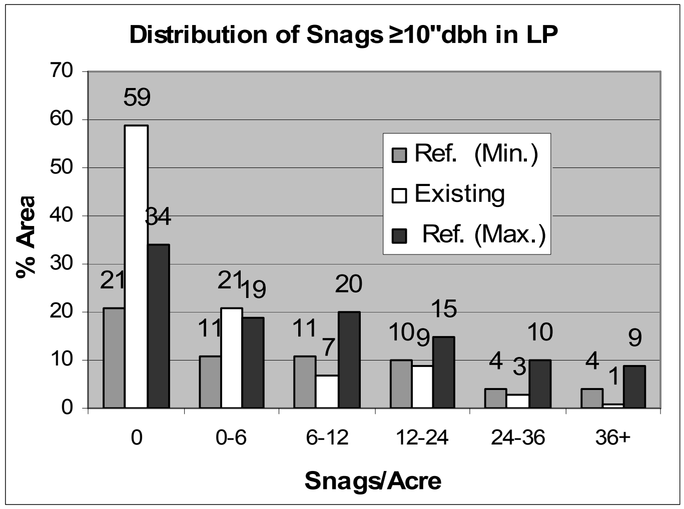


Figure 3-25. Distribution of snag densities across lodgepole pine habitats within the planning area.

Information from DecAID Tables LP_O.Inv-14, LP_S.Inv-14, ("no active management" plots for snags ≥10" dbh), than modified with HRV information from the Odell Pilot WA. Existing information is from transects.

Wisdom (2000) describes source habitats for blacked-backed woodpecker as a year-round resident that occurs in various forest types. Within its range, it is most abundant in recently burned forests. However, it frequently occupies stands of lodgepole pine that has been killed by bark beetles. Marshal et al (2003) reports for this species, the center of abundance of habitat in Oregon, is the lodgepole pine forest east of the Cascade crest between Bend and Klamath Falls. Endemic levels of bark beetles, common in lodgepole pine (10+ inches in diameter and 170 trees per acre), provide a constant food source in small pockets and individual trees scattered across the forest. In a study conducted on the Deschutes National Forest, Goggins (1989) found black-backed woodpeckers in predominately lodgepole pine forest stands below 4500 foot elevation. In the study area, they used stands with a mean diameter of 8 inches for nesting. Mean nest tree diameter was 11 inches. Nests excavated by black-backed woodpeckers were in portions of lodgepole pine trees with heartrot. All of the nests in the study were in lodgepole pine stands and 93% of foraging took place in lodgepole pine forest. Goggins found mountain pine beetles had infested 81 percent of the trees used for foraging. Recent dead trees were used most often (68 percent) for foraging.

Approximately 3,321 acres of recently burned stands in the Davis Fire provide habitat in all habitat types. These include the lodgepole pine in the Davis Lake area, as well as the mixed conifer with lodgepole pine understory stands on the slopes above the lake. There is no habitat within the fire area that meets the 50% tolerance level. Although the stands provide a relatively high density snag habitat, it remains at the 0-49 percent tolerance level because the stands had experienced bark beetles and begun to fall down before the wildfire. The Davis Fire Recovery Project EIS retained these areas in their post-fire condition to continue to provide habitat through the year 2010 (5-7 years post-fire).

The analysis area provides a range of quality of habitat. The density of snags within the lodgepole habitat type varies from 2 per acre to 16 per acre greater than 10 inches in diameter outside the fire to 76 snags per acre within the fire. DecAID does not provide information on snag densities preferred by black-backed woodpeckers in lodgepole pine, although it lists densities for other habitat types. From this, there is an indication that approximately 82% (7,810 acres) of the lodgepole pine habitat provides sufficient snag levels at the 80 percent tolerance level.

Table 3-59. Tolerance levels for the black-backed woodpecker in various habitat types and acres of existing lodgepole habitat at the various tolerance intervals.

Habitat type and Table used from DecAID[1]	Species	Snags	Snags/Acre	Tolerance Interval	Existing LP habitat 35,500 acres	
					Percent	Acres
Table EMC_S/L.sp-22, PPDF_S/L. sp-22	Black-backed Woodpecker	≥ 10 Inches dbh	0-2.4	0-29%	18	6,390
			2.5-13.5	30-49%	35	12,425
			13.6-29.1	50-79%	25	8,875
			≥ 29.2	≥ 80%	22	7,810
Post Fire	Davis Fire Acres as a % of Five Buttes					
Table MMC_PF.sp-23. snag size: ≥3"[2]	Black-backed Woodpecker	≥ 10 Inches dbh	0-41.5	0-29%	8	2,889
			41.6-78.8	30-49%	1	432
			78.9-133.9	50-79%	0	0
			≥134	≥ 80%	0	0

[1]These tables are only used for the Tolerance Intervals
[2]Tolerance levels include snags down to 3" in diameter; existing condition only included snags down to 6" in diameter.

Down Wood

Surveys across this habitat type found high densities of down wood (Figure 3-26). Inside the Davis Fire, fuels inventories for lodgepole pine range from 2 to 6 percent cover (6.21 to 19.32 tons per acre) of fuels greater than 3 inches in diameter. Outside of the Davis Fire, transects determined densities ranging from 1 to 11 percent cover (3-36 tons per acre) of fuels greater than 6 inches in diameter.

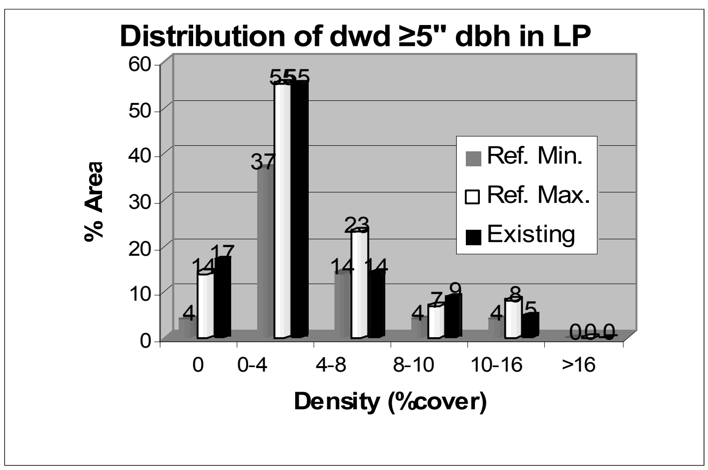


Figure 3-26. Distribution of down wood percent cover across lodgepole pine habitats within the Five Buttes project area.

Information from DecAID tables ("no active management" plots for down wood ≥5" (12.5cm) dbh) LP_S.Inv-16, LP_O.Inv-16, and modified with HRV information from Odell Pilot WA. Existing condition from weighted averages of down wood surveys and modeling.

A total of 9,940 acres has sufficient down wood to provide for black backed woodpeckers as displayed in the following table. Down wood distribution reflects the mortality caused by bark beetles in the 1980s, with the higher densities in the larger diameters of trees across portions of the landscape where no active management (i.e. salvage) occurred. Tables 3-59 and 3-60 reflect the down wood levels provided for black-backed woodpecker. Where snag levels are below the 50% tolerance interval, down wood levels on 1,775 acres meet or exceed the 50% tolerance interval.

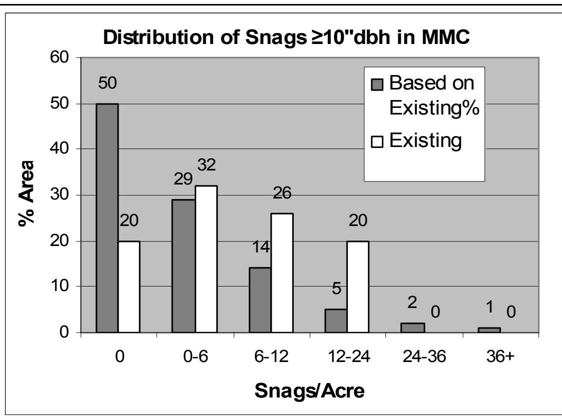
Table 3-60. Down wood tolerance levels for black-backed woodpecker in lodgepole habitat type and amount of habitat by tolerance interval.

Table Used in DecAID	Species	Percent DWD Cover	Tolerance Interval	Existing 35,500	
				Percent	Acres
Table LP_S/L.sp-24. (≥ 15 cm (6 in) diameter)	Black-backed Woodpecker	0-4.6	0-29%	72	25,560
		4.7-12.9	30-49%	23	8,165
		13-25	50-79%	5	1,775
		≥25	≥ 80%	0	0

Montane and Complex habitats – Flammulated owl, American marten, Northern flicker, Three-toed woodpecker, Hairy woodpecker.

There is approximately 32,600 acres of Montane mixed conifer habitat across the planning area and varies greatly. Located relatively high up the slopes (generally above 6000 feet in elevation), the vegetation transitions to mountain hemlock, western white pine, and lodgepole pine-dominated overstories. Sub-alpine fir may also be present in some areas, especially near timberline. There is no HRV for this habitat type because of the length of the disturbance cycle. Most of these areas are dominated by mountain hemlock, usually of similar age, since these areas may experience several centuries before a large scale stand replacement fire.

This habitat type has had very little timber harvest. Since it has no HRV, the existing percent of the landscape was used to weight the DecAID information. Existing information derived from plot data was compared to what would be expected given information from DecAID. Figure 3-27 displays the varying densities of snags across the landscape. Although there are differences shown compared with DecAID, it is assumed that since there has been little management within this habitat type and it is within HRV. The data shows that (for most circumstances) existing snag densities ≥10 inch dbh exceed what would be expected, while densities of snags ≥ 20 inches dbh are lower than what would be expected based on information from DecAID. The sample size for this habitat type was small and may not accurately represent actual snag densities.



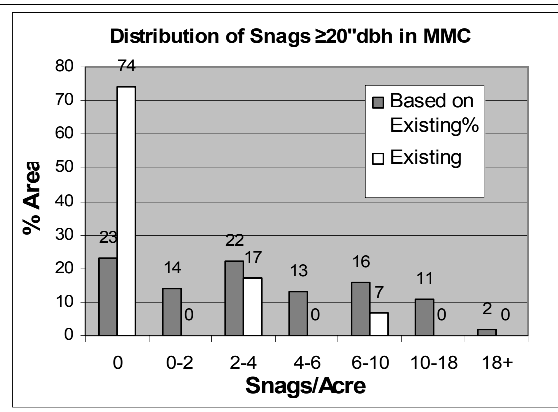


Figure 3-27. Distribution of Snag Densities Across Mixed Conifer Habitats within the Planning Area.

Information from DecAID Tables MMC_O.Inv-14, MMC_S.Inv-14, MMC_L.Inv-14, ("no active management" plots for snags ≥10" dbh), or MMC_O.Inv-15, MMC_S.Inv-15, MMC_L.Inv-15, ("no active management" plots for snags ≥20" dbh) than modified with HRV information from the Odell Pilot WA. Existing information is from stand exams.

Wisdom (2000) combined the flammulated owl and American marten with the northern goshawk and fisher because they share source habitats. He describes the source habitat as late-seral stages of the montane community group and young forests with sufficient large-diameter snags and logs. Flammulated owls are found in ponderosa pine dominated stands with dispersed dense thickets and grassy openings. They utilize cavities in live or dead trees created by pileated woodpeckers or northern flicker. The average diameter of snags and trees used for nesting were 22 and 28 inches, respectively (Marshall et al 2003).

American marten are found in a variety of habitats with large (20 inches in diameter or larger) diameter trees, snags and logs. They use snags and logs with intermediate levels of decay with greatest use in the larger (30 inches in diameter or larger) size classes when available (Raphael and Jones 1997). Canopy cover plays a greater role in winter where marten select for higher canopy cover during snow periods than snow-free periods. A study conducted in lodgepole pine forest of the Winema National Forest Mountain, south of the project area, estimated 0.2 live trees, 0.3 snags, 0.6 logs and 1.3 slash piles peer hectare (0.08 live, 0.12 snags, 0.24 logs, and 0.52 slash piles per acre) of appropriate size would meet denning and resting needs (Raphael and Jones 1997).

The hairy woodpecker is somewhat of a generalist that uses all types of habitat. They tend to prefer open older forests but are found in thinned younger stands. The hairy woodpecker readily moves into burned areas. The northern flicker is a most unconventional woodpecker. It feeds on ants, beetles and other insects on the ground and nests in open stands of older trees where there are larger snags, 13-22 inches in diameter, with some decay. Three-toed woodpecker habitat is found in predominately mixed conifer forest stands above 4,500 ft elevation and is associated with stands that are susceptible to attacks by bark beetles, generally mature and over-mature with high tree densities (Goggans et al 1989). Nests are excavated in portions of lodgepole pine trees with heartrot.

These species have been found across habitat types within the planning area. The key habitat features for all these species are down logs and snags.

Most of these species occur across the planning area throughout 108,000 acres of multi-story mid, late and old forest. Within the montane mixed conifer, approximately 32,200 acres of multi-storied mid, late and old forest provides habitat at varying levels. Table 3-61 shows 48 percent of the MMC provide snags densities of snags ≥20 inches in diameter above the 50 percent tolerance level. Within the Davis Fire, there was very little MMC that was burned and none provided densities above the 30 percent tolerance level to provide post fire-habitat.

Table 3-61. Tolerance levels for the flammulated owl, American marten, northern flicker, three-toed woodpecker, hairy woodpecker in various habitat types and acres of existing MMC habitat at the various tolerance levels.

Habitat type and Table used from DecAID	Species	Snags	Snags/Acre	Tolerance Interval	Existing 32,600	
					Percent	Acres
Table MMC_S/L.sp-22	American Marten	≥ 10 Inches dbh	0-16.1	0-49%	78	25,428
			≥16.2	≥50%	22	7,172
		≥ 20 Inches dbh	0-4.9	0-49%	52	16,952
			≥5	≥50%	48	15,648
	Post Fire Habitat Davis Fire Acres as a % of Five Buttes					
Table MMC_PF.sp-23. Snag size: ≥ 3"*	Hairy-Woodpecker	≥ 10 Inches dbh	0-31.2	0-29%	1.5	486
			31.3-61.4	30-49%	0	0
			61.5-106	50-79%	0	0
			≥ 106	≥ 80%	0	0
		≥ 20 Inches dbh	No Data			
	Northern Flicker	≥ 10 Inches dbh	0-39.4	0-49%	1.5	486
			39.5-93.2	50-79%	0	0
			≥ 93.3	≥ 80%	0	0
		≥ 20 Inches dbh	No Data			
	Three-toed Woodpecker	≥ 10 Inches dbh	0-44.1	0-29%	1.5	486
			44.2-71.5	30-49%	0	0
			71.5-111.7	50-79%	0	0
			≥ 111.8	≥ 80%	0	0
		≥ 20 Inches dbh	No Data			

*Tolerance levels include snags down to 3” in diameter; existing condition only included snags down to 6” in diameter.

Down Wood
Down wood across this habitat type appears to exceed what would be expected at the lower densities and less at the higher densities (Figure 3-28). The sample size for this habitat type was small and may not accurately represent actual down wood densities. Since there has been little active management in addition to an extended disturbance cycle, it is considered to be within historical conditions.

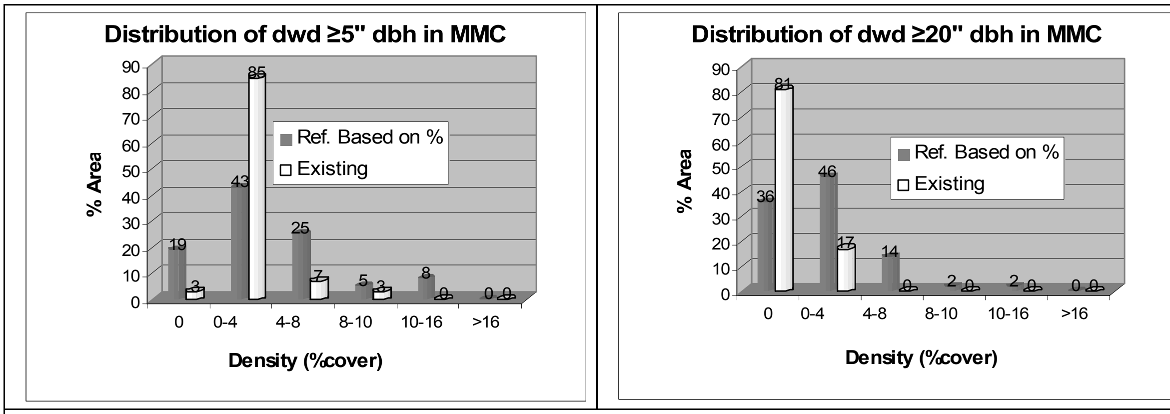


Figure 3-28. Distribution of down wood across Montane Mixed Conifer Habitats within the Five Buttes project area.

Information from DecAID tables ("no active management" plots for down wood ≥5" (12.5cm) dbh) MMC_S.Inv-16, MMC_L.Inv-16, or ("no active management" plots for down wood ≥20" (50cm) dbh) MMC_O.Inv-17, MMC_S.Inv-17, MMC_L.Inv-17 and modified with HRV information from Odell Pilot WA. Existing condition from weighted averages of down wood surveys and modeling.

Down wood habitat for denning (nesting), resting and feeding occurs for American marten and three-toed woodpeckers at various levels across the planning area. For marten, the limited data suggests there is sufficient down wood habitat above the 50 percent tolerance level on at least 1,630 acres within the MMC habitat type, with the remaining below 50 percent. Down wood is probably not limiting for three-toed woodpeckers within the MMC habitat type. Although down wood densities from the limited plots are at the 30-50 percent tolerance interval, the higher down wood densities greater than 16 percent down wood cover is rare on the landscape. Although the sample size did not encounter these high densities, it is likely that three percent of the landscape is in this condition.

Table 3-62. Down wood tolerance levels for American marten and three-toed woodpecker in MMC habitat type and existing habitat by tolerance interval.

Tables Used from DecAID	**Species**	Percent DWD Cover	Tolerance Interval	Existing	
				Percent	Acres
MMC_S.sp-24, MMC_L.sp-24. (> 10 (4"), >15, or >22 cm diameter)*	American Marten	0-8.0	0-49%	95	30,970
		>8.1	≥50%	5	1,630
	Three-toed Woodpecker	0-6.4	0-29%	88	28,688
		6.5-16.9	30-49%	10	3,260
		17-31.9	50-79%	0	0
		≥32	≥ 80%	0	0

*Existing data accounts for down wood ≥6"in diameter.

More than any of the other species discussed in this report, the flammulated owl, American marten, hairy woodpecker, three-toed woodpecker, and northern flicker are generalists and not tied to any one habitat. They take advantage of the mix of habitats found within the planning area.

Environmental Consequences

Snag and down wood modeling and subsequent effects discussions include private land, as well as past and present activities within the analysis area. This was provided in a manner that is most informative to the decision maker and reader. Table 3-63 summarizes acres of proposed treatments by habitat type.

Table 3-63. Treatments by habitat type.

ALT B	Acres of Habitat Treated				
Rx	EMC	LP	PP/DF	MMC	Total
HSL6M	134				134
HSL9M	1532		40	40	1612
HSV		34			34
HTH6C	133		500		633
HTH6M	491				491
HTH6S	210	22	341		573
HTH9M	906			10	916
HTH9Q	516		11		527
HTH9S	241	310	51		602
Total	4163	366	943	50	5522
Fuels Only	No fuels reduction activities outside of harvest units				

ALT C	Acres of Habitat Treated				
Rx	EMC	LP	PP/DF	MMC	Total
HSL6M	37				37
HSL9M	1,067		40	40	1,147
HSV					0
HTH6C	133		500		633
HTH6M	286				286
HTH6S	210	22	341		573
HTH9M	906			10	916
HTH9Q	516		11		527
HTH9S		116			116
Total	3,155	138	892	50	4,235
Fuels Only	2,570	630	330	33	3,563

RX = Silvicultural prescription; **HSL** = Single-tree selection to promote development of large trees with full crowns; **HSV** = Salvage of dead and down wood; **HTH** = Thinning from below; **6 or 9** = Thin to 67% of the upper management zone (UMZ) or 90% of the UMZ (respectively); **M** = multi storied ; **C** = combination of multi-storied and single-storied; **S** = single-story; **Q** = Retain 25% of the unit in a passive management scenario.

Alternative A –No Action

In the no action alternative, natural succession would continue to play a role in snag development. Uncharacteristic disturbance processes, particularly in the EMC and Ponderosa Pine habitat types, are likely to continue at the current rate.

<u>Ponderosa Pine Habitats – Lewis' Woodpecker, White-Headed Woodpecker, Pygmy Nuthatch</u>

In the no action alternative, opportunities to develop additional open large ponderosa pine habitat, which is important for these species, would be foregone during this planning cycle. High densities of trees and shrubs in the understories would continue to alter what once provided open habitats during a more characteristic disturbance regime. White-headed woodpeckers prefer to nest lower on large diameter trees and favor open conditions to be able to escape predators and defend their young. Local populations of white-headed woodpeckers would not likely increase and there is potential to eliminate them from portions of the analysis area that currently provide habitat. Lewis' woodpecker and pygmy nuthatch are not as affected by dense conditions.

<u>Mixed Conifer Habitat Northern Flying Squirrel, Southern Red-backed Vole, Bushy-tailed Woodrat, Williamson Sapsucker, Pileated Woodpecker</u>

Existing habitat for these species would not be altered in the short-term, and would not have as profound effect as for those species that prefer open habitats and large trees. These species depend upon dense canopies and down wood. Stands that have been actively managed in the early 1990s (approximately 7,900 acres) under the Seven Buttes and Seven Buttes Return decisions were thinned to a level of canopy cover that is returning to a dense condition. This alternative also has the highest potential to increase snag densities in the area for the short-term. However, in the long term, as evidenced by the Davis Fire, the risk of uncharacteristic disturbance remains at an elevated level, potentially creating a gap in snag habitat over large areas of the landscape for at least 100 years.

<u>Lodgepole Pine Habitats – Black-backed Woodpecker</u>

These are the types of habitat that are the most subject to rapid change, particularly on the Deschutes National Forest. As evidenced by the 2003 Davis Fire, the fire originated in dense lodgepole pine stands around Davis Lake, providing a conduit to burn upslope in other plant association groups in an uncharacteristic manner. Currently, these burned areas provide habitat for black-backed woodpeckers for 5-7 years. They increase in population (initially) with the influx of bark beetles, and then decline as insect populations diminish (Sallabanks et al, 2001 and Saab and Dudley, 1998). The Davis Fire of 2003 would continue to provide varying quality of habitat for the black-backed woodpecker over 15,500 acres of the fire area, through approximately 2010. The pioneering nature and subsequent development of lodgepole pine to a size and density where it would again host bark beetle populations would be expected in 60-100 years. Currently, outside the burn area, there is at least 1,000 acres of dense lodgepole pine stands with the size and density necessary to provide forage base and maintain black-backed woodpecker presence. However, due to the current condition and strategic nature of where these stands are located on the landscape, they are at an elevated risk to another event, although characteristic for this plant association group. The Davis LSRA calls for maintaining this habitat by rotating it around the landscape through time.

Montane and Complex habitats – Flammulated owl, American marten, Northern flicker, Three-toed woodpecker, Hairy woodpecker.
These species prefer higher elevation and complex/large structured forests. This habitat type tends to have a longer fire interval before a stand replacement event. It is assumed these habitats are currently within historical parameters and are providing for these species, although at somewhat of an elevated risk from a disturbance event as a result of the condition of adjacent habitat types.

Effects Common to all Action Alternatives
Project design criteria listed in Chapter 2 are the basis for the following discussion. These criteria have been utilized numerous times in the past on the Deschutes National Forest and it is reasonable to assume they would be implemented.

All snags and down wood greater than 9 inches in diameter would remain in actively managed areas. Live trees damaged during harvest would not be felled unless they pose a hazard. Cull material would remain in the unit and would not be taken to the landings.

Incidental felling of hazard trees for occupational safety within activity units and along designated haul roads would occur. Monitoring by timber sale administrators has shown approximately 1% of the hazard trees within activity units are dropped and retained on site (Linda Fitzer, personal com., 2006). Loss of hard snags along designated haul routes has not been monitored; however, professional judgment estimates these numbers to be relatively small and within levels that are routinely felled for public safety along Highway Safety Act roads. Generally, major roads that are frequently traveled by forest visitors are periodically surveyed for hazard trees and felling of those trees occurs on a sporadic basis. Hazard trees off major roads that are used primarily by industrial users are felled only during operation of the sale and on very specific designated haul routes. In general, hazard trees felled along roads are retained on site for down wood. The recent exception to this was the salvage of hazard trees along major routes within the Davis Fire area due to the high number of snags created by the fire.

Of those species in the habitat types listed above, disturbance is expected to be localized to activity units, if the actions take place during the nesting/denning season. Effects of disturbance could include nest abandonment, failure and/or destruction of nest. There potentially could be up to three seasons affected. The first would be during commercial harvest, another season for post-sale activities such as small diameter thinning, and the third for prescribed underburning. These activities would not take place in all activity units at once, and generally do not occur in the same location for consecutive years. Burning of piles is generally completed in the fall, outside of the denning/nesting season.

Activities and Snag Recruitment

For all activities, snag recruitment over time and across the landscape is similar compared to Alternative A, no action (Figures 3-29 and 3-30). Changes in snag densities over time are very similar.

Active management increases forest health which decreases potential agents that cause mortality in stands, however, from a landscape level, it is not a considerable difference among alternatives (Forested Vegetation section). A greater number of high risk areas remain on the landscape. Within the activity units, endemic levels of disturbance processes would continue to occur, and would recruit snags at a rate of

1 snag/acre over approximately 2,380 acres per year. Modeling is based on an average of the last 10 years of Forest Protection Aerial Survey Data.

Activities are designed to reduce risk by removing dead wood in the 9 inch size class and less. Although some species use this material, the trade-off potentially yields greater benefits. In the event of a wildfire event, a reduction in fire intensity would likely keep wood in the larger diameter size classes on the landscape longer.

Snags 9-14 inches in diameter and down wood 9-11 inches in diameter at the large end within PP/DF habitats would be at risk of reduction, charring or loss through prescribed underburning. Prescriptions call for fuel moistures such that snags greater than or equal to 15-19 inches in diameter and down wood greater than or equal to 12-16 inches in diameter at the large end would be not be reduced or have limited charring during fuel reduction activities. Snags greater than or equal to 20 inches in diameter and down wood greater than or equal to 16 inches in diameter at the large end, in advance stage of decay or with the presence of ants would be protected. Similarly, grapple and hand piling activities would not include material greater than 11 inches at the large end. Additional protection and/or creation of snags may be necessary where dead wood densities or diameters are below design elements as determined through post-harvest surveys. In these circumstances, it is likely these elements were not present prior to active management.

Occasionally, fuels reduction activities are outside prescriptive parameters and some down wood is lost. This is a result of weather changes during a burn or when small test fires are ignited to gauge fuel conditions. When this circumstance occurs, burning is suspended until conditions are favorable. This happens on average, less than one percent of the total burn acreage on the district (Boucher, 2006, personal communication). In areas where this happens, there is a trade off with additional snags falling down and new ones being created. There is generally an increase in deadwood for the short term with a corresponding reduction in live tree density, which affects snag recruitment over the long-term.

There would be no prescribed underburning in EMC, LP or MMC habitat types. The exception would be units in EMC habitat that are managed for more open habitats dominated by ponderosa and/or sugar pine, which may be maintained over time with prescriptive underburning.

Bull et al (2005) studied the short-term effects on pileated woodpeckers from two different fuel reduction activities in the EMC habitat type - mechanical (only) and broadcast burning after mechanical reduction. They found that fuels reduction activities following mechanical treatments reduced snags, down wood and stumps significantly more than mechanical treatments alone. The presence of charring on logs influenced the presence of ants, affecting forage base of the pileated woodpecker. They also found that prescribed burning did not allow the degree of control in retaining coarse woody debris as in mechanical treatment. In the study area, nest trees of pileated woodpeckers and great gray owls were burned. The degree of loss found on this study is unlikely because Project Design Measures were developed to respond to these findings and minimum fuel moistures used on the Crescent Ranger District are higher than used in the study. In the size classes described earlier in this section, protection would be afforded to the appropriate size classes by scratching a line of bare mineral soil around logs and snags, as well as pulling flammable fuels away from the base. This technique especially protects snags and down logs in advance stages of decay, which maintains squirrel and ant habitats – which are important prey for some species. Past performance implementing these measures has proven successful.

Figure 3-29 displays an increase in snag densities on a landscape level through time. There is very little difference between alternatives. The greatest reduction in snag density occurs within the Davis fire area, where most snags would fall within the first few decades. Few remain after 80 years. Individual trees and small pockets of mortality continue to occur across the landscape.

Figure 3-30 shows similar results for down wood. There is very little difference between the alternatives. Down wood accumulates over time. Small diameter trees (greater than 9 inches in diameter) would not accumulate in stands maintained by prescribed fire. Project Design Criteria designed to protect larger size classes contributes to an increase in the average diameter of down wood over time.

In both action alternatives, activities produce a mosaic of conditions. There would be lower numbers of snags developing in stands maintained with a fire regime. Diversity of live tree and snag densities are maintained through prescriptions for variable densities. Diversity is also maintained with Project Design Elements, areas where no active management occurs within activity units (15 percent), and in stands that remain at high risk to a disturbance process. The short-term reduction of habitat for some species at the stand level is offset by a much greater benefit from a reduction of risk for a large scale disturbance (Lehmkuhl 2004, Rapp 2005, Lehmkuhl et al 2006, Thompson 2006).

Ponderosa Pine Habitats – Lewis' Woodpecker, White-Headed Woodpecker, Pygmy Nuthatch
For Alternative B, habitat would be developed into more favorable open stands on 551 acres. This would occur in ponderosa pine and mixed conifer plant associations (dominated by ponderosa pine and/or sugar pine), primarily near the south side of Hamner Butte. The prescription for these stands (6S) would thin from below, favoring a single-storied stand of the largest trees.

Habitat for the Lewis's woodpecker would be increasing in the Davis Fire area as salvage and falling snags reduce densities to more favorable conditions. In the fire area over the next 10-15 years, habitat suitability for the white-headed woodpecker and pygmy nuthatch would diminish. This is due to an increase in understory vegetation through conifer reforestation and herbaceous growth.

For Alternative C, effects would be similar as disclosed for Alternative B. An additional 330 acres of habitat would be developed and maintained through fuel reduction activities, which includes small diameter thinning of trees 6 inches or less and implementation of a more appropriate fire regime to maintain open conditions.

Table 3-64 displays results of modeling activities in PP/DF habitat type at the landscape level. There is very little difference between alternatives in available habitat for the pygmy nuthatch or the white-headed woodpecker. As snag densities increase over time, there would be less ponderosa pine habitat at the lower tolerance intervals and more at the higher tolerance levels. For example, post-harvest snag levels greater than or equal to 20 inches in diameter at the 80 percent and greater tolerance interval occurs on 2 percent of the PP/DF habitat types in all alternatives for both species. Fifty years post-harvest, the amount of habitat with same snag density (and tolerance interval) has increased to 24-27% of the PP/DF habitat type.

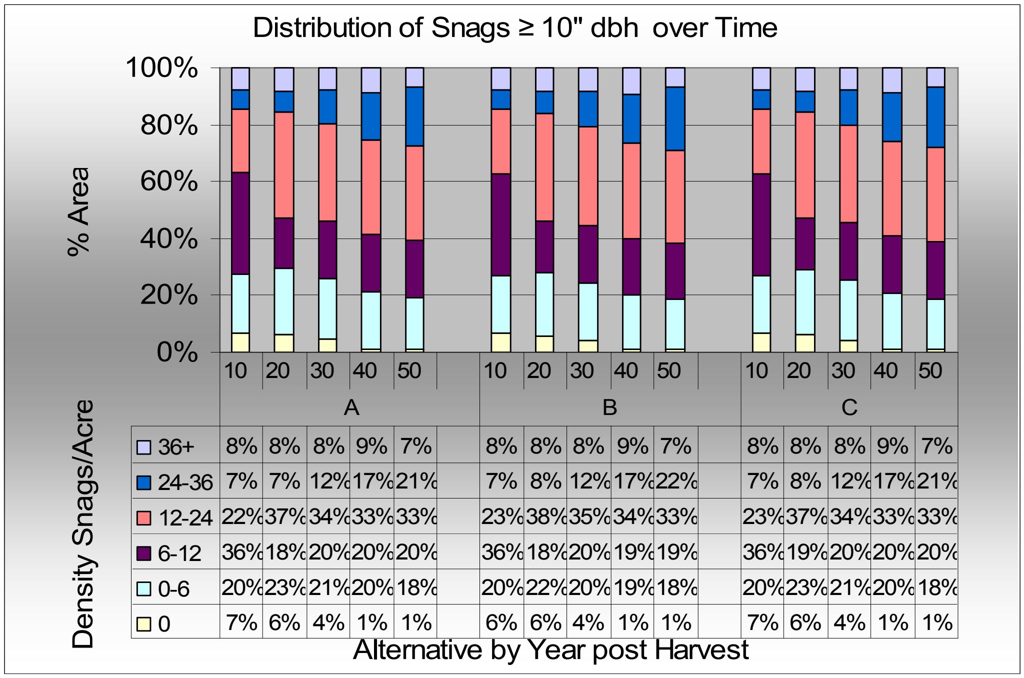


Figure 3-29. Snag density changes across all combined habitat types over time.

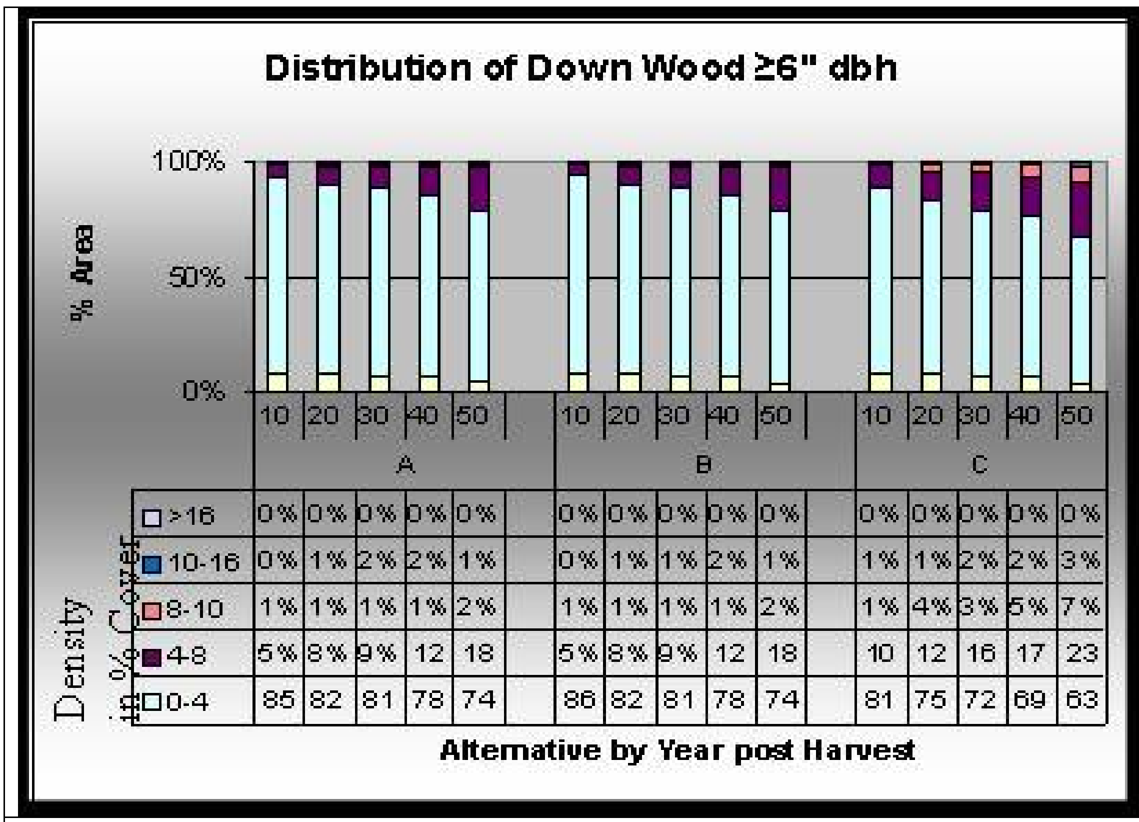


Figure 3-30. Down wood density changes across all combined habitat types over time.

Table 3-64. Changes in distribution of snags over time in PP/DF habitat by tolerance intervals for pygmy nuthatch and whiteheaded woodpecker.

Habitat type and Table used from DecAID	Species	Alternative	Snags	Snags/Acre	Tolerance Interval	% of Area					
						Post Harvest	10 Years	20 Years	30 Years	40 Years	50 Years
PP/DF Table PPDF_S/L.sp-22	Pygmy Nuthatch	A	≥ 10 Inches dbh	0-1	0-29%	10%	9%	8%	5%	4%	2%
				1.1-5.5	30-49%	24%	20%	17%	20%	16%	17%
				5.6-12.0	50-79%	52%	57%	33%	31%	28%	29%
				≥ 12.1	≥ 80%	15%	14%	42%	44%	52%	53%
			≥ 20 Inches dbh	0%	0-29%	17%	13%	12%	12%	11%	11%
				0.1-1.5	30-49%	49%	52%	51%	42%	38%	36%
				1.6-3.9	50-79%	32%	32%	15%	25%	28%	29%
				≥ 4	≥ 80%	2%	3%	22%	21%	22%	24%
		B	≥ 10 Inches dbh	0-1	0-29%	9%	8%	6%	4%	4%	1%
				1.1-5.5	30-49%	25%	22%	16%	17%	15%	17%
				5.6-12.0	50-79%	51%	57%	35%	33%	27%	26%
				≥ 12.1	≥ 80%	15%	14%	43%	46%	53%	55%
			≥ 20 Inches dbh	0	0-29%	17%	13%	12%	11%	11%	9%
				0.1-1.5	30-49%	49%	52%	51%	42%	38%	37%
				1.6-3.9	50-79%	32%	33%	15%	24%	29%	30%
				≥ 4	≥ 80%	2%	3%	22%	22%	23%	24%
		C	≥ 10 Inches dbh	0-1	0-29%	10%	8%	8%	5%	4%	2%
				1.1-5.5	30-49%	24%	21%	17%	20%	16%	17%
				5.6-12.0	50-79%	52%	57%	34%	31%	28%	29%
				≥ 12.1	≥ 80%	15%	14%	41%	44%	52%	53%
			≥ 20 Inches dbh	0	0-29%	17%	13%	12%	12%	11%	11%
				0.1-1.5	30-49%	48%	51%	50%	42%	38%	35%
				1.6-3.9	50-79%	33%	33%	16%	25%	29%	30%
				≥ 4	≥ 80%	2%	3%	22%	21%	23%	24%
	White-headed woodpecker	A	≥ 10 Inches dbh	0-0.2	0-29%	8%	8%	6%	4%	1%	1%
				0.3-1.6	30-49%	4%	4%	2%	2%	5%	3%
				1.7-3.6	50-79%	7%	4%	7%	9%	9%	11%
				≥ 3.7	≥ 80%	81%	85%	84%	85%	85%	85%
			≥ 20 Inches dbh	0-0.4	0-29%	33%	23%	22%	22%	21%	20%
				0.5-1.7	30-49%	38%	46%	42%	41%	34%	31%
				1.8-3.7	50-79%	27%	28%	14%	15%	21%	22%
				≥ 3.8	≥ 80%	2%	3%	22%	22%	24%	26%
		B	≥ 10 Inches dbh	0-0.2	0-29%	8%	6%	4%	3%	1%	0%
				0.3-1.6	30-49%	5%	4%	3%	2%	5%	3%
				1.7-3.6	50-79%	7%	6%	7%	9%	10%	12%
				≥ 3.7	≥ 80%	81%	84%	86%	86%	85%	85%
			≥ 20 Inches dbh	0-0.4	0-29%	33%	24%	23%	22%	22%	19%
				0.5-1.7	30-49%	37%	44%	41%	40%	33%	31%
				1.8-3.7	50-79%	27%	29%	14%	16%	22%	23%
				≥ 3.8	≥ 80%	2%	4%	22%	22%	24%	27%
		C	≥ 10 Inches dbh	0-0.2	0-29%	8%	7%	6%	4%	1%	1%
				0.3-1.6	30-49%	5%	3%	2%	2%	5%	3%
				1.7-3.6	50-79%	7%	5%	7%	9%	9%	11%
				≥ 3.7	≥ 80%	81%	85%	84%	85%	85%	85%
			≥ 20 Inches dbh	0-0.4	0-29%	33%	24%	23%	22%	21%	21%
				0.5-1.7	30-49%	37%	44%	41%	39%	33%	30%
				1.8-3.7	50-79%	27%	28%	15%	16%	21%	22%
				≥ 3.8	≥ 80%	2%	4%	22%	22%	24%	27%

Down Wood

For Alternative B, fuel reduction activities would occur on 943 acres of commercial harvest in the PP/DF habitat. Medium logs (greater than or equal to 15 inches in diameter) are maintained in place and Project Design Criteria minimize the loss of large logs greater than or equal to 20 inches in diameter.

For Alternative C, in addition to fuels reduction activities on 892 acres of commercial harvest, an additional 330 acres of fuels reduction activities (only) would occur. The target for fuels reduction would be those less than or equal to 6 inches in diameter and would not affect existing larger material.

Manipulation of down wood would have no effect on the Lewis's woodpecker, white-headed woodpecker or the pygmy nuthatch. These species forage on seeds, insects found on boles, branches and leaves and rarely utilize down wood.

Mixed Conifer Habitat Northern Flying Squirrel, Southern Red-backed Vole, Bushy-tailed Woodrat, Williamson Sapsucker, Pileated Woodpecker

Alternative B would commercially thin 4,163 acres within this habitat type. Habitat capability would remain on all but 343 acres, where the prescription (HTH6C, HTH6S) calls for more single-story and open conditions in ponderosa pine-dominated habitat. In this circumstance, the canopy cover may be reduced below species needs. A reduction of canopy cover below 55 percent would result in a corresponding reduction of habitat for pileated woodpecker, and lower densities of flying squirrels (Lehmkuhl et al. 2006). Reduction of canopy cover would not necessarily affect the other species, as there would be no removal of large snags or down wood outside of the small amount felled for occupational safety. Remaining stands would be allowed to become dense and develop decadence over time, which would favor flying squirrels and pileated woodpeckers, as well as the spotted owl. Prescribed underburning would occur in the EMC habitat, only in areas managed for ponderosa pine and sugar pine. Otherwise, there would be little reduction of dead wood habitat for the pileated woodpecker through charring that could reduce suitability for ants (Bull et al 2005). Habitat for the bushy-tailed woodrat within activity units would diminish – particularly where dwarf mistletoe is reduced. However, much more suitable habitat remains on the landscape.

Alternative C effects are similar to Alternative B. This alternative proposes to commercially thin 3,155 acres within this habitat type. Habitat capability would remain on all except 343 acres of the (HTH6C, HTH6S) single story and open prescriptive conditions for ponderosa pine-dominated habitat. The 2,570 acres of fuels reduction activities (only) may benefit the flying squirrels by retaining overstory canopy cover and opening up the understory. This increases understory species diversity and density, providing greater foraging diversity (Lehmkuhl et al. 2006). There would not be any prescribed underburning in the EMC habitat, only piling of material and disposal. Effects on woodrats are the same as described for Alternative B.

Table 3-65 shows modeling of the activities overtime in EMC habitat type. The trend is a decrease in habitat at the 80 percent tolerance level over time. The greatest decline is due to snag fall in the Davis Fire. Since the majority of the Davis Fire was in the EMC habitat type, it influences the higher snag densities more than the other habitat types.

Table 3-65. Changes in distribution of snags over time in EMC habitat by tolerance intervals for pileated woodpeckers and Williamson's sapsucker.

Habitat type and Table used from DecAID	Species	Alternative	Snags	Snags/Acre	Tolerance Interval	% of Area					
						Post Harvest	10 Years	20 Years	30 Years	40 Years	50 Years
EMC Table EMC_S/L.sp-22	Pileated Woodpecker	A	≥ 10 Inches dbh	0-14.8	0-29%	63%	62%	54%	50%	48%	49%
				14.9-30	30-49%	19%	20%	34%	39%	41%	36%
				30.1-49.2	50-79%	5%	9%	10%	10%	10%	13%
				≥ 49.3	≥ 80%	14%	8%	2%	1%	1%	2%
			≥ 20 Inches dbh	0-3.4	0-29%	77%	77%	76%	75%	75%	74%
				3.5-7.7	30-49%	9%	12%	16%	19%	20%	23%
				7.8-18.3	50-79%	8%	7%	7%	6%	4%	4%
				≥18.4	≥ 80%	5%	4%	1%	0%	0%	0%
		B	≥ 10 Inches dbh	0-14.8	0-29%	63%	62%	52%	47%	45%	46%
				14.9-30	30-49%	19%	21%	36%	41%	42%	36%
				30.1-49.2	50-79%	4%	9%	10%	11%	11%	15%
				≥ 49.3	≥ 80%	13%	8%	2%	1%	2%	3%
			≥ 20 Inches dbh	0-3.4	0-29%	78%	78%	77%	75%	74%	72%
				3.5-7.7	30-49%	9%	12%	16%	19%	22%	24%
				7.8-18.3	50-79%	7%	7%	7%	5%	4%	4%
				≥18.4	≥ 80%	5%	3%	1%	0%	0%	0%
		C	≥ 10 Inches dbh	0-14.8	0-29%	64%	62%	54%	49%	47%	47%
				14.9-30	30-49%	19%	21%	34%	40%	41%	36%
				30.1-49.2	50-79%	5%	9%	10%	10%	11%	15%
				≥ 49.3	≥ 80%	13%	8%	2%	1%	1%	2%
			≥ 20 Inches dbh	0-3.4	0-29%	78%	78%	77%	76%	74%	72%
				3.5-7.7	30-49%	9%	12%	16%	19%	21%	24%
				7.8-18.3	50-79%	8%	7%	7%	5%	4%	4%
				≥18.4	≥ 80%	5%	3%	1%	0%	0%	0%
	Williamson Sapsucker	A	≥ 10 Inches dbh	0-13.9	0-29%	60%	59%	52%	48%	45%	46%
				14-28.3	30-49%	20%	23%	33%	39%	41%	36%
				28.4-49.6	50-79%	6%	10%	13%	12%	12%	16%
				≥ 49.6	≥ 80%	14%	8%	2%	1%	1%	2%
			≥ 20 Inches dbh	0-3.2	0-29%	77%	76%	75%	73%	73%	69%
				3.3-8.5	30-49%	11%	14%	18%	23%	24%	29%
				8.6-16.5	50-79%	6%	6%	5%	4%	3%	2%
				≥ 16.6	≥ 80%	6%	4%	2%	0%	0%	0%
		B	≥ 10 Inches dbh	0-13.9	0-29%	61%	58%	50%	45%	42%	43%
				14-28.3	30-49%	20%	24%	35%	41%	42%	37%
				28.4-49.6	50-79%	6%	10%	13%	12%	14%	17%
				≥ 49.6	≥ 80%	13%	8%	2%	1%	2%	3%
			≥ 20 Inches dbh	0-3.2	0-29%	78%	77%	75%	73%	72%	67%
				3.3-8.5	30-49%	11%	13%	18%	23%	25%	30%
				8.6-16.5	50-79%	6%	6%	4%	4%	3%	2%
				≥ 16.6	≥ 80%	6%	4%	2%	0%	0%	0%
		C	≥ 10 Inches dbh	0-13.9	0-29%	61%	59%	52%	47%	44%	44%
				14-28.3	30-49%	20%	24%	34%	40%	41%	37%
				28.4-49.6	50-79%	6%	10%	13%	12%	13%	17%
				≥ 49.6	≥ 80%	13%	8%	2%	1%	1%	2%
			≥ 20 Inches dbh	0-3.2	0-29%	78%	77%	76%	73%	72%	68%
				3.3-8.5	30-49%	11%	14%	18%	23%	25%	30%
				8.6-16.5	50-79%	5%	6%	4%	4%	3%	2%
				≥ 16.6	≥ 80%	6%	4%	2%	0%	0%	0%

Down Wood

As in the other habitat types, residual down wood greater or equal to 15 inches in diameter would not change appreciably. A slight increase might result from the felling and retention of cull material (Project Design Criteria). However in Alternative C, 2,570 acres of "fuels only" activities have potential to reduce smaller diameters (6 inches or less). Larger diameter wood providing habitat for voles and food sources for the northern flying squirrel and southern red-backed vole would not be affected.

Down wood density models show a gradual increase over time (Table 3-66). Fifty years post-harvest, down wood densities for pileated woodpecker at the 80 percent tolerance level increases from 6 percent of the mixed conifer to 14 percent. This is true of all alternatives and most likely the result of snag fall in the Davis Fire area.

Table 3-66. Change in down wood densities in EMC habitat by tolerance intervals for pileated woodpeckers over time.

Table Used in DecAID	Species	Alternative	Percent Dwd Cover	Tolerance Interval	% Area				
					10 Years	20 Years	30 Years	40 Years	50 Years
EMC_S/L.sp-24. (=6 in diameter)	Pileated Woodpecker	A	0-3.9	0-29%	83%	76%	72%	69%	60%
			4-4.4	30-49%	7%	10%	11%	10%	19%
			4.5-5	50-79%	3%	4%	5%	8%	7%
			=5.1	≥ 80%	6%	10%	11%	13%	14%
		B	0-3.9	0-29%	84%	77%	73%	69%	58%
			4-4.4	30-49%	7%	9%	11%	11%	21%
			4.5-5	50-79%	3%	4%	6%	8%	7%
			=5.1	≥ 80%	6%	9%	11%	12%	14%
		C	0-3.9	0-29%	84%	77%	73%	70%	59%
			4-4.4	30-49%	7%	9%	11%	10%	20%
			4.5-5	50-79%	3%	4%	6%	8%	7%
			=5.1	≥ 80%	6%	9%	11%	12%	14%

Lodgepole Pine Habitats – Black-backed Woodpecker

Alternative B proposes commercial thinning on 332 acres and approximately 34 acres of salvage within lodgepole pine habitat. The thinning would increase the health of these stands and provide larger diameter nesting habitat in the future, and salvage activities would reduce down wood habitat. Neither activity appreciably changes nesting or foraging habitat for the black-backed woodpecker in the short or long-term (Table 3-67). The Davis LSRA calls for maintaining 1000 acres of dense and old lodgepole pine; rotating it over the landscape through time.

Alternative C proposes commercial thinning on 138 acres with similar effects as described for Alternative B. There is no salvage in lodgepole pine habitats proposed with this Alt. C.

Table 3-67. Changes in distribution of snags over time in lodgepole pine habitats by tolerance intervals for black-backed woodpeckers.

Habitat type and Table used from DecAID	Species	Alternative	Snags	Snags/Acre	Tolerance Interval	% of Area					
						Post Harvest	10 Years	20 Years	30 Years	40 Years	50 Years
Table EMC_S/L.sp-22, PPDF_S/L. sp-22	Black-backed Woodpecker	A	≥ 10 Inches dbh	0-2.4	0-29%	28%	30%	32%	27%	24%	18%
				2.5-13.5	30-49%	57%	58%	54%	56%	58%	58%
				13.6-29.1	50-79%	11%	9%	13%	15%	11%	15%
				≥ 29.2	≥ 80%	3%	2%	1%	2%	7%	9%
			≥ 20 Inches dbh	0	0-29%	44%	40%	38%	37%	39%	37%
				0-1.3	30-49%	45%	49%	45%	41%	38%	38%
				1.4-5.6	50-79%	9%	10%	16%	21%	20%	21%
				≥5.7	≥ 80%	2%	2%	1%	1%	4%	4%
		B	≥ 10 Inches dbh	0-2.4	0-29%	28%	29%	31%	27%	24%	18%
				2.5-13.5	30-49%	58%	59%	54%	56%	57%	57%
				13.6-29.1	50-79%	11%	9%	13%	15%	11%	16%
				≥ 29.2	≥ 80%	3%	2%	1%	3%	7%	9%
			≥ 20 Inches dbh	0	0-29%	45%	40%	38%	38%	39%	37%
				0-1.3	30-49%	45%	49%	45%	41%	38%	38%
				1.4-5.6	50-79%	9%	10%	16%	21%	20%	21%
				≥5.7	≥ 80%	2%	2%	1%	1%	4%	4%
		C	≥ 10 Inches dbh	0-2.4	0-29%	28%	30%	32%	27%	24%	18%
				2.5-13.5	30-49%	57%	58%	54%	56%	58%	58%
				13.6-29.1	50-79%	11%	9%	13%	15%	11%	15%
				≥ 29.2	≥ 80%	3%	2%	1%	2%	7%	9%
			≥ 20 Inches dbh	0	0-29%	45%	40%	38%	38%	39%	37%
				0-1.3	30-49%	45%	49%	45%	41%	38%	38%
				1.4-5.6	50-79%	9%	10%	16%	21%	20%	21%
				≥5.7	≥ 80%	2%	2%	1%	1%	4%	4%

Down Wood

Alternative B does not propose any activities that have the potential to affect large and down wood lodgepole pine habitat on a landscape scale. Alternative C proposes 630 acres of small diameter thinning ranging from 3-6 inches in diameter and removal of down logs 9 inches in diameter and less. These activities have potential to lessen future recruitment of downed material within the activity units by creating a more disturbance-prone stand. However, by reducing competition on the remaining trees, this increases the potential overall diameter of future down material (Table 3-68).

Table 3-68. Changes in the distribution of down wood over time in lodgepole pine habitat by tolerance intervals for black-backed woodpeckers.

Table Used in DecAID	Species	Alternative	Percent Dwd Cover	Tolerance Interval	% of Area				
					10 Years	20 Years	30 Years	40 Years	50 Years
Table LP_S/L.sp-24. (> 15 cm (6 in) diameter)	Black-backed Woodpecker	A	0-4.6	0-29%	93%	93%	93%	90%	80%
			4.7-12.9	30-49%	7%	7%	7%	10%	20%
			13-25	50-79%	0%	0%	0%	0%	0%
			=25	≥ 80%	0%	0%	0%	0%	0%
		B	0-4.6	0-29%	93%	93%	93%	90%	80%
			4.7-12.9	30-49%	7%	7%	7%	10%	20%
			13-25	50-79%	0%	0%	0%	0%	0%
			=25	≥ 80%	0%	0%	0%	0%	0%
		C	0-4.6	0-29%	93%	93%	93%	90%	80%
			4.7-12.9	30-49%	7%	7%	7%	10%	20%
			13-25	50-79%	0%	0%	0%	0%	0%
			=25	≥ 80%	0%	0%	0%	0%	0%

<u>Montane and Complex habitats – Flammulated owl, American marten, Northern flicker, Three-toed woodpecker, Hairy woodpecker.</u>

Both Alternatives B and C propose approximately 50 acres of commercial thinning to 90% UMZ with a multi-storied condition. This prescription maintains high densities of trees of various diameters and would not reduce existing snag and down wood levels beyond those felled for occupational safety, nor appreciably affect future snag level as mortality would continue at endemic levels. Habitat capability would be maintained for the flammulated owl, American marten, northern flicker, three-toed woodpecker and the hairy woodpecker (Table 3-69).

Table 3-69. Distribution of snags over time in MMC habitat by tolerance intervals for American marten.

Habitat type and Table used from DecAID	Species	Alternative	Snags	Snags/Acre	Tolerance Interval	% of Area					
						Post Harvest	10 Years	20 Years	30 Years	40 Years	50 Years
Table MMC_S/L.sp-22	American Marten	A	≥ 10 Inches dbh	0-16.1	0-16.1	71%	61%	26%	22%	21%	12%
				=16.2	=16.2	29%	39%	74%	78%	79%	88%
			≥ 20 Inches dbh	0-4.9	0-4.9	91%	92%	90%	85%	70%	69%
				=5	=5	9%	8%	10%	15%	30%	31%
		B	≥ 10 Inches dbh	0-16.1	0-16.1	71%	61%	26%	22%	21%	13%
				=16.2	=16.2	29%	39%	74%	78%	79%	87%
			≥ 20 Inches dbh	0-4.9	0-4.9	91%	92%	90%	86%	70%	69%
				=5	=5	9%	8%	10%	14%	30%	31%
		C	≥ 10 Inches dbh	0-16.1	0-16.1	71%	61%	26%	22%	21%	12%
				=16.2	=16.2	29%	39%	74%	78%	79%	88%
			≥ 20 Inches dbh	0-4.9	0-4.9	91%	92%	90%	85%	70%	69%
				=5	=5	9%	8%	10%	15%	30%	31%

Cumulative Effects

Snag and down wood modeling and subsequent effects discussions include private land, as well as past and present activities within the analysis area. This was provided in a manner that is most informative to the decision maker and reader.

<u>Ponderosa Pine Habitats – Lewis' Woodpecker, White-Headed Woodpecker, Pygmy Nuthatch</u>
Nearly 5,000 acres within the Davis LSR (MSAs F, G, BB), 6,000 acres in matrix and 70,000 acres east of the NWFP provide potential habitat for these species on the Crescent Ranger District. The most relevant past actions that affected these species within the analysis area were the Seven Buttes and Seven Buttes Return projects which returned ponderosa pine to an open single story condition. They developed approximately 4,000 acres of single story ponderosa pine habitat outside of the Davis Fire area (approximately 700 acres from Seven Buttes and 3,300 from Seven Buttes Return).

Foreseeable action in this habitat includes a project proposal to understory thin around large trees outside the Northwest Forest Plan boundary on approximately 6,000 acres. Called BLT, it has the potential to return a portion of the habitat to a single storied condition for ponderosa and sugar pine. It is likely that this project, similar to the Five Buttes project, would not affect snags and down wood appreciably on the landscape. This project remains in an early planning stage; therefore, more precise acres are not available. Also, The Greater La Pine Community Wildland Urban Interface Hazardous Fuel Reduction Project in the La Pine basin is proposing approximately 4,000 acres of similar actions. Therefore, in the foreseeable future, there may be up 10,000 acres more habitat available for these species.

Figure 3-31 includes all past and present activities within the project area to display distribution of snags over time by alternatives in this habitat type. Over time, the project area moves closer to HRV with an exception in the lower snag densities, where the percent of the area with 0 or 0-4 snags per acre is below HRV. This means that currently, there a more snags than likely were present under HRV ranges.

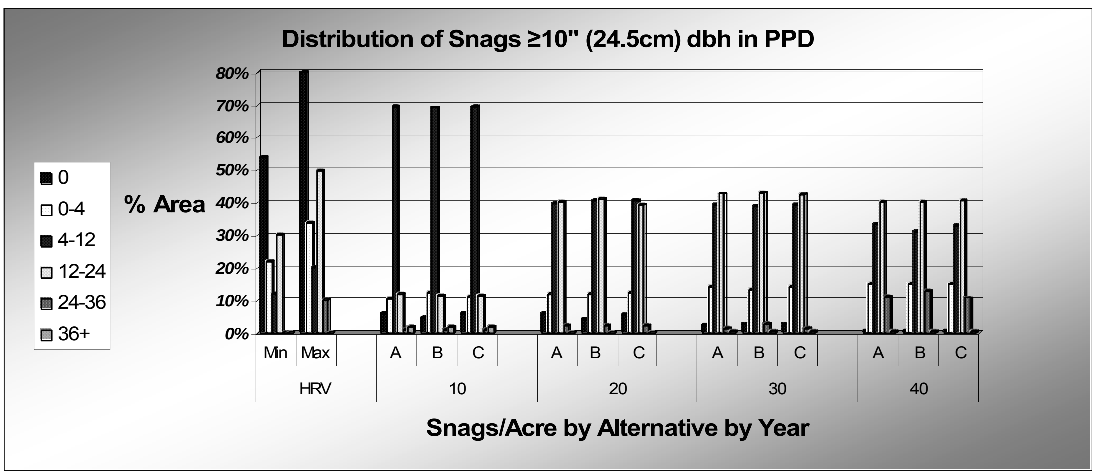


Figure 3-31. Comparison of alternatives with HRV over time in PPD habitat type.

<u>Mixed Conifer Habitats - Northern Flying Squirrel, Southern Red-backed Vole, Bushy-tailed Woodrat, Williamson Sapsucker, Pileated Woodpecker</u>
On Crescent Ranger District, potential habitat for pileated woodpecker and the Williamson sapsucker (outside of the Davis fire area) would be managed in the LSR on approximately 13,500 acres (in MSAs C, E, K, P, S, T, V, W, AA), 33,000 acres in matrix, 16,000 acres in administratively or congressional withdrawn lands, and 14,000 acres east of the NWFP. Habitat for all these species will continue to be managed on sites that have the potential to sustain high densities of trees.

Seven Buttes and Seven Buttes Return projects reduced habitat in some areas and maintained it in others creating a mosaic of conditions. Approximately 4,000 acres were returned to a single story condition that reduced habitat. Approximately 6,600 acres was maintained in a multistoried condition and close to the Upper Management Zone.

There continues to be a high level of risk from an uncharacteristic disturbance from insects and disease in large tree habitat in dense mixed conifer stands across the district. The few gains realized by the Seven

Buttes and Seven Buttes Return projects are diminishing. Implementation, starting in the 1990s, maintained habitat for mixed conifer species with the option to return stands to roosting and foraging conditions for the northern spotted owl within 10-15 years. Much of that time has passed for many of the activity units and they are now as vulnerable to disturbance from insects and disease as before.

The following discussion on foreseeable actions would have a beneficial effect by reducing the acres at high risk to insect and disease disturbance in mixed conifer, but would not likely change the snag and down log numbers on a landscape scale.

The BLT project has the potential to thin 6,000 acres in the mixed conifer habitat. It would avoid habitat characterized as spotted owl NRF and is located outside of the boundary of the Northwest Forest Plan, where habitat is marginal for the northern flying squirrel, southern red-backed vole, bushy-tailed woodrat, Williamson’s sapsucker, and pileated woodpecker. Actions proposed in the BLT project have the potential to reduce habitat for some of these species, but the primary habitat remains in the Five Buttes project area.

Another foreseeable action includes about 1,000 acres of thinning in the wildland urban interface around Crescent and Odell lakes. Prescriptions for thinning includes an upper diameter limit of 6 inches and snags and down logs would be retained at current levels. Habitat for these would not appreciably change and effects of the Five Buttes Project would not be additive to effects of the thinning projects.

Figure 3-32 shows distribution of snags compared to the Historical Range of Variability and proposed activities would not reduce snag densities over the landscape in the short-term. In the long-term, higher densities would exceed HRV in the moderate 12-24 snags/ac and the very low 0 snags/acre.

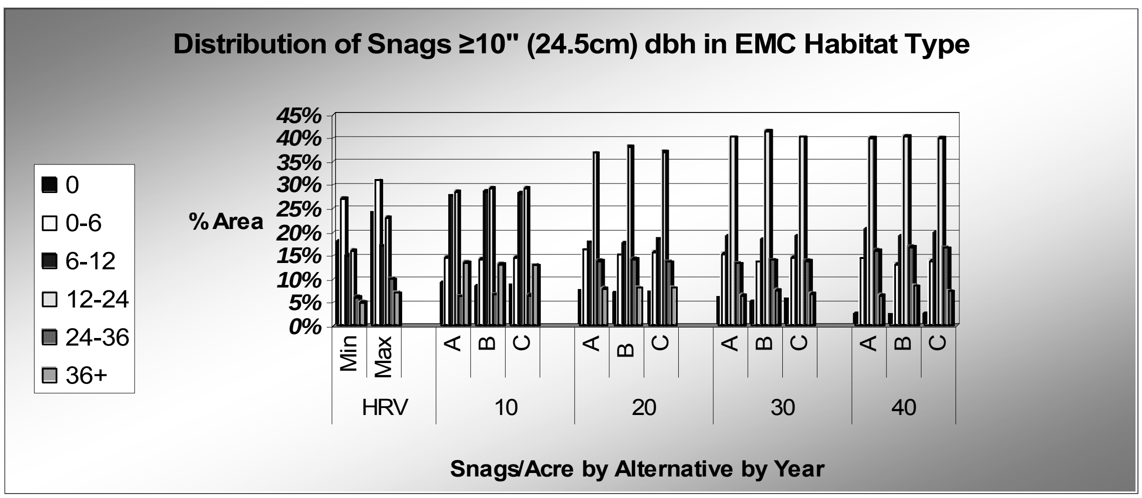


Figure 3-32. Comparison of alternatives with HRV over time in EMC habitat type.

<u>Lodgepole Pine Habitats – Black-backed Woodpecker</u>
Lodgepole pine habitat would continue to be managed for black-backed woodpeckers on approximately 10,000 acres within the Davis LSR (MSA A, B, D, I, U, X, Y, Z, and AA) with additional habitat outside the project area. Seven Buttes and Seven Buttes Return thinning of 2000 acres of lodgepole habitat are in the process of being completed.

Foreseeable actions include a decrease in black-backed woodpecker habitat density management of mixed conifer stands and lodgepole pine stands across the La Pine basin, particularly within the interface hazard adjacent to campgrounds and private land.

The Greater La Pine Community Wildland Urban Interface Hazardous Fuel Reduction Project would actively manage lodgepole pine stands on 12,000 acres. Of the thinning and hazard reduction activities, 3,000 acres would be in mature stands and 9,000 in younger forest. The mature stands are currently providing habitat for the black-backed woodpecker, but would not in the future, because it is unlikely that the required stand decadence would be maintained in the urban interface. This is also the case for the younger stands, although they currently are not providing habitat.

In the Wickiup Acres area, approximately 500 acres in the urban interface would receive risk reduction activities that would likely remove black-back woodpecker habitat now and in the future.

The BLT project proposes approximately 6,000 acres of active management in lodgepole pine; however, it is early in the planning process and details are specific enough to determine potential effects to black-backed woodpeckers.

These foreseeable actions have potential to be additive to the 366 acres of habitat loss within the Five Buttes project; however, loss of black-backed woodpecker habitat is minor compared to gains due to insect and disease infestations currently cycling through the landscape. On the Deschutes National Forest, the Bend watershed and the Three Creeks area on the Sister Ranger District are experiencing bark beetle infestation. Also, habitat created by recent fires has been a boon to local populations. Habitat for black-backed woodpeckers would be provided in a cyclic basis across approximately 141,500 acres of lodgepole pine habitat across the district and 567,086 acres across the forest would remain in various stages of bug infestation, decline and renewal.

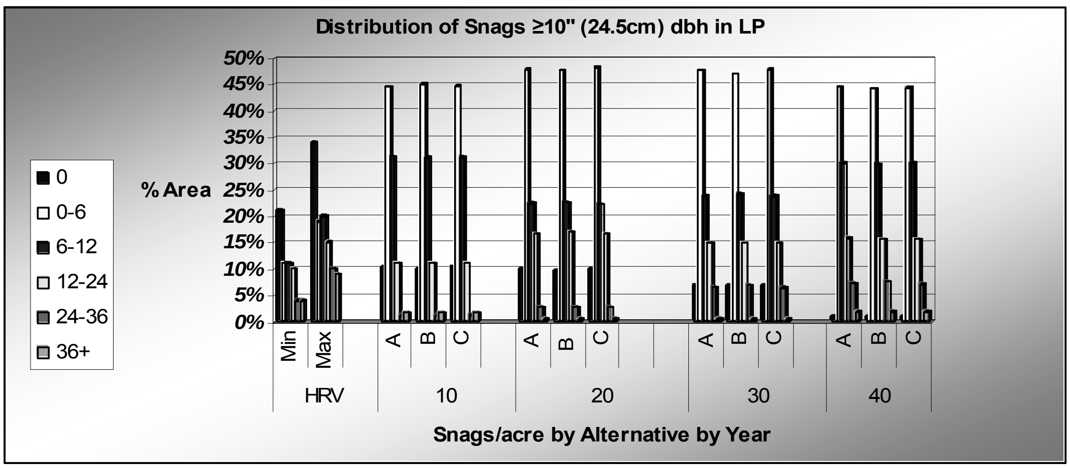


Figure 3-33. Comparison of alternatives with HRV over time in lodgepole habitat type.

<u>Montane and Complex habitats – Flammulated owl, American marten, Northern flicker, Three-toed woodpecker, Hairy woodpecker</u>
The majority of montane habitat occurs within wilderness, roadless or OCRA land allocations. Very little is proposed for active management. Complex habitat for all these species would be present in shifting patterns across the project area and across the district. Management for these species would continue across the LSR as emphasis for retaining large trees, and continued abundance of snags and down wood.

There are no identified additive effects to this habitat type. Over time, snag densities increase toward reference condition, with little active management taking place in this habitat type.

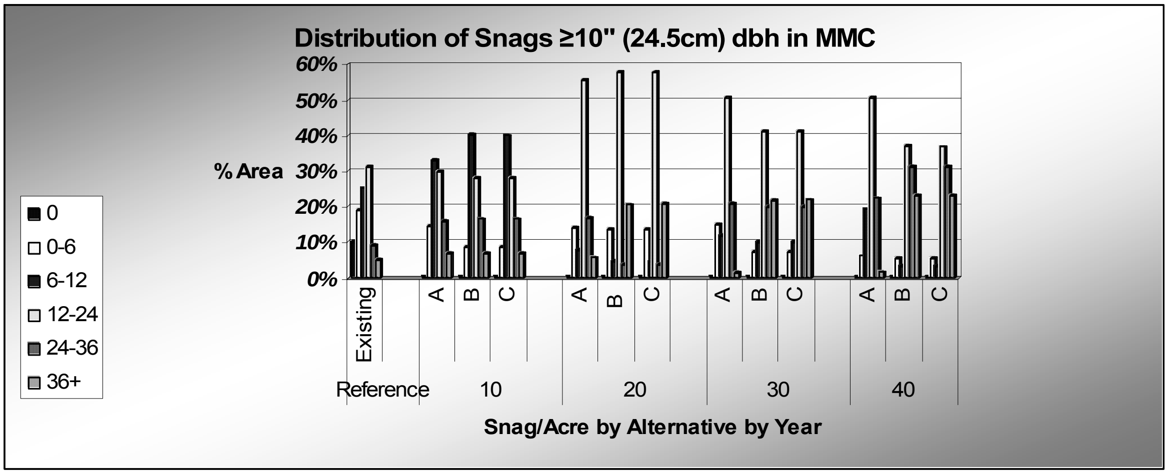


Figure 3-34. Comparison of alternatives with HRV over time in montane mixed conifer habitat type.

Late and Old Structure (LOS) Connectivity Corridors

Existing Condition

Late and old successional (LOS) habitat is an element of the "Interim Management Direction establishing Riparian, Ecosystem and Wildlife Standards for Timber Sales in the Regional Forester's Eastside Amendment #2." This amendment requires the identification of connectivity corridors designed to connect designated old growth areas and LOS habitat types across the landscape. These corridors are to allow movement and interaction of adults and dispersal of young of LOS or old growth associated species. Corridors do not necessarily meet the same description of "suitable" habitat for breeding, but allow free movement between suitable breeding habitats. It is important to insure that blocks of habitat maintain a high degree of connectivity between them and that blocks of habitat do not become fragmented in the short-term. Connectivity corridors are considered stands in which medium to larger trees are common, and canopy cover are within the top-third of site potential. Stand widths should be a minimum of 400 feet wide at their narrowest point, unless it is impossible to meet the 400 foot width with current vegetative conditions. If stands meeting these descriptions are not available, the next best available habitat would be identified.

Removal of trees within connectivity corridors is permitted if all the criteria described above can be met and if understory is left in patches or scattered to assist in supporting stand density and cover. Understory removal, stocking control, and salvage are potential activities that can occur. In stands that do not currently meet LOS standards, non-regeneration or single tree selection activities should proceed only if the prescription moves the stand towards LOS conditions as soon as possible (USDA 1995).

Connectivity corridors have been identified and mapped and can be found in the project file at Crescent Ranger District. Within the Five Buttes planning area there are approximately 10,085 acres of National Forest System lands that are east of the Northwest Forest Plan line and within the interim management direction area. This includes the northeastern portion of the planning area and near Crescent Creek and the Black Rock Borrow Pit in the south central portion of the project area.

Environmental Consequences

Alternatives A and B

Direct and Indirect Effects

Implementation of either alternative would result in no active management within or adjacent to identified connectivity corridors. Successional processes would continue to occur that may include increased overstory canopy cover and tree height and the formation of multiple canopy layering favorable to some species. Over the long-term this alternative may also increase the risk of overstocked stands becoming susceptible to large tree loss from disease, insects and fire events.

Alternative C
Direct and Indirect Effects
Alternative C would implement 210 acres of fuels treatments (units #676 and #677) in an identified connectivity corridor located east of the Cascade Lakes Highway and southwest of Hamner Butte. Green trees less than 6 inches diameter would be thinned to an average leave tree spacing of 18 feet. Tree thinning and burning of slash piles would reduce the tree density on overstocked late-successional stands and advance the growth and development of younger-aged forested stands toward late-successional conditions. Standards and Guidelines for the eastside Screens for snag retention, down woody debris, and unthinned areas would apply and provide habitat continuity for woodpeckers, songbirds, mammals, and other wildlife species. Activities would be consistent with the Regional Forester's Forest Plan Amendment #2 by maintaining all medium to large trees and current overstory canopy cover.

Cumulative Effects Common to All Action Alternatives
Activities from Table 3-1 were reviewed for their potential for cumulative effects on connectivity corridors. Since 1994 when the Regional Forester's Amendment #2 became effective, there has been no regeneration timber harvest within mapped connectivity corridors. However, the Seven Buttes environmental assessment (USDA 1996) stated either action alternative would reduce the amount of suitable corridor habitat but would still maintain at least two different 400 foot wide connectivity corridors for LOS stands or the best available as required by the Interim Management Direction.

A foreseeable vegetation project has been proposed near two private land subdivisions within the Five Buttes project area located south of Wickiup Reservoir (Wagontrail Wildland Urban Interface Fuels Reduction Project). Activities would be designed to thin trees and reduce fuel loadings in order to lessen the wildfire risk adjacent to the subdivisions. Activities may occur within connectivity corridors. As required by the Interim Management Direction, activities would be designed to meet Amendment #2 for wildlife movement and dispersal.

The Five Buttes project would propose treatments in Alternative C within connectivity corridors although activities would be consistent with Amendment #2 direction. Therefore, there are no cumulative effects expected with project implementation.

Forest Fragmentation

Li and Reynolds (1999) defined forest fragmentation as the processes of increasing the number of landscape pieces, decreasing interior habitat area, increasing the extent of forest-opening edges, or increasing isolation of residual forest patches. The primary force causing changes in the fragmentation patterns are human-caused disturbances (Butler et al. 2003). Since the late 1800s timber harvesting and fire suppression have replaced natural disturbances as the primary forces shaping forest landscapes (Rochelle 1999). In low-elevation forest land in western Washington and Oregon, a significant proportion of the forest has been converted to other uses such as agriculture and suburban development, resulting in long-term or permanent habitat loss and forest fragmentation (Rochelle 1999). In November 1998, a scientific conference was held in Portland, Oregon entitled "Forest Fragmentation: Wildlife and Management Implications." The conference was convened to provide a synthesis of the current state of knowledge related to fragmentation in managed forests of the Pacific Northwest. Rochelle (1999) synthesized key points from the authors' papers and conference presentations. Some of the key findings from the conference included:

- Northwest forests were naturally fragmented by disturbances such as fire and disease; small patches dominated east-side forests; larger patches characterized west-side forests. Over time in drier east-side forests, fire suppression is "de-fragmenting" patterns of fuel distribution and increasing the potential for large wildfires.
- Fragmentation usually co-occurs with habitat loss and the response of vertebrate populations differ, and for most species the effects of habitat loss are more significant than changes in habitat pattern.

- Both positive and negative effects of forest "edge" have been documented in recent research. Leaving relatively small amounts of habitat structure (e.g. shrubs, snags, decaying wood, live conifers and hardwoods) after harvest, apparently, makes the areas (matrix) between habitat patches more hospitable, so that movement and dispersal of many species may be enhanced.

Existing Condition

The 160,000 acre Five Buttes project area contains examples of natural and human induced forest fragmentation. Lakes and lava flows break up a connected, unfragmented forested landscape. There is also natural fragmentation occurring from changes in physiography, differences in geology, soil types, and aspect that affect which tree species are best suited to the growing condition. Human induced habitat fragmentation has occurred through the design and placement of a forest road network and regeneration timber harvest program that began in the 1950s. Road access to recreation areas and regeneration timber harvest blocks, generally less than 40 acres in size, have cumulatively created a fragmented forest landscape over much of the buttes and lowlands outside designated wilderness and other unroaded areas. However, the only permanent loss of forest stands is due to removal of stands for permanent road access. The regeneration harvest blocks have been re-planted with trees and will over the next several decades, result in a much reduced fragmented landscape as stands become mid-successional aged (greater than 40 years). During the interim, early-seral associated wildlife species benefit from a landscape that provides some of this habitat type. The Davis Fire of 2003 is currently providing about 16,000 acres of early-seral habitat with an assumption that much of this acreage will eventually become late-successional forest in approximately 100 years (Davis Fire Recovery EIS, 2004). For those species associated with later successional forest stages, the negative effects of forest fragmentation will be less if the population can move to a new habitat, survive in the surrounding matrix, or live in small patches of the original habitat until the surrounding habitat returns to more desirable conditions. Reforestation occurred on 4,700 acres in 2006 within the fire perimeter and approximately 8,000 acres will have been replanted by the end of 2007 when reforestation activities end. In addition, the growth of native shrubs and forbs are contributing to reducing the effects of this fragmentation event. Over time, species surviving in suitable habitat patches outside the burn would be able to move and disperse through the fire and may eventually occupy the fire acreage.

Environmental Consequences

Alternative A

Implementation of this alternative would result in no change from the current vegetative condition in the project area. The naturally fragmented portion of the landscape would remain while over time the growth of planted trees from regeneration harvests would reduce the amount and distribution of edge habitat across the project area. This would benefit wildlife species generally associated with increasing levels of canopy cover and larger tree diameter by providing a more connected forest landscape. Those wildlife species more closely associated with early-seral forests would gradually decrease in population and distribution as trees mature.

Alternatives B and C

Direct and Indirect Effects

Implementation of an active management scenario would generate little change to the current condition in the project area. While no regeneration timber harvest is proposed, active management (thinning and fuels reduction work) would reduce the risk of another event with potential to fragment the project area (see the sections titled "Fire and Fuels" and "Forested Vegetation" in Chapter 3 of this EIS). Vegetative prescriptions have been designed to maintain the current amount of forest opening and would not isolate residual forest patches. No permanent road construction would occur with this project. To access units, approximately 6 miles of temporary roads would be constructed resulting in about 12 acres of forested stands being converted to short-term road use. Temporary roads are generally less than 14 feet in width and would be subsoiled after the completion of all post-sale activities, usually within five years (or less) of the initial activity. Natural re-vegetation of subsoiled roads would occur as shrubs and tree species begin seeding in. Due to available seed source on the Crescent Ranger District, vegetative recovery on subsoiled roads is usually established within 5 years (Pers. Comm., Ken Kittrell, 2006). Although temporary road construction has effects that have been disclosed for other resources in this analysis (reference the sections titled "Soils," "Threatened and Endangered Species," "Survey and Manage Species," "Big Game," "Fisheries," "Hydrology and Water Quality," "Cultural Resources," and "Irreversible and Irretrievable Commitment of Resources" in Chapter 3 of this EIS), due to the temporary nature of the effects (less than 5 years) and the limited access for short-term, this activity would not be considered to change the existing continuity of the forest throughout the 160,000 acre planning area. Also, the potential for introduction of invasive plants associated with temporary road construction is discussed in the section titled "Invasive Plants" in Chapter 3 of this EIS. Activities proposed would not create additional habitat fragmentation to mid- or late-seral forested stands in the project area.

Cumulative Effects Common to Action Alternatives
Private lands within the project area are primarily industrial forest timberlands which have experienced several commercial entries over the last 5-6 years. However, most of this acreage remains stocked with trees at varying levels. Long-term and/or permanent forest fragmentation on these lands is unlikely as long as these lands remain as industrial forestlands and not converted to other uses. There are also numerous subdivisions scattered within the project area with undeveloped lots generally less than several acres in size. Potential conversion of these lots to home construction is likely but would not appreciably contribute to forest fragmentation because of their small size and the amount of fragmentation that has already occurred in the subdivisions. The subdivisions are located near Crescent Lake Junction and near Wickiup Reservoir.

All Forest Service managed lands within the project area would remain as forested habitats because no lands are being converted to non-forest uses with the exception of the short-term temporary road construction previously mentioned. In addition, there is no regeneration timber harvest activity proposed in the Five Buttes project or in actions listed in Table 3-1 that would result in forest fragmentation; therefore there are no additive cumulative effects.

Old Growth Management Areas

Within the project area, the Northwest Forest Plan overlays seven designated Old Growth areas identified in the 1990 Deschutes Land and Resource Management Plan. Only two of the seven Old Growth Management Areas are proposed for active management. One Old Growth area is located on Maklaks Mountain and is also allocated to Late-Successional Reserve. When Northwest Forest Plan allocations overlay the Deschutes LRMP, in order to provide the greater benefit to late and old forest-related species, the most restrictive plan would be followed (NWFP Record of Decision, page 12). In this case, Standards and Guidelines for Late-Successional Reserves would apply, except where the Deschutes LRMP provides requirements for vegetation manipulation to "enhance and perpetuate old growth characteristics" (LRMP M15-4).

The second designated Old Growth unit near Crescent Creek is within the Northwest Forest Plan allocated to Administratively Withdrawn lands and partially overlaps Wild and Scenic River designation. The most beneficial Standard and Guideline for late and old forest-related species would apply. For a discussion on consistency with Wild and Scenic values, reference the section titled "Wild and Scenic Rivers" in Chapter 3 of this EIS.

The Late-Successional Reserve system under the Northwest Forest Plan was designed to "…protect and enhance conditions of late-successional and old growth forest ecosystems…" (NWFP Record of Decision, C-11). As such, using a site-specific plan (Davis Late-Successional Reserve Assessment focused on landscape-level resources and strategies for managing late and old forest-dependent focal species, the requirement in the Deschutes Forest Plan for an Old Growth Management Plan (Deschutes LRMP Appendix 15-4) has been met as all activities have been found consistent with that assessment. Assessments for the Maklaks Mountain and Crescent Creek Old Growth Management Areas have been completed and can be found on file at the Crescent Ranger District.

Alternative A
Direct and Indirect Effects
Implementation of this alternative would result in no immediate vegetative change within any of the seven designated Old Growth Management Areas (OGMAs) within the project. Habitat capability would be

maintained for the designated species although overstocked stands would continue to be at risk of large tree loss from disease, insects, and uncharacteristic fire events. For more information, reference sections titled “Fire and Fuels” and “Forested Vegetation” in Chapter 3 of this EIS.

During the Davis Fire an entire designated OGMA was converted to an early seral stage. This resulted in reduced habitat effectiveness for those species for which the OGMA is managed, and in some cases the complete loss of habitat resulted in individuals needing to relocate into more suitable habitats. However, in the short-term (approximately five years following an event), a stand-replacing fire can be a boon for transient species, such as the black-backed woodpecker, that thrive on insects that follow wildfire events. Large trees are the most important element of old growth forests, and if lost, large trees require the longest timeframe to replace.

Alternative B
Direct and Indirect Effects
Implementation of this alternative would result in silvicultural treatments prescribed to reduce stem density and overstocking within two OGMAs to perpetuate and enhance old growth characteristics. Unit #610 is located within the boundaries of the 252 acre Maklaks OGMA which has the American marten as a designated species under the Deschutes Forest Plan. Proposed activities would commercially thin 143 acres and maintain a multi-storied mixed conifer forest with fewer trees per acre to increase the likelihood of long-term retention of the largest trees on site. The understory thinning would focus on removing trees less than 21 inches dbh but still maintain the two and three canopy layers currently present. Post-sale activities would focus on reducing the density of non-merchantable trees and disposal of slash material. The most obvious visual effect would be a reduction in tree density and canopy cover of smaller diameter trees with tree limbs reaching near the ground.

Based on a similar prescription on an adjacent harvest unit from the Royal timber sale (Seven Buttes EA, 1996) marten habitat capability would be retained in unit 810. All old growth habitat components currently present would be retained, including the 30-40 inch diameter and larger ponderosa pine and Douglas-fir trees, snags, and large diameter wood. In addition, the increased canopy cover would likely result in increased shrub growth of chinquapin, currant species, and snowbrush. While lower canopy cover would likely result in an increased snow depth reaching the forest floor, overall tree canopy cover would still exceed 40 percent. Studies cited in Buskirk and Powell (1994) and Buskirk and Ruggiero (1994) report complete or partial avoidance of non-forested habitats by marten, particularly in winter. The prescription planned for unit #610 would not result in a non-forested habitat condition post-harvest. In winter, most of the small mammals that marten prey upon live in subnivean spaces formed by vegetation and coarse woody debris near the snow-ground interface. Because large diameter wood would not be removed, subnivean access to this prey habitat would be maintained.

The silvicultural prescriptions for units #810 and unit #345 (outside the OGMA) collectively would reduce the risk of wildfire severely impacting the connected late-successional forested stands from above Odell Lake easterly along the southern flanks of Maklaks Mountain then running north parallel to the unroaded area. These treatment areas were strategically placed to break up the continuity of fuels (see Fire and Fuels reports in Chapter 3 of this EIS).

Silvicultural treatments are also proposed in the 970 acre Crescent Creek OGMA. Ten acres of proposed unit #690 is within the boundary of this OGMA. The desired long-term condition of this stand is late and old structure single story ponderosa pine. To achieve this goal, understory thinning would be prescribed. Because this OGMA was designated for the northern goshawk, a mix of densely forested areas with large tree diameters is desired for nesting stands and more along with open stands in close proximity to provide foraging opportunities. Nesting and foraging habitat is provided in this 970 acre OGMA and thinning and post-sale activities would not affect the ability of the OGMA to function for goshawks as designated. At the present time there are no known goshawk nests in the OGMA. If they are discovered during sale operations, every attempt would be made to align with Forest Plan standards and guidelines.

Alternative C
Direct and Indirect Effects
Implementation of this alternative would have impacts to the Maklaks OGMA similar to those described in Alternative B because the commercial thinning and post-sale treatments are the same. However, an additional fuels treatment unit #811 (outside the OGMA but located adjacent to and south of unit #810) has been added to this alternative to provide a larger, more connected fuel break that begins near Odell Creek and extends uphill on Maklaks Mountain. Because the same silvicultural prescription would be implemented on unit #810, the effects on the Maklaks OGMA would be the same as for Alternative B.

Within the Crescent Creek OGMA, a total of 97 acres are proposed for silvicultural and fuels treatment. The same 10 acres of unit #690 would be scheduled similar to Alternative B. Eighty-seven (87) acres of unit #692 would have fuels treatments, permitting green trees less than 6 inches dbh to be removed to an average spacing of 18-20 feet between live trees. This unit was added to the fuels reduction activities to be implemented as part of the overall protection strategy for Alternative C to provide larger and more strategic "blocks" of forest where wildfire behavior would be modified. The cut trees would be piled and burned or utilized as post and pole material if possible. This reduction in tree density would allow goshawks more foraging area and greater ease in pursuing prey species. All other effects discussed in Alternative B would apply. Although there are no known nests, nesting habitat would remain available and well distributed in the OGMA.

The silvicultural and fuels treatments, as designed, are consistent with the goals and objectives of each OGMA plan.

Cumulative Effects of all Action Alternatives
Activities in Table 3-1 were reviewed for their potential for cumulative effects on OGMAs. There are no additive effects identified with the implementation of the action alternatives and past, present, and reasonably foreseeable actions, therefore no additive cumulative effects are anticipated.

In both active management scenarios, vegetation manipulation has been designed to enhance and perpetuate old growth characteristics; therefore, both alternatives are consistent with M15-4 of the Deschutes Land and Resource Management Plan.

Fisheries

A Biological Assessment (BA) was prepared to document the review and findings of the Five Buttes Project for possible effects on species:

- listed or proposed for listing by the USDI Fish and Wildlife Service (USFWS) as Threatened or Endangered; or
- designated by the Pacific Northwest Regional Forester as Sensitive; or
- that require consultation with the National Marine Fisheries Service (NMFS) under the Magnuson-Stevens Fishery Conservation Act (MSA).

The BA is prepared in compliance with the requirements of Forest Service Manual (FSM) 2630.3, FSM 2672.4, and the Endangered Species Act of 1973, as amended (ESA) (Subpart B; 402.12, Section 7 Consultation).

The determination in the BA was that implementation of this project will have No Effect to bull trout or their habitat. The project will have No Impact on redband trout or their habitat.

The following information addresses the potential effects of implementing the Five Buttes Project on threatened, endangered, and sensitive fish species. This determination, required by the Interagency Cooperation Regulations (Federal Register, January 4, 1978), ensures compliance with the ESA. Changes to the R-6 Regional Forester's Sensitive Species List were instituted on November 28, 2000. Invertebrate species were not included and were not be covered under the BA/BE.

Existing Condition

The proposed project lies within three fifth-field watersheds, and 12 sixth-field sub watersheds. Odell and Davis Lakes and their tributaries are part of the Odell Lake Bull Trout Recovery Unit. Odell Creek, which flows from Odell Lake to Davis Lake, is listed with the Oregon Department of Environmental Quality (DEQ) as a 303(d) water quality limited water body, the limiting factor being excess water temperatures during summer months. Crescent Creek, flowing from Crescent Lake to the Little Deschutes River is also listed as water quality limited for exceeding summer water temperatures. Table 3-70 identifies water bodies and associated fish species within the Five Buttes project area.

The Odell Creek subwatershed is designated as a Tier 1 Key watershed as defined by the Northwest Forest Plan. Tier 1 watersheds contribute directly to the conservation of at-risk salmonids.

Fish species known to currently inhabit Odell Creek include; bull trout, redband trout and mountain whitefish. Largemouth bass and tui chub have been illegally introduced into Davis Lake at some time within the past century (Odell Watershed Analysis, 1999). Bull trout recently have been documented in Odell Creek, with a majority of the fish being found near the confluence of cold spring-fed tributaries (Maklaks, McCord Cabin Springs, and Unnamed Tributary). It is believed that bull trout may use Odell Creek for foraging and possible spawning in cold-water tributaries (Odell Watershed Analysis, 1999). Redband trout are the dominant fish species in Odell Creek. The Columbia River populations of bull trout were listed as a threatened species by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA) on June 10, 1998 (63 FR 31647). Bull trout historically inhabited Crescent Creek and Crescent Lake, but have been presumed extirpated from those water bodies for several decades. Redband trout are on the Regional Forester's sensitive species list.

Moore Creek flows out of Bobby Lake and into Davis Lake. Until 2003, Bobby Lake was stocked with cutthroat and brook trout. Moore Creek flows for a short distance before going subterranean and, within the project area, typically flows for only a few weeks during spring snowmelt. Fish use within this reach is unknown, but it is assumed that during peak times of continuous flow Moore Creek carries fish out-migrating from Bobby Lake. The Moore Creek channel empties into the east side of Davis Lake.

Wickiup Reservoir lies on the Bend/Fort Rock District of the Deschutes National Forest. Wickiup dam was constructed on the Upper Deschutes River between 1939 and 1949, with a dam height of 100 feet (US

Bureau of Reclamation). Fish species known to be present in Wickiup include: brown trout, kokanee salmon, coho salmon, rainbow trout, brook trout, whitefish, tui chub, stickleback and largemouth bass. All but rainbow trout and mountain whitefish are non-native. Bull trout were historically present in the Deschutes River through this reach, but have since been extirpated.

Table 3-70. Bodies of water within the Five Buttes project area and fish species utilizing them. (Fish species in bold type are native to that water body).

Body of Water	Species
Davis Lake	Largemouth Bass Tui Chub **Redband Trout** **Bull Trout**
Odell Creek	**Redband Trout** **Bull Trout** **Mountain Whitefish** Kokanee Salmon
Crescent Creek	**Redband Trout** Brook Trout Brown Trout **Mountain Whitefish** **Sculpin**
Maklaks Creek, McCord Cabin Springs, Unnamed Tributary to Odell Creek	**Redband Trout** **Bull Trout** Brook Trout
Cold Creek	Brook Trout **Rainbow Trout**
Ranger Creek	Brook Trout **Rainbow Trout**
Moore Creek	Brook Trout Cutthroat Trout
Wickiup Reservoir	Largemouth Bass Stickleback **Rainbow Trout** Brown Trout Brook Trout Tui Chub Coho Salmon **Mountain Whitefish** Kokanee Salmon

Bull Trout and Redband Trout Status, Distribution and Habitat

The Columbia River populations of bull trout were listed as a threatened species by the USFWS under the Endangered Species Act on June 10, 1998 (63 FR 31647). The Odell Lake Recovery Unit encompasses an area of approximately 302 square kilometers. It is located within the Deschutes National Forest in Deschutes and Klamath Counties, Oregon. The Odell Lake Recovery Unit consists of Odell and Davis Lakes, Odell Creek, which flows from Odell Lake to Davis Lake, and all tributaries. The lakes were isolated from the Deschutes River by a lava flow about 5,500 years ago that impounded Odell Creek and formed Davis Lake. The lava flow isolated bull trout in Odell Lake from bull trout in the rest of the upper Deschutes Basin. Odell Lake bull trout are the only remaining natural adfluvial population of bull trout in Oregon. Currently, bull trout are known to be spawning in only one tributary (Trapper Creek) to Odell Lake, indicating that there is one population of bull trout in the Recovery Unit. The estimated abundance of adult spawners is less than 100 (USFWS, 2003).

The USFWS, ODFW, and Forest Service (USFS) have developed a recovery plan which addresses limiting factors for the Odell Lake Recovery Unit. Within the recovery unit, historical and current land use activities have affected bull trout local populations. Limiting factors include competition with other fish species for resources, hybridization with brook trout, limited spawning and rearing habitat in the tributaries of Odell Lake, full or partial barriers created at railroad or road crossings, and habitat degradation due to large woody debris removal, intentional channelization of streams, and loss of riparian cover. All federally managed lands within the jurisdiction of the Northwest Forest Plan have been excluded from the USFWS's final bull trout critical habitat unit designation.

The goal for bull trout recovery is to ensure the long-term persistence of self-sustaining complex, interacting groups of bull trout distributed across the species' native range, so that the species can be de-listed. To accomplish this goal the following four objectives were identified for bull trout in the Odell Lake Recover Unit (USFWS 2003):

1. Maintain the current distribution of bull trout and restore distribution in previously occupied habitats within the Odell Lake Recovery Unit.
2. Establish an increasing trend in abundance of adult bull trout.
3. Restore and maintain suitable habitat conditions for all bull trout life history stages and forms.
4. Conserve genetic diversity and provide opportunity for genetic exchange.

The recovery plan developed for the Odell Recovery Unit identifies forest recreation, particularly along Trapper Creek, and past stream alterations to Trapper Creek (including railroad and road crossings, berming, and cleanouts) as the forest management practices that pose the greatest threat to the Odell bull trout.

Population Trends

Bull Trout

Odell Lake has the only remaining natural adfluvial population of bull trout in the state of Oregon. Bull trout are occasionally observed in Odell Creek. Satterthwaite (1979) observed various age classes of bull trout while snorkeling the length of Odell Creek. An adult bull trout was sighted in Odell Creek on 11/1/98 about 100 yards below the outlet of Odell Lake (Dachtler 1998). Anglers reportedly caught two bull trout in this system in 1989 (Dachtler personal communication). Five juvenile bull trout were observed in Odell and Maklaks Creeks and an unnamed tributary to Odell Creek during exploratory surveys in 2003 by USFS fisheries biologists. Follow up surveys conducted in 2004 found an additional 17 bull trout in the unnamed tributary and two juveniles in lower Odell Creek. The estimated abundance of adult bull trout spawners is less than 100 (USFWS 2003). Redd production generally ranges from 10 to 20 redds per year within a 0.66 mile reach of Trapper Creek. While historical abundance of bull trout in this watershed is somewhat anecdotal, it is believed that there has been a decrease in the population over the past century. An Oregon State Game Commission (OSGC) report from 1948 states that excellent fishing was enjoyed during the year; the fishery was supported mainly by blueback salmon (kokanee) and Dolly Varden (bull trout). The same report goes on to say that there was a large population of forage fish including whitefish and large Dolly Varden. A 1946 OSCG report states that Dolly Vardens are abundant and provide good early-season fishing for trollers. This same report goes on to suggest that trapping and removing Dolly Varden from their spawning runs would be desirable to reduce the predation of blueback salmon (kokanee).

Snorkeling surveys have been conducted in Trapper Creek, annually since 1996. Results from those surveys are listed below in the Description of Ratings of Baseline Indicators section.

Lake trout, Eastern brook trout and kokanee salmon compete with bull trout for food, as well as rearing and spawning habitat. Donald and Alger (1992) documented lake systems where lake trout decimated bull trout populations. Expansion of brook trout and other species into bull trout habitats can lead to greater isolation (Leary, 1993) and hybridization.

During the past two years, bull trout redds have been covered with wire fence by ODFW to reduce the amount of disturbance caused by later spawning kokanee. Kokanee salmon tend to spawn after bull trout in Trapper Creek and in such densities that nearly the entire stream bottom is overturned. There is concern that spawning kokanee may be digging up and jeopardizing the survival of bull trout redds.

Redband Trout

Redband trout are a regionally sensitive species; their numbers have declined throughout much of the Upper Deschutes and Upper Little Deschutes basins. Declines in redband abundance are commonly attributed to increased stream temperatures and competition from introduced species such as brook trout and brown trout.

Snorkel surveys conducted in Trapper and Odell Creeks have documented an abundance of reband trout. A survey conducted in June of 2004 along less than one mile of lower Odell Creek documented 217 redband trout greater than eight inches in length. Numerous smaller redband were observed and not counted due to the abundance of the fish.

Redd surveys conducted in the spring of each year regularly document a high density of redband trout redds, particularly along lower Odell Creek. Redd counts average around 250 per year in the lower four miles.

Redband trout are present but at depleted levels within Crescent Creek. The native redband population has likely been negatively affected by the introduction of brook and brown trout, flow modifications, disease/parasites and the passage barrier at Crescent Dam.

Habitat Description - Natural, Physical and Biological Character

The Little Deschutes and Upper Deschutes 4th field HUC watersheds are part of the High Cascades Ecoregion and consist of basalt, andesite and basaltic eruptive complexes that form large, overlapping shield volcanoes. The parent materials for the dominant soil types in this watershed are the air fall pumice and ash from the Mount Mazama eruption approximately 7,700 years ago. The glaciated portions of the watershed have fine sandy loam textured soils over compacted ground moraines. The subbasin is composed primarily of older glacial outwash that affects the character of water transport and plant growth in the area. Recreational activities have concentrated around water and riparian areas. Riparian vegetation has been negatively affected as a result of compacted soils and erosion.

Crescent Creek flows from Crescent Lake for approximately 26 miles before entering the Little Deschutes River near the town of Gilchrist, Oregon. Crescent Lake was a natural, glacially carved lake, which was modified with a dam structure in 1922 to increase the storage capacity for irrigation purposes. The dam was reconstructed in 1955-56 to restore the storage capacity of the project and replace the original timber-crib dam structure with concrete. The dam structure is 40 feet tall and does not allow for fish passage (Bureau of Reclamation 2004). The two main tributaries to Crescent Creek (below the dam) are Big Marsh Creek and Cold Creek.

The substrate of Crescent Creek between County Road 61 and Highway 58 is dominated by small boulders, and to a lesser extent with cobble and large boulders. Gradient in this section averages 3%, and the stream channel is confined by a steep canyon. Large and small boulders provide primary instream cover in this section with small woody debris being secondary. Upstream of Highway 58, the gradient of Crescent Creek decreases and the valley floor widens in this 7.5-mile reach. The stream channel gradient averages between 1 and 2%. Numerous backwater and side channel areas are in this section. Habitat distribution has a fairly even balance between pools, riffles, and glides. Instream cover consists of undercut banks, wood and turbulence.

Crescent Creek discharge fluctuates greatly due to the irrigation dam at the outlet of Crescent Lake. Because of flow modifications, the natural hydrograph of Crescent Creek has changed to low flows prevalent between September and April during reservoir storage months and high flows during the rest of the year (see Table 3-71). The State of Oregon owns an in stream water right to Crescent Creek from the confluence with the Little Deschutes River to the Crescent Lake Dam. This Water Right is dated 10-11-1990 and is junior to that of the irrigation district. Other than blocked passage, flow regulation at Crescent Lake Dam is probably the greatest limiting factor affecting fish habitat.

Table 3-71. State of Oregon instream water right for Crescent Creek.

Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
75	75	125	125	125	75	50	50	50	50	108	125

Wickiup Reservoir lies to the north of the project area. The Wickiup and Davis Creek subwatersheds lie within the project area and drain to Wickiup Reservoir. Within the Wickiup watershed, surface and ground water generally originate in the high precipitation areas to the west and drain to Wickiup Reservoir. The Deschutes River flows down from Crane Prairie Reservoir to the north to Wickiup Reservoir and is listed on the state of Oregon's 303 (d) list of water quality impaired streams. The Deschutes River is listed for high summer water temperatures.

As there are no streams or delivery mechanisms within the Wickiup or Davis Creek subwatersheds that could possibly transport sediment from project areas to Wickiup reservoir, riparian reserves will not be entered, and project activities are on the opposite side of a major road (FS road 44), this water body will not be further discussed or analyzed in the fisheries report. Davis Creek will no longer be discussed as it is a backwatered portion of Wickiup Reservoir and no longer a flowing stream separate from Wickiup Reservoir.

Riparian Plant Community Condition

Riparian vegetation within the inner riparian zone of Odell Creek is dominated by small (9.0-20.9"dbh) trees with more large sized trees between the 4660 road and the confluence of Maklaks Creek (Dachtler 1998). Species in the inner riparian zone consisted mainly of willows, mountain alder and lodgepole pine in the lower section of Odell Creek (Davis Lake to the 4660 road crossing). Within the Davis Fire perimeter, a majority of the encroaching lodgepole pine trees were killed as a result of the 2003 fire. Grasses and other small herbaceous plants began growing within the inner riparian area within a few days after the fire moved on. Several deciduous riparian species, including mountain alder, bog birch, snowberry and willow, have rebounded quite well. Engelmann spruce, Douglas fir, white fir, lodgepole pine and a few ponderosa pines are common along upper Odell Creek. This riparian area is functioning very well, providing adequate shade, diversity and roughness to the stream channel.

Odell Creek has a broad floodplain/water influence zone and the outer terrace defining the vegetation break is approximately a quarter mile from the creek in most segments. The entire landscape area is managed as a Riparian Reserve, where any activities conducted within this zone are to be complementary to riparian goals. The riparian reserve will be a minimum of 300 feet either side of Odell Creek, and will extend beyond where the vegetation zone break is defined by the outer terrace. This will capture all of the floodplain, and water influence zone.

Within the riparian reserve of Davis Lake, the Plant Association Group (PAG) along the western shore is Lodgepole Wet and Lodgepole Dry. Along the eastern shore of Davis Lake the PAG is Ponderosa Pine Dry.

The inner riparian zone of Crescent Creek through the project area consists mainly of bog birch, mountain alder, and lodgepole pine while the outer riparian zone consists predominantly of ponderosa pine, lodgepole pine and Engelmann spruce.

Upslope Plant Communities

The Odell Creek subwatershed predominately comprises the lodgepole pine dry PAG, with the mixed conifer dry PAG in higher elevations which tend to be out of frost pocket areas. The Odell Creek subwatershed is within the Davis Late Successional Reserve and is managed for late succession conditions. Approximately 23% of this subwatershed was burned during the Davis Fire of 2003.

Habitat Condition and Trends

Spawning

The only known active bull trout spawning area for the Odell Lake population is from the mouth of Trapper Creek to a 7.6-foot falls inside the Diamond Peak Wilderness (0.66 miles). Trapper Creek is a tributary to

Odell Lake. Cy Bingham, an early Forest Service Ranger and an Oregon State Game Commission report from 1948 identify Crystal Creek (Odell Lake tributary) as a most significant bull trout spawning area. Bull trout had not been documented in Crystal Creek for several decades, however one juvenile was found during the summer of 2005 during an electroshocking survey. While no bull trout spawning has been documented in Odell Creek, individuals may be spawning there. The juveniles observed during the summers of 2003 and 2004 were potentially the progeny of spawning in Odell Creek. Ten to 15 bull trout redds are usually documented each year in Trapper Creek (Figure 3-35). Bull trout typically begin spawning in Trapper Creek in early September and finish by late November.

Brook trout are present in the Odell Lake Recovery Unit and have been found to hybridize with bull trout. The USFS, ODFW and USFWS have for the past two years been actively trying to eradicate brook trout from the watershed to reduce/eliminate hybridization and the loss of bull trout genes. Brook trout are also being removed from upstream of the potential falls barrier on Trapper Creek, so that the upper stream can someday be reclaimed by bull trout without hybridization occurring there.

Odell and Trapper Creeks provide spawning and rearing habitat for redband trout in the Odell Watershed. A coordinated effort led by the Oregon Department of Fish and Wildlife annually monitor redband trout redds in Odell Creek. Redband trout spawning in Odell Creek occurs during late winter and spring. The majority of the spawning occurs below the 4660 road crossing downstream toward Davis Lake. On average well over 200 redds are counted annually in this section alone. Redband trout in the Crescent watershed are found in lesser numbers. Increased competitions from brown trout and brook trout and flow modifications have likely displaced much of this population.

Redband trout spawn heavily in the lower reaches of Odell Creek. The number of observed redds typically correlates strongly to the availability of water for that year. That is, high water years tend to have higher redd counts. It should be noted that in Figure 3-36, the 2004 data only depicts ½ of the usual survey area. Typically the redd survey is conducted from the snowmobile bridge at approximate river-mile 3.9 to the mouth. Surveys conducted in 2004 were from the 4660 road (approximate river-mile 2.0) to the mouth.

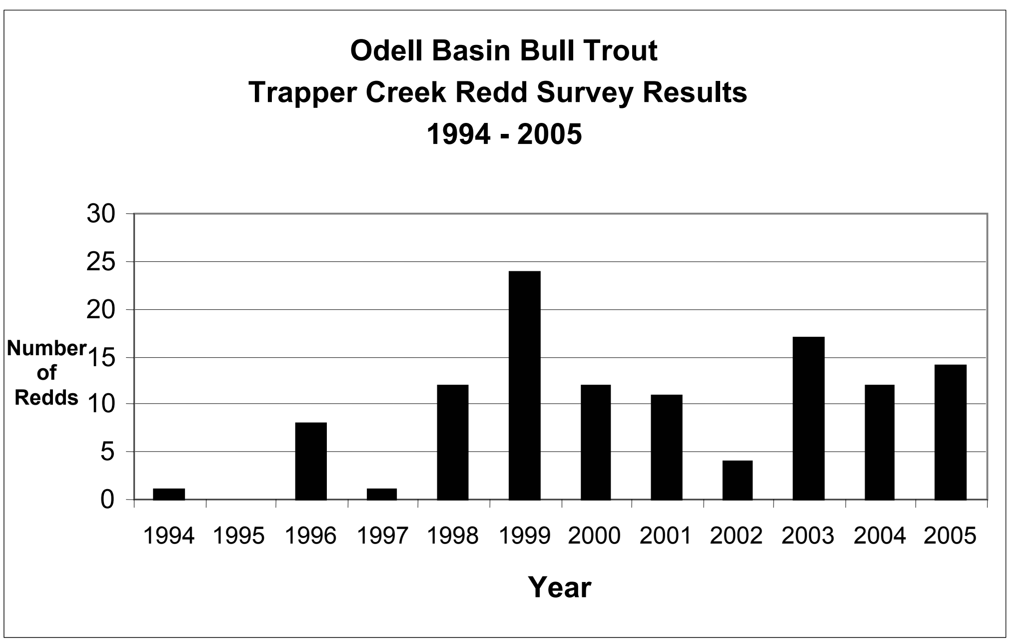


Figure 3-35. Number of observed bull trout redds in Odell Creek (Wise, ODFW, 2005).

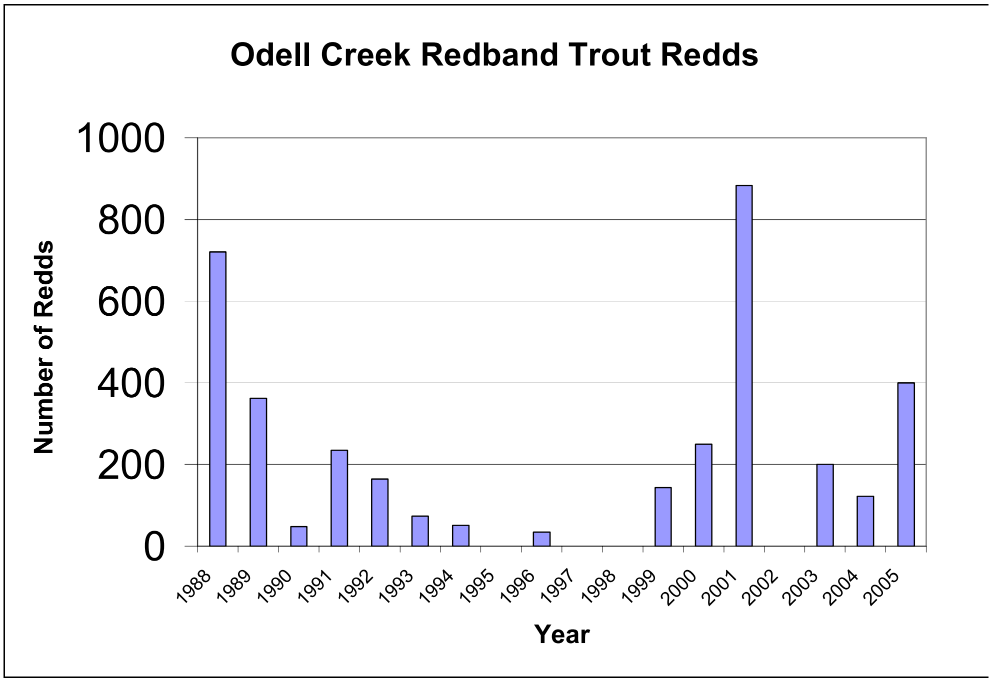


Figure 3-36. Observed redband trout redds in Trapper Creek from 1994-2005.

Rearing

A majority of the bull trout in the Odell Lake Recovery Unit rear in Trapper Creek (main tributary to Odell Lake), with some rearing likely occurring in Odell Lake. During 2003 and 2004 exploratory surveys, juvenile bull trout were found in mid and lower Odell Creek, Maklaks Creek and an unnamed tributary immediately upstream of Maklaks Creek. Odell Creek is mainly composed of several hundred foot long riffles through this reach, with a few deep pools separating them. Lower Odell Creek provides more suitable rearing habitat as the stream gradient and temperatures are reduced and habitat diversity is increased. Debris jams and off channel habitat are more common features of lower Odell Creek. Redband trout in Davis Lake utilize the lower reach of Odell Creek as a cool water refuge in late summer when water levels are low and temperatures are high in Davis Lake (Wise, personal communication). Saitterwaite observed bull trout at various life stages in this lower reach of Odell Creek in 1979. Most known bull trout rearing occurs in Trapper Creek. Redband trout rear in Odell, Trapper, Ranger, Crystal and Crescent Creeks.

Redband trout are commonly found in Davis and Odell Lakes as well as Odell Creek. Snorkeling and other fish sampling efforts have documented individual fish in Crystal, Trapper, and Maklaks Creeks. Crystal and Trapper Creeks are tributaries to Odell Lake and are upstream of the Five Buttes Analysis area.

Environmental Consequences

Description of Ratings of Baseline Indicators for the Odell Lake Subwatershed

Table 3-72 displays ratings of relevant indicators for the Odell Lake Subwatershed. The Odell Lake Subwatershed was analyzed because it is a bull trout watershed and considered Critical Habitat. Indicators that would not be affected by any alternative in the Five Buttes project are identified; justification for why these factors would not be affected is included in the Fisheries Report in the Five Buttes project file at the Crescent Ranger District. Following the table, each indicator that may be affected by the Five Buttes project is discussed. Some of these indicators are also included in the Water Quality and/or Soils sections.

Table 3-72. Checklist for documenting environmental baseline and short-term effects of proposed action(s) on relevant indicators for bull trout.

Diagnostics / Pathways	Population and Environmental Baseline			Effects of the Action(s)[1]	
Indicators[2]	Functioning Appropriately	Functioning at Risk	Functioning at Unacceptable Risk	No Effect (NE)	May Affect Not Likely to Adversely Affect (NLAA)
Subpopulation Size			X	X	
Growth and Survival			X	X	
Life History Diversity and Isolation			X	X	
Persistence and Genetic Integrity			X	X	
Water Temperature			X		X
Sediment	X				X
Chem/nutrients		X			X
Physical Barriers		X		X	
Substrate Embeddedness				X	
Large Woody Debris	X				X
Pool Frequency and Quality		X		X	
Large Pools		X		X	
Off Channel Habitat		X		X	
Refugia		X		X	
Wetted Width/Max Depth Ratio		X		X	
Streambank Condition	X			X	
Floodplain Connectivity	X			X	
Change in Peak/base flows		X		X	
Drainage Network Increase	X				X
Road Density and Location		X			X
Disturbance History				X	
Riparian Conservation Areas		X		X	
Disturbance Regime		X			X
Integration of Species and Habitat Conditions			X		X

[1]No activity proposed under any alternative was found to have the potential to adversely affect any indicator. For more information, please see the Fisheries Report in the project file, Crescent Ranger District, Crescent, OR.
[2]Indicators that were found to potentially be affected by the Five Buttes Project will be discussed in the following section.

Water Temperature –*__Functioning at Unacceptable Risk__* –

Direct, Indirect and Cumulative Effects
No Action
No Effect. Stream and lake temperatures would be unaffected as vegetative conditions would remain unchanged.

Alternatives B and C
Stream temperatures would not be affected by the implementation of either of these alternatives as vegetative management would be limited to areas outside of the riparian reserve of stream channels. Therefore, shading by trees and other vegetation would be unchanged.

Vegetative management would occur in units 756 and 757 along the northeast shore of Davis Lake. Thinning these units to a single story of large, mature trees should not have any measurable effect on water temperature in Davis Lake. During summer months when shading is an issue, the shoreline of Davis Lake has usually receded to a couple hundred feet from the timberline. Additionally, the temperature of Davis

Lake is most significantly affected by the large surface area and shallow depths. Because of this, Davis Lake heats and cools quickly with changing weather conditions and diurnal temperature fluctuations.

Fire-killed lodgepole pine trees will be recruited into Odell and Ranger Creeks as woody debris over the next 20 years or so. These trees will add to the amount of cover provided to the stream channel, but will not likely result in measurable changes to stream temperature.

Over the next ten years, stream temperatures are expected to decrease as the result of riparian vegetation recovery and from an anticipated elevated water table (resulting from increased roughness in channel and reduced water uptake by lodgepole pine). Increased stream shade and storage of subsurface water would reduce the surface area of water exposed to solar radiation, supply the stream with cooler, hyporheic water and therefore lowered water temperatures would be expected.

Sediment –*Functioning Appropriately* –
Direct, Indirect and Cumulative Effects
All Alternatives

Increased sediment delivery to area streams or waterways is not expected to change with the implementation of any of the proposed alternatives. Due to the proximity of project activities, low stream density, high infiltration rates and highly porous soils, increased sediment delivery is not expected.

Commercial timber harvest and roads construction in particular (Rice et al 1972, Beschta 1978) have great potential to lead to additional sediment delivery to area streams. Reid and Dunne (1984) suggest that un-paved roads in particular can yield high volumes of sediment input for streams. Eaglin and Hubert (1993) showed a positive correlation between the density of stream crossings and the proportion of a drainage that was logged to the amount of fine sediments found in streams and the level of embeddedness of the substrate.

An estimated six miles of temporary road construction would occur on the upslopes. McIver (2000) and others have shown that logging roads are most often the source of increased sedimentation in streams and habitat degradation. Temporary road construction could lead to increased sediment delivery; however, this is not expected as the roads would be upslope with no connectivity to area waterways and would be decommissioned following project implementation. These temporary roads would have the potential to increase sediment routing until they are reclaimed by vegetation. Stream density in the project area is low due to the highly porous glacial moraine and Mazama ash that blanket the area (Davis Fire Rapid Assessment 2003). There are no streams flowing through proposed harvest areas as water quickly penetrates the soil and moves down slope as subsurface flow. Moderate slopes and a very flat valley bottom further contribute to this condition. Therefore there will not be an increased amount of sediment delivery to any water body.

There is potential for post-fire storm flow to contribute ash and erode soil along Odell Creek. However, due to the highly porous soils, flat topography and woody material on the floodplain and new growth of riparian vegetation, this should be limited to the area directly adjacent to the stream channels. It is expected that erosion would be relatively minor, as bank stability was estimated to be at 96% within the project area immediately after the fire. Areas of bank instability were limited to a few isolated areas where the vegetation had been burned leaving bare soils. These sites have since become re-vegetated and stable. Additional sediment input may result as dead lodgepole pine trees tip over, exposing their root mass and the soil around it. Flows in Odell Creek were not turbid during a recent rain-on-snow event.

If the water table were to become elevated as it is anticipated it should, sediment input would be further reduced. Maintaining a more consistent water table elevation, with less fluctuation would result in increased soil stability. Less erratic rising and falling of seasonal water elevations would subject the streambanks to less wetting and subsequent drying, which tends to make soils erodable. Keeping these streambanks moist would improve soil cohesion and allow riparian vegetation to become established on and stabilize more bank area.

As part of the Davis Fire Travel Management Plan, 33 miles of roads have been closed within the burn perimeter. As a general rule, decommissioning and closing roads has the potential to reduce the amount of sediment delivered to the stream channel via these mechanisms. However, given the topography and soil conditions within the project area, the roads are not hydrologically connected and are not increasing sediment delivery themselves. Roads within the riparian area are contributing to bank instability by providing access to dispersed campers, hunters, and anglers. Closure of the 600 spur along Odell Creek reduces riparian area disturbances from dispersed use.

There also exists the possibility that increased sediment could reach Odell Creek as a result of timber harvest and temporary road construction within the Davis Fire Recovery Project area. Commercial timber harvest and roads construction in particular (Rice et al 1972, Beschta 1978) could lead to additional sediment delivery to the streams. This is not expected, as timber harvest units are outside of riparian areas and reserves; the topography of the area is generally flat, with high infiltration rates for the soil and the lack of delivery mechanisms within the proposed timber harvest area.

Future culvert improvement projects at the intersection of Odell Creek and FS road 4660 and at Maklaks Creek and FS road 4668 will result in short term (less than 1 week) increases or pulses of sediment from having equipment working in or adjacent to the stream channel and removing the old culvert structures. These pulses of sediment would be short-lived and the long-term effect would be beneficial for fish, sediment and wood passage. At each site, the potential for the pipe to become plugged or blown out would decrease. In the event of a blown out culvert, for example at Odell Creek and the 4660 road, there would be a large amount of angular road fill sediment quickly released into Odell Creek, degrading habitat downstream. This would be particularly impacting to redband trout spawning, as a majority of spawning occurs downstream of this point. Silt and angular rock tend to make poor substrate for spawning as it does not turn over easily, there are reduced interstitial spaces and silts smother eggs, preventing them from receiving enough oxygen to develop and survive. As described in the turbidity section, increases of fine particles can negatively affect fishes' ability to breathe, see and eat.

In addition to reducing the risk of culvert failure, velocities would be decreased at these points as flows would no longer be funneled through a restricted area, thus decreasing stream power and reducing erosion potential.

Chemical Contaminants/Nutrients – *Functioning at Risk* –

Direct, Indirect and Cumulative Effects
All Alternatives
None of the alternatives presented should affect chemical or nutrient conditions in area water bodies. Cumulative effects are the same as the discussion in the sediment section, plus:

Water quality in Odell Lake, as well as other area lakes managed by the Deschutes National Forest, will continue to be monitored. The Oregon Department of Environmental Quality will likely be issuing a determination for Total Maximum Daily Loading (TMDL) for Odell Lake some time in 2006. Once this TMDL is established, the USFS will be responsible for meeting those water quality standards. After the standard has been issued, the Forest Service will need to work with ODFW and other agencies to determine how to reach that standard. This could include reducing the biomass of introduced fish species such as kokanee salmon and lake trout.

If the biomass of introduced species is to be reduced, this could be beneficial for the bull trout population. Reductions in the abundance of lake trout would reduce competition from another piscivorous fish and reduce predation on juvenile bull trout. Reductions in the density of kokanee may also be beneficial as fewer kokanee would be spawning on top of bull trout redds, possibly damaging them. However, the nutrients that the kokanee carcasses supply to Trapper Creek would be decreased.

Fire retardant dropped in the project area (June 2003) is assumed to have dissipated by now as described by Sussmann (2003) in his Soils Specialist report for the Davis Recovery EIS.

Large Woody Debris – ***Functioning at Risk***

Large wood is an important component of healthy and properly functioning streams. Before the 1970s, large wood was generally considered a nuisance or hazard in streams throughout the world. Large wood was systematically removed from streams to benefit river navigation, prevent or decrease flooding effects, enhance log transportation and improve fish passage (Messer and Sedell 1994 in Reich 2003). The emerging body of literature documents the role of large wood in structuring the physical template in streams (Montgomery et al 2003, Abbe and Montgomery 2003; Gregory 2003) the importance of wood in nutrient cycles (Bilby 2003) and the role of large wood in streams as fish habitat (Roni and Quinn 2001; Zalewski et al. 2003; Dolloff and Warren 2003 *in* Reich 2003).

Recent restoration efforts in Odell Creek have placed large woody debris in the stream channel, so that currently the stream does meet the large wood recommendation for east side streams; however, west side standards may be more appropriate given the location of the stream and the precipitation (up to 70 inches annually) that the area receives.

Large wood is nearly non-existent in Davis Lake. During the early 1990s a few small wood clusters were placed at the outlet of Odell Creek; some of these have since been deposited on the floodplain, while others are providing cover for fish.

Using the Region 6 Level 2 Stream Inventory protocol, woody debris within the bankfull channel of Crescent Creek was classified into three size classes. The three size classes used for east side streams are small (20 feet by 6 inches at the small end), medium (35 feet by 12 inches) and large (35 feet by 20 inches). Results of the 2002 survey are listed in Table 3-73.

Table 3-73. Woody debris abundance within bankfull channel of Crescent Creek.

Reach	Pieces of Medium and Large Wood	Pieces of Small Wood	Pieces of Medium and Large per Mile	Pieces of Small per Mile
1	55	185	32.4	108.9
2	16	49	17.9	54.7
3	2	13	5.4	35
4	11	90	14.3	117.1
5	4	23	8	45.9
6	8	71	20.1	181.5
8	35	371	28.3	300
10	35	194	76.5	423.8
11	16	177	16.3	180.7

As with most of the streams in this area, the most abundant size of woody material is in the small range. This is due to the tree community adjacent to most streams is dominated by lodgepole pine. These trees generally have a relatively short life expectancy and typically do not grow to be very large in size.

Direct, Indirect and Cumulative Effects
All Alternatives
No instream work would occur as part of this project. Wood would neither be added nor removed from stream channels. Wood recruitment will continue to occur from riparian contributions and not upslope sources as would occur in landslide and debris torrent landscapes.

None of the proposed alternatives would contribute to nor reduce the recruitment of large woody debris to area streams. There may be a slight reduction of small wood contributions along the shoreline of Davis Lake as the result of implementing Alternative B or C. These alternatives would thin small diameter trees in units 756 and 757 to promote the growth of large ponderosa pine trees in a Bald Eagle Management Area (BEMA). The potential loss of small tree recruitment at this site would be offset by the increased growth of large ponderosa pine trees which someday will contribute more significantly to instream wood mass and function than small diameter trees would.

Large wood recruitment to area water bodies is not anticipated to be affected regardless of which alternative is selected. Riparian Reserves are being maintained at 300 feet for all perennial streams and 50 feet for ephemeral drainages.

Dead and dying lodgepole pine trees resulting from the Davis Fire are and will continue to fall over for the next 20 years or so, contributing to the volume of instream and floodplain wood along lower Odell Creek, Ranger Creek and lower Moore Creek. Once all of the streamside trees that were killed during the Davis Fire of 2003 fall over, it will likely be a long while before new trees can grow to size and then be recruited to the stream themselves. This area is to be replanted with native shrubs and Engelmann spruce.

The Five Buttes project, when combined with Seven Buttes Return, Crescent WUI, Charlie Brown, the Davis Fire and Davis Fire Recovery, will have no effect on wood recruitment to area water bodies. With the exception of the Five Buttes project, these projects have no commercial harvest within riparian reserves; none of the projects would prevent or reduce attainment of large wood.

Streambank Condition – *Functioning Appropriately*

1998 Odell Creek stream survey data indicates bank stability of 98% for all three reaches. Survey data also points out that undercut banks are common, which strongly correlates with stable banks. Following the Davis Fire, approximately 400 feet of streambank within Reach 1 were found to be actively eroding or unstable. These areas of instability resulted from a loss of riparian vegetation. Bank stability within Reach 1 was estimated to be at 96% post fire (Figure 3-37). One year after the fire, vegetative recovery was apparent (Figure 3-37).

Crescent Creek
The banks of Crescent Creek are very stable. Dachtler (2001) noted that bank stability was at or near 100% in reaches 1, 2, 3, 5, 6, 7, and 9. Bank instability was minimal in reaches 4, 8, 10 and 11.

Direct, Indirect and Cumulative Effects
All Alternatives
No instream work would occur as part of any of the proposed alternatives and stream bank stability should be unaffected.

Areas of instability within the Davis Fire area will likely stabilize as riparian vegetation becomes reestablished. A logjam construction project implemented during the summer of 2004, along with natural recruitment of burned lodgepole pines, will likely provide additional stability by reducing stream velocities and energies and by reducing shear stress. By increasing roughness and floodplain connectivity, stream power would be decreased and so too would be erosion potential. As floodplain connectivity is improved, suspended fine sediments can be deposited on the floodplain and near bank shear stresses reduced. Figure 3-39 contains four images of rehabilitation work completed on Odell Creek. These photos show the high level of vegetative recovery as well as improvements to channel stability and increased habitat complexity.

Figure 3-37. Area of unstable banks within Reach 1 of Odell Creek immediately after the fire (July 2003).

Figure 3-38. Vegetative recovery one year post fire (8/2004).

Figure 3-39. Photos of stream rehabilitation of Odell Creek and improved bank stability, habitat complexity and channel stability.

Increase in Drainage Network - *Functioning at Risk*

Odell Creek

There is a high road density within all the project sub-watersheds with the exception of Odell Lake (see Table 3-74). These roads, however, have not led to an increase in the drainage network as the roadside drainage ditches are not hydrologically connected to the stream network. The highly absorbent pumice soils result in the subsurface movement of most water down-slope. That is not to say that water does not move down the road surfaces, as it most certainly does, but these flows do not continue on to connect with any ephemeral channels or surface water streams. Flows moving down a road are generally short during summer thunderstorm events and then the water is quickly absorbed into the soil.

Table 3-74. Road densities by subwatershed in the planning area (Kittrell, 2005).

Subwatershed Name	Operational Open Road Density	Objective Open Road Density	Total Road Density
Cold Creek	2.30	2.17	2.75
Cryder#	4.48	4.45	4.49
Davis Creek*	3.45	2.91	4.42
Davis Lake*	3.26	2.52	5.48
Hamner	3.33	2.49	4.35
Lower Crescent Cr#.	4.35	4.09	4.64
Middle Crescent Cr.	3.21	2.81	4.50
Moore Creek*	2.49	1.62	3.67
Odell Creek	2.31	2.20	4.44
Odell Lake*	0.56	0.55	0.58
Wickiup#	5.09	3.73	6.26

* - Acreage of lakes and/or Designated Roadless Areas have been subtracted from the total area of the subwatershed used to calculate road densities. The exception is Odell Lake, where only the area of the lake has been subtracted from the subwatershed acreage. In this case, the majority of roads are around the perimeter of the lake, which is surrounded by land in various roadless allocations; to subtract that land area in this peculiar case would result in artificially high road densities that do not accurately reflect the circumstances of the surrounding subwatershed.

\# - These subwatersheds encompass land outside of the National Forest and contain roads not under Forest Service jurisdiction.

Direct, Indirect and Cumulative Effects

No Action Alternative

There would be no net gain in drainage network resulting from this alternative as no new permanent or temporary roads would be constructed.

There is likely to be no increase in drainage network as the result of implementing the proposed alternative as no new, permanent road construction would occur. Under alternatives B and C, up to six miles of temporary road would be constructed. Temporary roads would be decommissioned following project implementation, but would continue to have the potential for water movement until the time that they become completely revegetated and decompacted. Temporary roads, however, should not have hydrologic connectivity to surface water bodies and would be constructed outside of riparian reserves.

No projects or activities have been proposed or are foreseeable that would result in an increase in the drainage network.

Watershed Conditions

Road Density and Location - *Functioning at Risk*
Road densities within the Odell Creek Riparian Reserves are 2.0 miles per square mile (Odell Watershed Analysis, 1999). As part of the Davis Fire Recovery Project 33 miles of road within the project area are closed (Davis Fire Roads Analysis, 2003).

Road density (see Table 3-73) has been linked to a series of negative effects to the aquatic environment, including increased drainage miles and altered water chemistry. Snyder et al. (1975) found precipitation runoff leached nutrients from the exposed soil and provided increased nutrient concentrations directly to the stream. Wemple et al. (1996) demonstrates how road systems can increase peak flow and that drainage ditches can form gullies that lead to streams.

Rieman et. al. (1997) has shown that within colder subwatersheds (mean annual air temperature <5.1°C), bull trout populations were reported as strong nearly seven times more frequently in those with less than 2.5 miles of road per square mile than those with more.

Forestry practices, including roading, have been linked to declines in diversity of fish populations in the Pacific Northwest. Primary explanations are poor egg and juvenile survival because of increased temperatures, frequent fine sediment input and reduced legacies, primarily large woody debris in streams (Sarr et. al. 2005).

Direct, Indirect and Cumulative Effects
All Alternatives
No roads have been identified for closure or decommissioning as part of this project proposal. Up to six miles of temporary road construction would occur under Alternative B. These roads would be decommissioned after project implementation.

Newly created temporary roads in the Davis Fire Recovery project will use native surface materials as road beds for harvesting; this would provide runoff potential and increased nutrient loading to streams until these roads are restored to a natural condition after harvest and post harvest treatments occur (Snyder et al. 1975). Due to the highly porous soils and generally flat topography I do not anticipate surface flows carrying sediment or nutrients to the stream or lake as a result of temporary road construction.

Disturbance Regime - *Functioning at Risk*
Originating from Odell Lake, with up to 50% of summer flows being contributed by springs, flows within Odell Creek are relatively stable and predictable (see Table 3-75). Scour events and debris torrents are not common occurrences within this system. Peak flow events generally occur in the spring as the result of snowmelt. Rain on snow or summer thunderstorm events are capable of producing sediment transport to the stream despite the rapid infiltration rates of the surface mineral soil component. Soil particles can become detached and mobilized in areas which are not adequately vegetated or when infiltration rates are not fast enough to keep up with the volume of water present on the surface.

Table 3-75. Odell Creek Discharge in CFS for indicated recurrence interval in years and annual exceedancte probability in percent.

Recurrence interval Annual probability of exceedance	1.25 80%	2 50%	5 20%	10 10%	25 4%	50 2%	100 1%
cfs	171	236	345	430	556	662	781

(14055500 Odell Creek water master statistical summary for period of record 1934-1976)

The Davis Fire of 2003 burned 21,000 acres, including a considerable portion of the lower Odell watershed, nearly 2 miles along Odell Creek (see Table 3-76). This disturbance has significantly altered the vegetative community along the stream. Nearly all of the lodgepole pine that grew in the riparian areas has been killed. Grasses, forbs and deciduous trees were burned as well, but are showing great recovery. The diminished stream shade will likely result in increased solar radiation and higher stream temperatures during summer months. Trees killed by the fire are expected to fall and contribute notably to the amount of instream woody debris. The increased amount of in-channel woody debris will provide additional stream cover and help offset the loss of shade provided by trees. Recovery of riparian plant species will likely occur relatively quickly. Grasses were found to be growing within a week of when the fire burned over the area. Willow clumps also displayed new growth within a matter of weeks following the fire. Establishment of deciduous riparian species will probably be improved as the result of reduced competition from encroaching lodgepole pine. Willow, mountain alder, bog birch, serviceberry and snowberry are becoming re-established across the floodplain.

Peak flows may increase slightly due to the reduction in vegetative cover from the Davis Fire. Evapotranspiration will likely be reduced, as precipitation will fall directly to the forest floor rather than being intercepted by foliage. Infiltration rates will remain high; however storage of rain and snowfall will probably be reduced. Given that this area of disturbance is at the lower end of a somewhat closed system, increases area expected to be minor.

Table 3-76. Sixth field watersheds affected by Davis Fire (Davis Fire Rapid Assessment).

6th Field Watershed Name	Acres	% of subwatershed within burn perimeter
Middle Crescent Creek	18,051	1
Lower Crescent Creek	26,964	2
Hamner Butte	13,360	27
Odell Creek	13,830	23
Davis Lake	22,505	37
Davis Creek	17,639	7
Wickiup	26,963	17
Moore Creek	14,748	<1

<u>Crescent Creek</u>
Flows in Crescent Creek have been dictated by dam operations since the 1920s. Minimal flow is released during winter months when water is being stored for use during the summer irrigation months. Flows between the Crescent Dam and the confluence with Big Marsh Creek are generally low during historic peak flow times as minimal water is being released from Crescent Lake. Supplemental water is contributed from Cold Creek as well as several small seeps and springs. Downstream of the confluence with Big Marsh Creek, peak discharges are composed primarily of water from Big Marsh Creek, with little contribution from the upper Crescent Watershed.

Direct, Indirect and Cumulative Effects
All Alternatives

Project activities are not expected to result in any measurable changes in flow timing or volume. This is due to the highly porous soils, relatively low amount of precipitation, generally flat topography and lack of proximity of activities to riparian areas and live bodies of water.

Species and Habitat
Integration of Species and Habitat Conditions - *<u>Functioning at Unacceptable Risk</u>*
Odell Creek is a relatively stable stream. Base and peak flows are generally consistent and predictable. This system is not prone to scour events, debris torrents or wild fluctuations in discharge. Water temperatures tend to be high (summer average of 17.6°C, 25°C maximum) in the upper reach of Odell Creek, as stream flows originate from the surface water of Odell Lake. Several small springs and spring fed tributaries help cool Odell Creek to about 11°C mean summer temperature by the time it reaches Davis Lake.

Fish habitat is generally good within the lower two reaches. Several deep pools can be found along with access to cover and off channel habitat. The uppermost reach is dominated by long riffles with a few nice pools intermixed. All three reaches could benefit from increased amounts of large woody debris. Wood counts throughout the stream are high for east side streams; however, the size is generally small. Instream wood is typically lodgepole pine smaller than 14 inches in diameter. Larger material clustered together in logjams would more effectively create and maintain quality pool habitat, and restore floodplain connectivity.

During the past century, bull trout were found throughout the Odell watershed. Bull trout were known to spawn in tributaries to Odell Lake and possibly Odell Creek and its tributaries. Bull trout are believed to have migrated from Odell Lake to Davis Lake and used Odell Creek for foraging. Bull trout have since nearly been lost from the watershed. A depleted population, the last remaining natural, adfluvial population in the state of Oregon, still exists in Odell Lake. These fish utilize Trapper Creek (Odell Lake tributary) for spawning. A few adults have been found in the upper reach of Odell Creek during recent years and juveniles have been found in the mainstem as well as a few spring-fed tributaries during 2003-2005 surveys.

A rock weir at the outlet of Odell Lake has been maintained for a period of 50 years or more. The operators of the East Odell Lake Lodge and/or Odell Lake cabin owners typically install the weir in late June in an attempt to raise the residual water level of Odell Lake. The stated purpose of this structure is to make area docks accessible during typical low water level times (June through October). This weir may be blocking fish migration from Odell Lake to Odell Creek and vise versa.

Redband trout and mountain whitefish inhabit Odell Creek and both species appear to be doing quite well. Snorkel surveys conducted by USFS personnel have documented seeing several hundred of each species within ¼ mile sections. Davis Lake and Odell Creek are regulated by the Oregon Department of Fish and Wildlife as fly fishing only bodies of water. Trophy sized trout (24”+) are not uncommon in Davis Lake.

Two introduced fish species, largemouth bass and tui chub, have established thriving populations within Davis Lake. These fish flourish in the warm waters that Davis Lake provides during summer months. ODFW and USFS try to reduce bass numbers by annually conducting electroshocking removal efforts from boats.

Lodgepole pine trees appear to have encroached upon the riparian area of lower Odell Creek prior to the 2003 Davis Fire. This has likely occurred as the result of slight channel degradation and fire exclusion. The resulting lowered water table along with a decrease in floodplain connectivity would lead to drier soils in the riparian flats. Lodgepole pine was then likely able to become established and out compete moisture dependent riparian species.

The Davis fire has killed the encroaching lodgepole pine and has afforded riparian grasses, sedges and shrubs the opportunity to once again dominate the floodprone area. Instream woody debris will increase as dead and dying trees continue to fall over. This increase of instream woody debris will assist the recovery of the riparian plant community by creating logjams, and restoring the vital floodplain connectivity and function.

<u>Crescent Creek</u>
Crescent Creek, in contrast to Odell Creek, is heavily influenced by human activities and modifications. One of the most significant detractors to the health of the stream is the highly modified flow regime out of Crescent Lake and the loss of passage at this structure. The flows do not mimic natural conditions and likely have a negative effect on native fish communities. Introduced non-native brook trout and brown trout have become the dominant fish species within this water body.

A dam structure at the outlet of Crescent Lake blocks migration between Crescent Lake and Crescent Creek. Bull trout that once inhabited the lake and probably used Cold and Crescent Creeks for spawning have become extirpated. Once the new dam structure was constructed in 1956, bull trout were no longer able to out migrate to spawning areas and areas of spring flow into the lake which could have been used for spawning were flooded out. http://www.usbr.gov/dataweb/html/crescent.html#general

Direct, Indirect and Cumulative Effects

No Action Alternative
Alternative A would have no effect on the integration of species and habitat conditions.

Alternatives B & C
The Five Buttes project **May Affect but is not likely to Affect** aquatic species (including bull trout and redband trout) or their habitat within the planning area. Project activities will occur outside of riparian reserve boundaries of all streams, and therefore will not affect shading, soil contributions or large wood recruitment. Two units would enter the riparian reserve of Davis Lake on the eastern shore, which is managed for a nesting bald eagle pair. Within these units, the prescription is to thin small diameter trees to promote nesting, roosting and foraging habitat for the eagles. Treatments would not affect bull trout or redband trout as only small diameter trees are to be removed, promoting the growth of larger, mature trees. These units lie at the bottom of a closed watershed at a location with little if any bull trout use.

The Davis Fire Rehabilitation Project likely had little or no negative effect on bull trout, redband trout or their habitat. Timber harvest occurred well outside riparian reserve areas. Timber harvest was limited to trees with 100% mortality due to the fire. Helicopter logging was utilized on areas with moderate or steep slopes. Given that there are no streams or sediment delivery mechanisms in timber harvest units, it is unlikely that there would be any increase in sediment delivery to any of the area bodies of water. This is evidenced by a greater than bankfull event occurring in January 2006 as the result of a rain on snow event, in which Odell Creek continues to flow. Furthermore, the generally flat topography of the area and the highly porous soils allow for precipitation to infiltrate the soils and move downslope subsurface. Riparian shrub and grass recovery will likely occur within the next ten years at various levels depending on whether the areas are planted or not.

Additional future stream rehabilitation projects, culvert improvement and the removal of passage barriers should result in the recovery of the Odell Lake bull trout population during the next 25 years.

There are no foreseeable future activities that would be additive to the affects of any action proposed in the Five Buttes project.

Hydrology and Water Quality

Management Direction

Clean Water Act

The State of Oregon, as directed by the Clean Water Act and the Environmental Protection Agency, is responsible for the protection of rivers and other bodies of water in the public interest. Oregon Administrative Rules, Chapter 340 list the beneficial uses in the project area as:

- Public Domestic Water Supply
- Private Domestic Water Supply
- Industrial Water Supply
- Irrigation Water Supply
- Livestock Watering
- Fish and Aquatic Life
- Wildlife and Hunting
- Fishing and Boating
- Water Contact Recreation
- Aesthetic Quality

Information from Table 130A, Designated Beneficial Uses, Oregon Department of Environmental Quality (DEQ)

The State is required by the Clean Water Act, Section 303(d), to identify waters that do not meet water quality standards. Odell Creek and Crescent Creek are listed by Oregon Department of Environmental Quality (DEQ) under Section 303(d) as water quality limited water bodies due to excessive water temperatures during summer months.

The Forest Service responsibilities under the Clean Water Act are defined in a 2002 Memorandum of Understanding between DEQ and the Forest Service. The MOU designates the Forest Service as management agency for the State on National Forest System Lands.

Utilizing Best Management Practices (BMP) in project implementation is a requirement of the Clean Water Act, which requires the State of Oregon to develop a statewide water quality management plan and to set standards for water quality. The BMPs are reviewed periodically to see if state standards are being met. The current BMPs have been determined to meet or exceed state requirements (USDA Forest Service, 1988). BMPs that apply to this project are identified in Chapter 2 of this EIS.

Northwest Forest Plan

All alternatives in the Five Buttes project comply with the Riparian Reserve and Key Watershed standards and guidelines as specified in the Northwest Forest Plan (see Appendix A of this EIS).

The Deschutes National Forest LRMP was amended in 1994 by the Record of Decision for Amendments to the Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (Northwest Forest Plan). An essential piece of the Northwest Forest Plan is the Aquatic Conservation Strategy (ACS), which “was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands” (USFS 1994, B-9). The Odell Creek 6^{th} field watershed is a Tier 1 Key Watershed; it contributes directly to the conservation of the threatened bull trout and resident fish populations. The NWFP specifies standards and guidelines for Key Watersheds and Riparian Reserves that prohibit or regulate activities that retard or prevent attainment of the ACS Objectives.

The primary water quality management stated by the ACS is that all activities shall be designed to maintain or improve ecological health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources. This approach seeks to prevent further degradation and restore habitat over a broad landscape.

Riparian resources on the majority of the federal lands in the Five Buttes project area (about 133,565 ac.) are managed according to the Northwest Forest Plan. The Inland Native Fish Strategy (INFISH, 1995) provides interim direction to protect habitat and populations of resident native fish on public lands east of the Northwest Forest Plan boundary; however, the Five Buttes project has no proposed activities adjacent to perennial or intermittent stream channels located east of the owl line.

Scope of Analysis
Water Quality and Riparian dependent resources may be directly, indirectly, and cumulatively affected within watersheds and subwatersheds in the Five Buttes planning area. This analysis will look at the subwatershed scale. This is the most logical unit of measurement to assess effects from past management activities and how it relates to water quality and riparian habitat.

The Five Buttes project is in three 5th field watersheds: Wickiup, Middle Crescent Creek, and Crescent Creek. Table 3-77 displays the 6th field watersheds and acres included in the area. There are no proposed activities in Odell Lake Subwatershed; therefore, it will not be analyzed.

Table 3-77. Watersheds, Subwatersheds and Percent of Watersheds in the Five Buttes project Area.

5th Field Watershed	6th Field Subwatershed	Subwatershed Acres Total	Percent in Five Buttes project Area
Wickiup	Odell Lake (huc # 170703010201)	23,169	100
	Odell Creek (huc # 170703010202)	13,831	100
	Moore Creek (huc # 170703010203)	14,704	100
	Davis Lake (huc # 170703010204)	22,506	100
	Browns Creek (huc # 170703010205)	13,004	0.9
	Davis Creek (huc # 170703010206)	17,637	66
	Wickiup (huc # 170703010207)	26,963	26
Middle Little Deschutes River			
	Hamner Butte (huc # 170703020301)	13,360	91
	Cryder East (huc # 170703020302)	17,009	17
Crescent Creek			
	Cold Creek (huc # 170703020205)	13,436	100
	Middle Crescent Creek (huc # 170703020206)	18,051	100
	Lower Crescent Creek (huc # 170703020207)	19,191	100

The project area is approximately 160,000 acres in size and has a drainage area of 274 square miles. Elevation in the project area ranges from 4,391 feet above mean sea level (msl) at Davis Lake to 7,818 feet above msl at Maiden Peak.

Existing Condition

Large moist air masses accumulate over the Pacific Ocean and move west to east over Oregon crossing the coast mountain range and the higher Cascade Mountain range before reaching the analysis area. As much as 80 inches can fall on the crest of the Cascades as clouds reach their highest elevation. Precipitation rates drop drastically from the crest of the Cascades east into the analysis area and range from 25 to 50 inches. Elevations in the analysis area range from 4,000 feet above mean sea level (msl) to 7,098 msl. As a result, precipitation falls mostly as snow between November and May with average accumulations of three to five feet. Uncommon winter storms that come from the southwest can produce warm winds and rain that quickly reduce the snow pack, causing increases in peak flows. Summer thunderstorms can produce large amounts of rain in a short time; resultant runoff is absorbed into the soil. These systems are fast moving, usually coming from the south or southwest, and can produce rainfall amounts of 2 to 3 inches per hour.

Five major perennial streams (Odell Creek, Maklaks Creek, Crescent Creek, Ranger Creek and Davis Creek) and one named ephemeral stream (Moore Creek) flow in or through the project area. Major water bodies within or adjacent to the project area include: Davis Lake, Wickiup Reservoir, Odell Lake and Crescent Reservoir. There are numerous intermittent/ephemeral streams in the project area.

Odell Creek subwatershed is designated as a Tier 1 Key watershed. The State of Oregon owns an in-stream water right for Odell Creek dated September 24, 1990. Ownership limits are described in Table 3-78.

Table 3-78. Instream Water Rights for Odell Creek.

Period	Flow (cubic feet per second)
October 1- December 31	82
January 1- February 29	70
March 1- May 31	85
June 1- June 30	70
July 1- August 31	50
September 1 – September 30	82

Odell Creek is a low gradient stream, about 0.6% from the mouth to the confluence with Maklaks Creek and then increases to approximately 1.2% to the outlet at Odell Lake. Most of Odell Creek is characteristic of a Rosgen C3 or C4 type channel (cobble/gravel dominated with less than 2% average slope, sinuosity greater than 1.4, entrenchment of 1.4 to 2.2 and a bankfull width to depth ratio of greater than 12).

Maklaks Creek is a perennial spring-fed creek that originates on Maklaks Mountain and is a main tributary to Odell Creek. Maklaks Creek and two other spring-fed tributaries feed into Odell Creek and contribute approximately 50% of the flow during summer months (Dachtler 1998).

Ranger Creek originates from springs and flows approximately one mile into Davis Lake. Both Ranger and Odell Creeks enter Davis Lake on the south side. Moore Creek is an intermittent stream in the lower reaches as it enters Davis Lake and a perennial stream further up the drainage towards Bobby Lake. Flows from Moore Creek occur during spring melt-off and stream flow usually stops in the first part of June.

There are other draws that originate on the west and east sides of Davis Mountain, and Hamner Butte, and west of Ranger Butte, but these draws show no evidence of stream flow and have no aquatic vegetation associated with them. This probably is a result of the depths of pumice deposited in draws during the eruption of Mt. Mazama.

Davis Lake was created approximately 5,500 years ago by a lava flow that dammed Odell Creek. There is no surface outflow from this impoundment making it a topographically closed basin (USDI, 1968). Water seepage and surface evapotranspiration account for the loss of water from this shallow lake. Seepage rates are estimated to be 150 cubic feet per second (cfs) on average, with more seepage occurring during periods of elevated lake levels (Phillips, 1968). Previous studies have not been able to definitively identify where seepage water from Davis Lake goes, although it is believed and likely that water is delivered to Wickiup Reservoir through subsurface spring flows (McCammon, 1982). Lake elevations have fluctuated from an estimated elevation of 4395.4 before 1728 to a low of 4376.1 in 1941 (Phillips, 1968). During the 1980s the low lake surface level has ranged in elevation from 4389 in 1984 to 4379 in 1988, a difference of 10 feet within four years (Lake Elevation Graph). Lake elevations are a direct reflection of precipitation for the year; during low water or drought years the lake is low and the lake is high during high water years (Phillips, 1968).

The annual water budget of Davis Lake is as follows:

1. Infalling precipitation, 36 inches depth (8,000 ac-ft).
2. Inflow from Odell Creek and tributaries 150ft^3/s (109,000 ac-ft)
3. Evaporation loss 30 inches (8,000 ac-ft).
4. Outflow by seepage, 150ft^3/s (109,000 ac-ft).
5. Observed lake level has ranged from a minimum of 4,375.9 feet on October 20, 1942, to a maximum 4,393.2 feet high water mark 1957, total contents is approximately 45,000 ac-ft.

Crescent Creek originates from Crescent Lake. A dam is operated at the outlet of Crescent Lake by the Tumalo Irrigation District. Irrigation water is stored in Crescent Lake through the winter months and released in the summer. Flow in Crescent Creek is highly modified below the dam structure. Winter flows from the dam to the confluence with Big Marsh Creek are often in the range of 3 to 9 cfs, while summer discharge averages about 120 cfs (Bureau of Reclamation 2004). From the dam at Crescent Lake to the intersection with County Road 61, Crescent Creek is part of the National Wild and Scenic Rivers System. The large ponderosa pine trees and the narrow canyon adjacent to Odell Butte have contributed to the determination that vegetation and scenery are the Outstanding Remarkable Values (ORV) for this river segment. The Wild and Scenic Rivers Act requires that these and other river-related values be protected and enhanced. The Deschutes National Forest Land and Resource Management Plan requires that harvest of trees will be oriented towards enhancement of scenic, hydrologic, fisheries, recreational, and/or wildlife values. The interim Wild and Scenic river buffer corridor is ¼ mile (1320 feet) on either side of the stream. The standards and guidelines in the Forest Plan will serve as an interim management direction until formal river corridor management plans are completed and the Forest Plan is amended to include the appropriate direction

Crescent Creek was surveyed using Region Six stream protocol (USFS 1988) in 1990 (Houslet and Hollister 1990) and 1992 (anonymous) from County Road 61 to the outlet of Crescent Lake. A more recent survey of the stream was completed from the private/FS boundary near the 61 road to the Highway 58 bridge and from the private property boundary to the dam at Crescent Lake during the summer and fall of 2000 (Dachtler 2001).

The substrate of Crescent Creek between County Road 61 and Highway 58 is dominated by small boulders, and to a lesser extent with cobble and large boulder. Gradient in this section averages 3%, and is confined by a steep canyon. Large and small boulders provide primary instream cover in this section with small woody debris being secondary. Upstream of Highway 58, the gradient of Crescent Creek decreases and the valley floor widens in this 7.5-mile reach. The stream channel gradient averages between 1% and 2%. Numerous backwater and side channel areas are in this section. Habitat distribution has a fairly even balance between pools, riffles, and glides. Instream cover consists of undercut banks, wood and turbulence.

Crescent Creek discharge fluctuates greatly due to an irrigation dam at the outlet of Crescent Lake. Flow regulation at Crescent Lake Dam is probably the greatest limiting factor affecting fish habitat. Because of flow modifications, the natural hydrograph of Crescent Creek has changed to low flows prevalent between September and April during reservoir storage months and high flows during the rest of the year. The State of Oregon owns an in-stream water right to Crescent Creek from the confluence with the Little Deschutes River to the Crescent Lake Dam. This Water Right is dated 10-11-1990. Ownership limits are described in Table 3-79.

Table 3-79. Instream Water Rights for Crescent Creek.

Period	Flow (cubic feet per second)
January	75
February	75
March	125
April	125
May	125
June	75
July	50
August	50
September	50
October	50
November	108
December	125

Streamflow

Stream density is very low in the Five Buttes project area due to the depth of the highly porous pumice soils. Table 3-80 lists miles of perennial, intermittent and ephemeral streams by subwatershed. See Figure 3-41 for locations of streams and riparian areas in the Five Buttes project area.

Table 3-80. Five Buttes Project Area streamflow.

Subwatershed	Perennial Miles	Intermittent Miles	Ephemeral Miles	Stream Density mi/mi^2
Cold Creek	14.75	18.77	0	1.59
Cryder Butte	2.50	.738	.87	.15
Davis Creek	0	0	1.91	.07
Davis Lake	0	5.84	3.13	.25
Hamner Butte	0	0	19.9	.95
Lower Crescent Creek	14.04	0	18.04	1.07
Middle Crescent Creek	7.1	5.9	7.02	.70
Moore Creek	0	8.68	6.64	.66
Odell Creek	16.3	3.30	7.03	1.23
Odell Lake	22.19	12.86	0	.96
Wickiup	0	0	5.66	.13

Stream Temperatures

Water temperatures recorded in Odell Creek during the summer of 1998 averaged 17.6°C at the outlet of Odell Lake/origin of Odell Creek (Table 3-81). Maximum water temperatures exceed 25°C during the months of July and August. Tributaries such as Maklaks Creek, and a few other small springs contribute water that averages 4°C during summer months. The cooling effect of these springs reduces the temperature of Odell Creek to an average of 11.6°C by the time it reaches Davis Lake (Dachtler 1998). A small rock weir constructed during summer months at the outlet of Odell Lake may contribute to increased water temperatures in Odell Creek as additional lake surface water is stored and exposed to increased solar radiation in Odell Lake.

Table 3-81. Maximum, minimum and mean 1998 summer temperatures near the outlet of Odell Lake (upper) and at the footbridge above Davis Lake (lower).

Temperature Type	Outlet of Odell Lake º C	Near inlet to Davis Lake º C
Maximum	25.2	20.2
Minimum	11.4	5
Mean	17.6	11.6

(Source: Deschutes Basin FLIR Report, 2002).

Odell Creek is warm at its origin, then cools significantly with the input from the cold spring fed tributaries, then gradually resumes warming as it moves towards Davis Lake.

In 1999, before the Davis Fire, the average stream temperature from July 10 to October 6 increased between the site below Maklaks Creek and the footbridge by an average of 1.10°C. In 2004, the stream increased by an average of 1.99°C within the same reach and time frame. Likewise the average maximum temperature in 1999 increased 2.36°C between the two locations, while the average maximum temperature increased an average of 3.47°C in 2004. There are other factors such as weather (air temperature and precipitation) and stream flow that could influence this data. However, it is to be expected that lower Odell Creek would show increased stream temperatures as a result of increased solar radiation due to the loss of shading vegetation following the fire.

Lodgepole pine encroachment, particularly along the lower two miles of Odell Creek, has likely had a negative effect on water temperatures during summer months. The once wet meadow has transitioned from a riparian dependent, sedge/shrub dominated flat to a dry lodgepole pine flat. Lodgepole encroachment has been facilitated by fire exclusion, stream cleanouts (removing woody debris from the channel) and from the reduction in beaver activity. These three factors have lowered the water table to the point that lodgepole pine trees could out-compete riparian dependent native sedges and shrubs. Riparian shrubs such as willow help reduce the effects of warming due to solar radiation by providing shade and bank stability. The broad, bushy shape of these shrubs can provide more shade to a small stream channel than the tall, spindly lodgepole pine trees can. Riparian dependent sedges and shrubs also provide bank stability, maintaining a relatively deep and narrow low-flow stream channel, which reduces the surface area of water exposed to the warming effects of solar radiation.

Davis Lake is shallow with a large surface area; it heats up quickly during the day and then quickly cools at night. Davis Lake is typically in the 20°C to 25°C range during the day in summer months and around 16°C at night.

Crescent Creek originates as surface water from Crescent Lake and therefore begins its journey as a warm body of water during summer months. As the chart below shows, Crescent Creek continues a general warming trend until about river mile 19 at which point it begins to cool very slightly.

Sedimentation

Forest Service Roads are the major contributor to erosion and stream sedimentation. Roads will concentrate flow in roadside ditch areas that have decreased infiltration rates due to road construction. In some cases these roads are sloped down into the stream as the roads approach the stream channel. This area can be used to identify the aquatic influence zone, which might be affected by these road and ditch features. Roads can add sediment to streams, influence stream migration, reduce floodplain efficiency, affect riparian vegetation, and disrupt travel paths of riparian dependent species.

The topography is flat at the majority of road crossings and riparian areas, limiting the water that is available to the ditch to that which is directly adjacent to the stream channel. Soils in these areas are outwash plains of a thick layer of coarse pumice that exhibits high infiltration rates (SRI, 1976). As a result, flows rarely occur in roadside ditches. Many roads in the project area are closed during winter months due to heavy snow.

Potential sedimentation from the upslope areas, Odell Butte, Hamner Butte, Odell Butte, Maklaks Mountain, and Davis Mountain, can be analyzed by looking at current ground cover and past vegetation or fuels management activities that may have reduced it. With the exception of the Davis Fire area, ground cover in the upslope areas is within standards and guidelines in the LRMP (SL-6).

The Davis fire area was monitored for over-land surface flows in May 2004, June 2005, and May 2006. Monitoring showed very little movement of surface soils in the upslope area. Small, short areas of soil movement were observed in road prisms. In the majority of cases, rills traveled short distances, moved off the roadway at water bars, and finally traveled down hill (less than 50 feet) to be reabsorbed into the soils. No movement of surface soil was observed entering and stream channel or wet area (Davis Fire monitoring reports are on file at the Crescent Ranger District).

Due to the high infiltration rate and depth of the pumice soil, stream density on Hamner Butte, Maklaks Mountain, Odell Butte and Davis Mountain is considered low. Water moves downslope subsurface until it encounters the water table adjacent to Odell Creek or Davis Lake.

During 1998 Forest Service level II stream surveys, substrate was visually estimated in each main channel habitat unit and two modified Wolman pebble count surveys were performed in each reach of Odell Creek (Tables 3-82 and 3-83). Both the estimated substrate and pebble counts indicated that gravel and cobble were the most common types of substrate with cobble being more dominant in reaches 2 and 3. Amounts of fines were highest in reach 1 while boulders were more common in reach 3.

Table 3-82. Estimated percent substrate within the wetted main channel of Odell Creek.

Reach	Sand <.08”	Gravel	Cobble	Boulder	Bedrock
1	14.4 %	72.7 %	12.2 %	0.6 %	0.0 %
2	13.1 %	45.7 %	39.8 %	1.2 %	0.2 %
3	4.7 %	40.0 %	50.5 %	4.5 %	0.4 %

Table 3-83. Substrate percentages from pebble counts within the bankfull channel of selected riffles of Odell Creek.

Reach	NSO #	Riffle #	Sand < .08”	Gravel	Cobble	Boulder
1	39	16	25 %	72 %	4 %	0 %
1	66	28	34 %	43 %	23 %	0 %
2	107	44	12 %	60 %	28 %	0 %
2	125	51	12 %	39 %	49 %	0 %
3	178	72	11 %	30 %	42 %	17 %
3	210	83	15 %	40 %	38 %	2 %

Crescent Creek has been sediment starved, especially in the upper reaches, as a result of the Crescent Dam. Suspended sediment is not effectively passed through the dam and delivered to the stream channel. USFS level II stream surveys have documented that gravel is the dominant substrate type in all reaches except 2 and 11, which were boulder dominated (Table 3-84). Lower gradient stream reaches have relatively high percentages of fine sediment (< 2mm). Reaches 4, 10 and 11 had small areas of bank instability totaling 0.2% (18 feet), 1.8% (85 feet) and 0.6% (60 feet) respectively. All other reaches were rated at 100% stable (Dachtler 2001). Extreme flow modifications resulting from dam operations may be contributing to the unstable bank conditions found in reaches 10 and 11.

Table 3-84. Pebble count summaries per reach of Crescent Creek.

Reach	% Fines <2mm	% Fines <5.7 mm	D50 (mm)	D50 Substrate Size Class	D84 (mm)	D84 Substrate Size Class
1	24.5	26.5	29	Course Gravel	54.8	Very Course Gravel
2	9	11.5	34.5	Very Course Gravel	220.5	Large Cobble
3	13	16	36.8	Very Course Gravel	57.2	Very Course Gravel
4	14	17.5	34.3	Very Course Gravel	424.7	Small Boulder
5	9.5	13	31.6	Course Gravel	56	Very Course Gravel
6	29	35	17.1	Course Gravel	59.2	Very Course Gravel
8	20	24	21.5	Course Gravel	46.9	Very Course Gravel
10	14	15.5	41.4	Very Course Gravel	76.5	Small Cobble
11	11	14.5	92.9	Small Cobble	211.1	Large Cobble

Turbidity

Turbidity is an easily measured indicator of suspended sediment concentration in water. In most cases silt and clay size soil particles are the primary causes of turbidity (water appears cloudy or muddy) (Kunkle and Comer 1971, Aumen et al in Watershed Management, 1992).

Studies indicate that the ability of salmonids to capture food may be impaired at turbidity values in the range of 25 to 70 Nephelometric Turbidity Units (NTU), growth maybe reduced and gill tissues damaged after 5 to 10 days exposure to turbidity of 25 NTU, and some species may be displaced at 50 NTU (McDonald et al., 1991). Oregon administration rules state, "No more than 10 percent cumulative increases in natural streams turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity" (OAR Chapter 340, Division 41-DEQ). Activities such as road construction, maintenance, and use and timber harvest can contribute to an increase in stream turbidity. Separating management related turbidity from natural levels would require a large amount of data. Currently, there are no turbidity data from the Five Buttes project area.

Chemical Contaminants/Nutrients

Nutrients The pH of Odell Lake and Odell Creek exceeded the State standards of 8.5 on five separate occasions, peaking at 9.8 in the epilimnion and 10.0 in Odell Creek during August 2001. Secchi disc measurements along with chlorophyll α density measurements indicated an algal bloom of green algae and possibly blue-green algae occurred from late July through September 2001. The pH of the epilimnion (μ= 8.9) was greater than the hypolimnion (μ = 7.5) throughout the summer months, indicating the effect of the phytoplankton on the carbon cycle and pH (Houslet, 2001).

Analysis of phosphorus and nitrogen derived nutrients found no elevated levels of nutrients being input into the system from tributary sources. Nitrogen was found to be limiting in Odell Lake during the early summer (5.2:1) then became phosphorus limited during late summer and fall (49.6:1). This switch in nutrient excess was not due to any additional input throughout any tributaries during any time period. Water quality sampling in 2002 found dissolved oxygen minima occurring in the epilimnion of Odell Lake. Measurement of 3.0 mg/ L dissolved oxygen was recorded during that time (Houslet, 2002).

Fire Retardant From 2003 Davis Fire airtanker records, it was determined that 12 drops of retardant occurred within or near the fire perimeter. Two of the 12 retardant drops may have occurred across stream drainages (one across Odell Creek, and one across the ephemeral drainage located to the southeast of Odell

Creek). There was no on-the-ground evidence (e.g. red dye on vegetation or observed fish kills) that could confirm this. The majority of retardant was applied to upland locations far enough from channels so that a very low percentage could contribute to stream concentrations as a result of overland flow mechanisms. It is likely three years have eliminated the potential for chemical effects as a result of retardant.

Cyanobacteria High levels of a cyanobacteria or blue-green algae (*Anabaena flos-aqua*) have been documented in Odell Lake during the summers of 2003 and 2004. This species of *Anabaena* has the potential to create two toxins, anatoxin-A, which is a neurotoxin and microcystin, which is a liver toxin. Anatoxin-A has been documented to cause human fatalities.

Environmental Consequences

Alternative A

Implementation of the No Action alternative may increase or maintain the likelihood of a problem fire occurring within the project area. Information gathered during monitoring of the 2003 Davis Fire area provides illustration of the potential effects to hydrologic resources and water quality under this scenario. Monitoring reports are filed at the Crescent Ranger District, Crescent, Oregon.

Although the 2003 Davis Fire created higher potential for affecting water quality and quantity, no change has been observed.

A summary of observed effects of the Davis Fire to Odell Creek includes:

- Odell Creek stream temperatures increased slightly following the fire.
- Streamside vegetation, including encroaching lodgepole pine, was mostly removed by the fire.
- Instream wood and riparian grasses survived the fire.
- Wetlands were not affected by the fire due to high porosity of soils.
- There is some evidence of erosion following the fire.
- There was no observed increase in sediments directly from roads, fire salvage units, or from upslope areas.
- Overall, riparian vegetation and streambank stability are recovering well after three years.

Figure 3-40 contains photos that illustrate some effects of the Davis Fire on Odell Creek.

	
Example of erosion along lower Odell Creek resulting from the Davis Fire.	Burned lodgepole pines along braided portion of Odell Creek and re-establishment of grasses under the burned trees.

Characteristic burn pattern along Odell Creek.

Burned lodgepole pine trees and willow clumps on Odell Creek floodplain.

Figure 3-40. Photographs of Davis Fire effects on Odell Creek.

Alternatives B and C

All proposed activities have been determined to meet Aquatic Conservation Strategy on a 6th field watershed basis and Riparian Habitat Conservation Area Objectives.

The conditions that reduce the likelihood that proposed activities are capable of affecting watershed conditions include:

- The majority of the Five Buttes Project is located at the "bottom" of closed subwatersheds; that is, effects are expected to be confined to a minimal area.
- Proposed activities are in soils that are well-drained (i.e. pumiceous).
- Best Management Practices will be employed (see Chapter 2 of this EIS).
- There are no proposed commercial harvest activities within Riparian Reserves adjacent to stream channels.

Sediment Sources, Mass Movement and Turbidity

All proposed units in each of the action alternatives and temporary road construction have been assessed for existing and potential sediment sources and slope stability concerns (see the section titled "Soils" in Chapter 3 of this EIS). There are no areas identified as areas of concern for stability. There is no harvest or temporary road construction inside riparian reserves adjacent to stream channels. Two units (756 and 757) are located within the Davis Lake riparian area. These units would utilize a cable logging system, which would incur the lowest amount of soil disturbance as compared to ground logging systems. Equipment would be restricted to the hardened surface of the existing road in the riparian area next to Davis Lake. Implementation of BMPs reduces or eliminates the risk of sediments entering water bodies, so there would be no degradation of water quality.

All temporary roads would be constructed according to BMPs. Where possible, temporary roads would be constructed on existing skid trails, but would involve some level of improvement (primarily widening with a dozer blade). Temporary roads would be located on ridge tops or in flat areas, would avoid riparian reserves, and these roads would be decommissioned (subsoiled) after the commercial harvest activities are completed. Temporary road construction is not expected to have an effect on basin hydrology or aquatic resources.

With road maintenance activities, there might be a short-term localized potential input of sediments. Erosion control mitigation (BMPs) during road maintenance activities reduces the risk to aquatic resource. The following BMPs would be applied to road related activities: R-3, R-4, R-5, R-7, R-9, R-13, R-14, and R-23.

There are two perennial stream crossings (Forest Road 4660 crossing Odell Creek and Forest road 4668 crossing Maklaks Creek) which may be used for haul. The Odell Creek crossing has a bridge and the Maklaks Creek crossing has an open-bottom arch. The crossings have good drainage from the surfaces of the bridge and the open-bottom arch as well as the roadside ditches. If log hauling were to occur in the dry season (July to October) dust (fine particles) would not be expected to increase turbidity levels above 10% over natural levels set by the DEQ.

There is no evidence of sediment problems in Odell Creek associated with past management practices. Forest Service level II stream surveys in 1998 indicate that the dominant substrate in Odell Creek in reach 3 and reach 2 are gravels and cobbles, and in reach 1 the dominant substrate is gravels. Substrates in all three streams exhibit what would be expected in a natural undisturbed stream.

Due to very flat topography, high infiltration rates, limited harvest inside riparian reserves, and mitigation measures applied to logging and log hauling, **no sedimentation to streams or lakes from either action alternative is expected.**

Aquatic Conservation Strategy

"The intent is to ensure that a decision maker must find that the proposed management activity is consistent with the Aquatic Conservation Strategy objectives. The decision maker will use the results of watershed analysis to support the finding. In order to make the finding that a project or management action 'meets' or 'does not prevent attainment' of the Aquatic Conservation Strategy objectives, the analysis must include a description of the existing condition, a description of the range of natural variability of the important physical and biological components of a given watershed, and how the proposed project or management action maintains the existing condition or moves it within the range of natural variability" (1994 ROD, Attachment B, p. B-10).

The existing condition discussion, including biological and physical components of the riparian condition, is found in soil quality, hydrology, and fisheries sections in Chapter 3 of this FEIS. These components are closely associated with the vegetative condition. Additional discussion on the transportation system, Best Management Practices, and effects on Riparian Reserves is also found in the FEIS (Chapter 3, Appendices A and B).

In summary, this active management would maintain the components of the nine objectives. The 1999 Odell Watershed Analysis specifies the objectives for Davis Lake as "Vegetative treatments should be designed to promote development of large tree dominated stands, late successional forest, and bald eagle habitat and may include prescribed fire and thinning" (page 157, Recommendations)." Retention of large trees on the landscape while reducing risk of wide-scale disturbance processes is the goal for this project. This condition would more closely follow the reference condition, or Historic Range of Variability as defined "…vegetation, disturbance regimes, and environmental conditions that are minimally altered by 20th century management activities, but may reflect patterns or conditions resulting from interactions of aboriginal peoples with their environments." The Watershed Analysis (page 31) identifies floodplain function and riparian health as in "excellent" condition over 99 percent of the watershed (Odell WA, 31). Active management under Alternatives B and C would not change that condition, including the portion of Odell Creek that burned in the Davis Fire. However, it identified the following trends in vegetative structure. The three primary areas of concern for the conifer vegetation are:

- Retention of large trees on the landscape.
- Development of replacement trees as large trees inevitably are lost from the landscape.
- Resilience of forest stands to disturbance agents (insects and fire).

Proposed activities within the Five Buttes Project were developed to address these trends.

The only activities associated with the Five Buttes Project that are within Riparian Reserves are: 1) understory commercial thinning, handpiling, and disposal of forest residue on 53 acres at Davis Lake; and

2) hauling and maintenance on up to 4.2 miles of road in Alternative B. None of these activities are within areas typically associated with riparian vegetation.

The project follows the Aquatic Conservation Strategy by meeting the nine objectives through an interdisciplinary process:

1. Maintain and restore the distribution, diversity, and complexity of watersheds and landscape scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

Action alternatives would maintain and restore the distribution, diversity, and complexity of watersheds and landscape scale by implementing a strategy to reduce fuel loadings and forest vegetation density so as to lessen the risk that disturbance events such as insect, disease, and wildfire will lead to large-scale loss of forest. The Davis Fire created a homogenous condition over much of the fire area. The Five Buttes project is a landscape-scale strategy to cycle in and out of NRF habitat while maintaining the large tree component throughout the cycle. The cycling from non-NRF to NRF across the landscape over time would reduce risk to large and contiguous blocks of habitat disturbance processes. While commercial thinning would occur, the primary emphasis would be removing some of the understory trees to reduce ladder fuels and stand density competition. The largest diameter trees would be retained to maintain late and old-structured forests. In addition, no snags or dead and down wood would be removed with the exception of unit #370 where some salvage of down lodgepole is proposed to reduce wildfire risk to Maklaks Mountain and an occupied spotted owl territory; and as necessary for occupational safety, which is characterized as incidental.

Riparian reserves would be maintained by avoidance with the exception of two units along Davis Lake. The two riparian reserve units identified for treatment along Davis Lake would be thinned to a single story condition to lessen the risk of a wildfire originating from the campground and burning upslope, and to meet objectives for bald eagle management of habitat. These units are at the downstream extent of a closed watershed, downstream of spawning areas for redband and bull trout. Active management would avoid riparian associated vegetation. No trees with the potential to affect shading on Davis Lake during summer months or contribute to large woody debris recruitment would be disturbed.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These lineages must provide chemically and physical unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian dependent species.

All alternatives maintain existing riparian connections between watersheds. In this project, the potential effects to hydrologic resources from a direct, indirect, or cumulative nature is relatively benign due a range of reasons (DEIS, Chapter 3, Hydrology; page 234); but mostly due to the limited activity in proximity to water at the bottom of a closed watershed system.

The action alternatives propose to harvest acres located on uplands (with the exception of two units adjacent to Davis Lake) and therefore will not disturb the riparian corridor of the stream network. For all activities, snag recruitment, over time and across the landscape, is similar compared to Alternative A, no action. Changes in snag densities over time are very similar.

Spatial and temporal connectivity along stream drainages will be maintained through the implementation of the Forest Plan riparian reserve widths (USDA, 1994). All fish bearing streams will have no-harvest buffers of two standard tree heights (minimum of 300 feet). Non-fish bearing streams and ephemeral streams will have one standard tree height or 150 feet no-harvest buffer placed on either side of the stream. Seasonal and ephemeral drainages will be maintained with a 50 foot buffer on both sides. These areas allow for connectivity between riparian areas and upland areas as well as maintain the micro-climate within the riparian area. None of the alternatives proposes to build roads across stream channels.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Physical integrity of the aquatic system is anticipated to be maintained and preserved by adhering to the recommended riparian reserve widths outlined in the Northwest Forest Plan, Odell Watershed Analysis and by using Best Management Practices (BMPs) (USDA, 1988). Specific BMPs are T-2 (harvest unit design); T-7 (Streamside Management Unit Designation); T-8 (Stream Course Protection). These practices maintain the physical integrity of the aquatic system by designating prescriptions (i.e., maintenance of root strength, shade canopy, and large woody material). No riparian treatments would occur within the riparian reserve of any active stream channel. Vegetative treatments in two units within the riparian reserve of Davis Lake, will enhance stand conditions for bald eagles within a Bald Eagle Management Area. Within these riparian reserves, equipment will not be allowed off of existing, hardened roads, and landings/decks will occur outside of the riparian reserve. These restrictions will maintain stability and reduce potential sediment delivery to this closed system.

The action alternatives would not restore the physical integrity of the aquatic system but are likely to maintain current conditions. Odell Creek is of lake origin with spring fed tributaries while Ranger Creek is an entirely spring fed system, both with small bedloads and a relatively stable hydrograph. Flows in Crescent Creek are dictated by dam operations at Crescent Lake. Although proposed harvest would physically disturb a portion of subwatershed upland areas, it is unlikely that measurable changes would occur within the streams or their riparian areas.

Area streams would experience no loss of instream woody material or potential future recruitment as the result of action alternatives. Woody material is critical for maintaining stream health, aquatic habitat, the stream channel, and banks. This material is integral for developing and maintaining the physical structure of the aquatic system by contributing to the development of pools and slow water depositional areas that retain sediment. At the watershed and landscape scale, implementing the action alternatives would maintain the current physical integrity of Crescent Creek, Odell Creek, and the Davis Lake basin.

4. Maintain and restore water quality necessary to support a healthy riparian, aquatic, and wetland ecosystem. Water quality must remain in the range that maintains the system biological, physical, and chemical integrity and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

The primary concerns to water quality in the project area are increases in water temperature in Odell Creek and Davis Lake. Water quality parameters regulated by the State of Oregon under the Clean Water Act include temperature, turbidity, and total dissolved solids in streams and temperature, pH and chlorophyll a in lakes. Portions of Odell Creek and Davis Lake are on the state 303(d) list for exceeding water temperature standards for bull trout rearing or red band salmonid water bodies. Odell Lake and Odell Creek which flows from Odell to Davis Lake are listed as “water quality limited” for not meeting state water quality standards. Odell Lake is listed for chlorophyll a and pH exceedences during summer months. Odell Creek is listed for chlorophyll a, pH, and summer temperature exceedences. TMDLs (total maximum daily load) are being developed for these parameters. Conditions in Odell Lake appear to be a byproduct of the proliferation of an introduced fish species (kokanee salmon). It is likely a reduction in kokanee numbers would result in improved water quality in Odell Lake and Odell Creek.

The reduction of shade is the primary concern related to increases in water temperature while increased erosion and sedimentation are the most likely to affect turbidity and total dissolved solids. The transport of nutrients to the streams as a result of sediment delivery can also affect water quality.

Water temperatures and water quality are not expected to be affected as the result of active management. Two units lie adjacent to Davis Lake, within the riparian reserve buffer. Trees with the ability to affect shading of the lake during summer months or contribute to future large wood recruitment will not be disturbed. Mitigation measures include restrictions on equipment off hardened surfaces and exclusions of decks and landings from the riparian reserve will minimize potential disturbance of surface soils and reduce the probability of mobilizing sediment to the lake. Riparian reserves buffers will be maintained at

Northwest Forest Plan standards on all stream bodies. Therefore, reductions in shade, increases in stream temperature, and increased sediment delivery are not expected.

Other activities such as road construction, use and maintenance, and ground disturbance from timber harvest can contribute to a potential increase in stream turbidity. This potential turbidity as a result of management activities would be indistinguishable from background levels. The topography has minimal drainage features and high infiltration rates which minimizes potential overland flows capable of detaching sediment and carrying it directly into stream channels. The project would also incorporate BMPs to maintain water quality that maintain detrimental soil disturbance within regional soil quality guidelines, obliterate and restore hydrologic function to temporary roads after their use is not needed, and restrict harvest activities to times and locations appropriate for site conditions.

5. Maintain and restore the sediment regime under which the aquatic system evolved. Elements of the sediment regime include the timing, volume, rate, and character of the sediment input, storage, and transport.

Proposed activities will not affect the flow regime or bed/bank stability and therefore would not have an effect on the sediment regime of area streams.

Loss of vegetative cover, post-Davis Fire conditions, have been identified in the Davis Recovery EIS analysis as the largest potential source of sediment within these subwatersheds. The sediment delivery zone of overland flows to stream channels under all but the most extreme runoff conditions includes the area within approximately 480 feet from a channel edge. Although the sediment regime along Odell Creek had been altered to some degree as a result of the loss of cover immediately after the fire, monitoring has shown the amounts moved and delivered to stream channels was minimal due to the low slopes, minimal hydrologic connectivity of roads, surface roughness provided by down woody debris, and high infiltration rates of the soils. Delivery rates during storm events have decreased as vegetative re-growth has provided cover to reduce raindrop impacts.

Due to the lake origin of Odell and Crescent Creeks, the historic hydrograph would have been relatively stable and therefore, the banks would be well vegetated and sediment contributions from bank erosion would be low. Likewise the relative bedload movement would also be low. A dam structure on Crescent Lake significantly alters the natural flow regime of Crescent Creek. Winter flows are restricted to as low as 5 cfs, while summer flows are ramped up to over 300 cfs to provide irrigation water down stream. The exaggerated fluctuation between peak and base flows resulting from dam operations has likely contributed to an increase in sediment contributions from the banks in the form of erosion.

All action alternatives will maintain the sediment regime under which these systems evolved. All alternatives would provide no treatment zones within 300 feet of perennial stream reaches that would minimize potential introduction of sediments. The input of sediments to spring-fed and lake source streams is typically from hydrologic connectivity with roads. No additional roads with hydrologic connectivity would be constructed under the action alternatives.

The action alternative would create skid trails, landings and temporary roads capable of contributing sediment and generating concentrated flows within these subwatersheds. All proposed activity areas are outside of riparian reserve buffers of stream channels and would have difficulty contributing sediment into the aquatic system unless there was direct hydrologic connectivity provided by the road system. Action alternatives would implement Best Management Practices to protect riparian buffers, maintain soil compaction within regional soil quality guidelines, locate temporary roads outside of riparian areas on existing skid trails and restore them where needed, and restrict harvest activities to times and locations appropriate for site conditions.

6. Maintain and restore instream flows sufficient to create and sustain riparian, aquatic, and wetland habitat and to retain patterns of sediment, nutrient, and wood routing.

Project activities would not result in any direct changes to riparian habitats as riparian reserve buffers are being maintained on all stream channels as defined by the Northwest Forest Plan. The vast majority of stream flow volume within Odell Creek comes in the form of tributary springs and outflows from Odell Lake. No defined drainages contribute stream flows to Odell Creek from uplands.

Wood recruitment in the next twenty years is likely to be higher as a result of the 2003 Davis Fire as standing dead trees begin to fall into the stream channels. A void of wood recruitment is likely to occur after fire-killed snags have all fallen and before regeneration of spruce and lodgepole is large enough to provide this component.

None of the action alternatives are expected to negatively affect base flow conditions, nor would affect instream flows to an extent that would inhibit riparian, aquatic and wetland habitats.

The timing, magnitude, duration, and spatial distribution of flows contributed by storm events and associated overland runoff from areas within the project area would not be affected by active management associated with this project.

7. Maintain and restore the timing, variability, duration of the floodplain inundation and water table elevation in meadows and wetlands.

The area of influence to instream flows by the project is relatively minimal. Seasonal peak flows occurring as a result of snowmelt are not likely to be affected by the Five Buttes project, with the timing and duration of floodplain inundation from this mechanism not expected to change. Peak flows as a result of storm events (summer thunderstorm or rain on snow) may increase slightly in the lower reach of Odell Creek, with floodplain inundation possibly occurring to a greater extent during these events. Higher flows capable of channel alteration are unlikely to occur and inundation that does occur would contribute fine sediment to floodplain areas. Earlier snowmelts may also contribute additional subsurface inputs of water to the lower reach of Odell Creek and the Davis Lake system earlier in the spring, possibly reducing the length of water table inundation within the soil profile into the growing season.

Action alternatives would have no effect on floodplain inundation or water table elevations within the project area. Implementing any of the action alternatives would maintain the timing, variability, and duration of floodplain inundation and water table elevations currently existing. The vegetative manipulation in the upland areas would not have a physical effect on floodplains and ground disturbance within activity units and soil quality would be maintained within regional soil quality guidelines. Potential for overland flows resulting from this disturbance contributing to sediment to Odell Creek, Crescent Creek or Davis Lake is very low, as discussed under objective #5. With the implementation of the Northwest Forest Plan standards and guidelines and by applying BMPs, it is anticipated that instream flows would be maintained sufficiently to create and sustain riparian, aquatic and wetland habitats.

Proposed actions are expected to be indistinguishable from base flow conditions.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian zones and wetlands to provide adequate summer and winter thermal regulation, nutrient, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of large wood sufficient to sustain physical complexity and stability.

Although approximately 30 percent of the Reserves along Odell Creek were burned by the Davis Fire, annuals and shrub re-sprouts returned during the late summer and fall of 2003. All of these elements are expected to contribute to a return of cover and diversity in upcoming growing seasons in amounts necessary to provide adequate summer and winter thermal regulation and nutrient filtering within the system. Appropriate rates of surface erosion, bank erosion, and channel migration are relatively low in a spring fed and weir controlled system and are expected to continue at reasonable rates despite the exposure of some banks within the lower reach of the creek. Bank stability along Odell Creek, within the burn area was estimated at 96 percent after the Davis Fire. Bank stability has since increased to approximately 99 percent.

The amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability within the aquatic system would be provided under post-fire conditions as dead trees along stream reaches began to fall into the stream channels and replaced those consumed by the fire.

Implementation of action alternative would not enter or disturb the riparian zones of streams within the project area. Thinning would occur within the riparian reserve of Davis Lake. Trees with the potential to be recruited as future large woody debris would remain. Appropriate rates of surface erosion, bank erosion, and channel migration are also not expected to be affected by proposed active management. Although coarse woody material would be removed from within the subwatersheds, it would generally be located in upland areas and would not decrease the amount available to replace that which was consumed by the fire within or adjacent to riparian areas.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate riparian-dependent species.

The Five Buttes project has been designed to restore and enhance habitat conditions for species associated with late and old structure forests. The modeling of fire behavior has been used to show how silvicultural and fuels activities would reduce the risk of large scale loss of forest vegetation.

There is no regeneration timber harvest proposed within the riparian zones in either action alternative that would eliminate or retard the development of habitat to support well distributed populations of any native, invertebrate or vertebrate riparian dependent species. Both action alternatives do propose commercial thinning within the riparian zone along the eastern shore of Davis Lake however, no thinning would occur within riparian asssociated vegetation.

To maintain vegetation diversity on the landscape, both action alternatives would change the function of some existing northern spotted owl Nesting, Roosting, Foraging (NRF) habitat; some acreage of NRF would be converted to single-story stands that would take longer to return to a condition that could be considered NRF. These areas are typically drier sites dominated by ponderosa pine and are more suited to a frequent fire regime. Other acreage would retain its ability to become NRF in the future much sooner and become part of a strategy to cycle spotted owl habitat on the landscape. Since spotted owl habitat has an inherently higher disturbance risk than do more open areas, by cycling spotted owl habitat on the landscape, the strategy reduces the risk of wide-scale disturbance processes removing thousands of acres of owl habitat all at once.

Project design criteria and site-specific mitigation measures have been prescribed for the retention of snags, coarse woody debris, no cut buffers, and limited operating periods to avoid disturbance to nesting bald eagles. These actions collectively, would reduce the likelihood of a wide-scale disturbance event and maintain and restore habitat to support well-distributed populations of native plant, invertebrate riparian-dependent species.

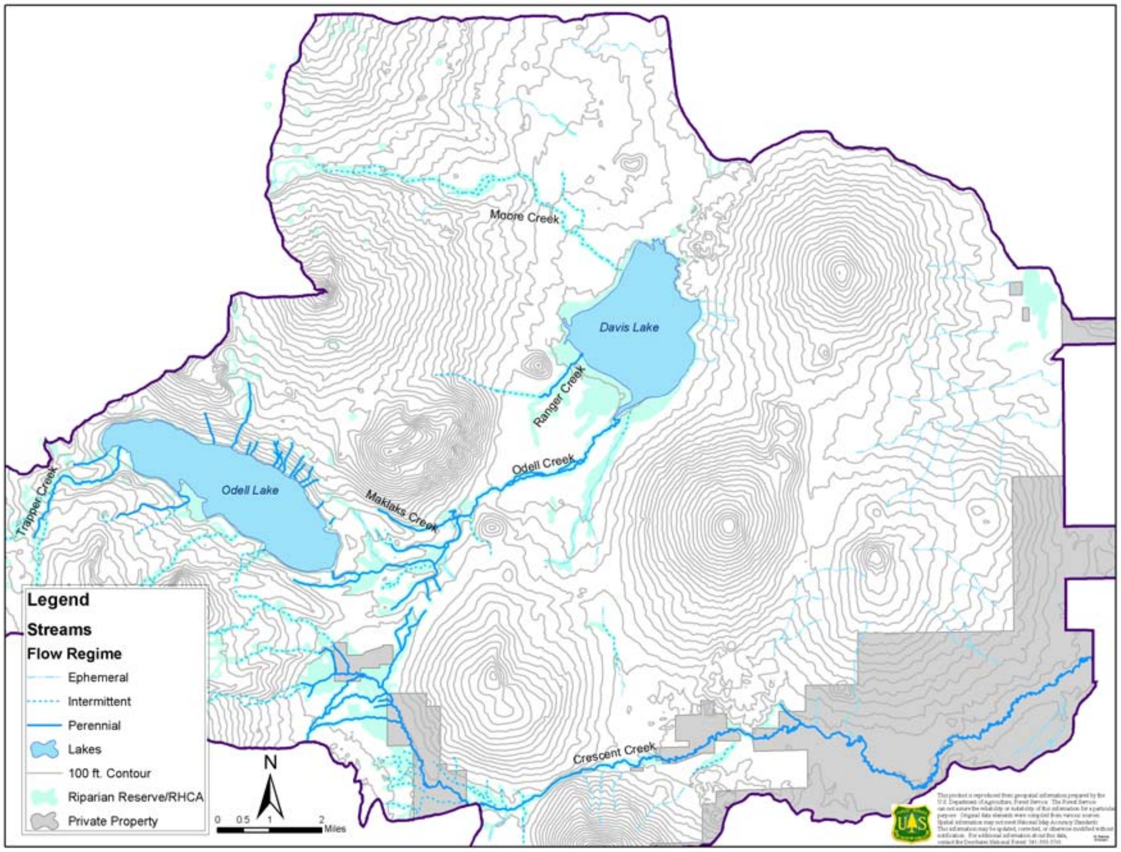


Figure 3-41. Streams and riparian areas in the Five Buttes project area.

Wild and Scenic River

Crescent Creek is part of the National Wild and Scenic Rivers System, from the dam at Crescent Lake to the point where the creek crosses County Road 61. The large ponderosa pines along the stream combined with the narrow canyon adjacent to Odell Butte create a unique experience for the area and contributed to the determination that vegetation/scenery was found to be the outstandingly remarkable value (ORV) for this stretch of Crescent Creek. The Wild and Scenic Rivers Act requires that these values and other river-related values be protected and enhanced.

Since a management plan for Crescent Creek has not been completed, direction for management reverts to Standards and Guidelines found in the Deschutes Forest Plan (4-155). Implementation of action alternatives would be consistent with the interim direction specified in the Deschutes Forest Plan, as well as the identified Outstandingly Remarkable Values for geological, scenic, and vegetation.

Portions of the following units fall within the wild and scenic river interim corridor (1/4 mile each side of the creek): 460, 690, 691, 692, 693, and 695 (Table 3-85). In the context of the entire river corridor (2,283 acres), the treatment units overlap a relatively small percentage in the river. Activities in these units have been determined to be necessary for an overall landscape-scale fire behavior modification.

Table 3-85. Units within the Wild and Scenic River corridor in the Five Buttes project.

UNIT	ACRES	LOGGING SYSTEM
460	68.0	Ground
690	20.6	Ground
691	30.0	Fuels only
692	104.3	Fuels only
693	3.4	Fuels only
695	5.2	Advanced

Unit 460 is located above County road 62 and would not be visible from the river corridor. The vegetative prescription calls for commercial thinning by mechanical harvest system with a combination of single and multistory objective. Prescribed underburning would also occur. Mechanical ground-based harvest systems would be utilized with a buffer maintained along road 62 to protect a sensitive resource.

Unit 690 is on a bench on the Odell Creek side of the river and is not likely visible from the river corridor as it approximately one quarter of a mile from the river and on a bench. The desired long-term condition of this stand is late and old structure single story ponderosa pine. To achieve this goal, commercial understory thinning would be prescribed using ground-based harvest systems. A very short piece of temporary road construction would potentially be needed, but it would not be visible as it would be constructed above the bench.

Units 691, 692 and 693 are prescribed for “fuels only” activities that include small diameter thinning with an upper diameter limit of 6 inches on 85 acres. Utilization of wood products is also prescribed and the existing road system is adequate to facilitate this. Prescribed underburning would be utilized. No activities would occur within the Riparian Reserve.

Unit 695 is adjacent to 690, also on a bench. The desired condition is similar to 690. To achieve this and to mimize soil disturbance, prescriptions similar those proposed for 690 would be implemented by advanced harvest systems. Approximately 94 acres within the corridor are proposed for understory thinning to highlight and maintain the large ponderosa pine trees. Activities would occur outside of the Riparian Reserve boundary.

Implementation of proposed activities is expected to protect long-term ecological integrity of the corridor by mimicking natural processes. Most activities would not be visible from the river corridor and those that have the potential, would be small diameter tree removal that typically has very low associated impacts to soil and visual quality. There would be an improvement in the scenic values by highlighting the visibility of large trees. Other values associated with the immediate river environment, such as water quality, fish and wildlife and riparian plant communities would have a measure of protection provided by a reduction in risk of a wide scale disturbance process. Also, water quality is expected to remain at its current level due to the distance from the river, methods utilized to minimize overland flow and sedimentation (please refer to sections titled “Fisheries” and “Hydrology and Water Quality” in Chapter 3 of this EIS), topography and the porous nature of the soils.

Botany

The Forest Service Manual (USDA Forest Service, 1995b) and the Land and Resource Management Plan for the Deschutes National Forest (LRMP) (USDA Forest Service, 1990) both state that habitat for sensitive plant and animal species shall be Managed or Protected to ensure that the species do not become threatened or endangered. The LRMP also states that management guides (now referred to as Conservation Strategies[17]) are to be developed and used. The Forest Service Manual (FSM) states that habitats for all existing native and desired nonnative plants, fish, and wildlife should be managed to maintain at least viable populations for each species (USDA Forest Service, 1995a). A viable population consists of a number of individuals adequately distributed throughout their range necessary to perpetuate the existence of the species in natural, genetically stable, self-sustaining populations (Phillips and Wooley, 1994).

The Northwest Forest Plan (USDA/USDI, 1994) and the Final Supplemental Environmental Impact Statement for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA/USDI, 2001) established Standards and Guidelines for Survey and Manage species listed in the Northwest Forest Plan that amended the LRMPs for forests in the area covered by the NWFP.

Any projects with habitat-disturbing activities will comply with the 2001 ROD, including any amendments or modifications that were in effect as of March 21, 2004.

Existing Condition

There are no federally listed Threatened, Endangered or Proposed (for listing) plant species known to exist within or near the project area.

Prefield Review

Sensitive Plants

Prefield reviews were conducted in May 1999 for the 7 Buttes Return Project units proposed for treatments. Units on the north side of Davis Mountain were added after the 1999 survey season and the prefield review for those units was done in May 2000. Habitat requirements of all PETS (Proposed, Endangered, Threatened, and Sensitive) and Survey & Manage plant species known or suspected to occur on the Crescent Ranger District, Deschutes National Forest at that time were compared with habitats that occur within the planning area.

Since the original prefield reviews for the 7 Buttes Return Planning Area were done, the R6 Sensitive Plant List has changed. The most recent list (July 2004) includes former Survey and Manage species in the Northwest Forest Plan (NWFP) area that were added to the list when the ROD (April 2004) was signed to remove Survey and Manage Standards and Guidelines from the NWFP. (The 2001 S&M ROD was reinstated by court order Jan 9, 2006. See above.) The R6 Sensitive Plant List applies to all National Forest lands, including areas outside the Northwest Forest Plan.

A Forest Service Memorandum was issued regarding “Tools and Information to Assist Field Units in Managing Survey and Manage Species” (February 8, 2006). That memorandum stated: Many of the Survey and Manage species were added to agency Special Status and Sensitive Species (SSSS) programs in 2004. These species should follow both Survey and Manage S&Gs and SSSS policies. Management of *known sites* for species that are within both agency programs should utilize the best available information. This may include Appendix J-2 from the Northwest Forest Plan (NWFP), Survey and Management MRs (Management Recommendations), SSSS Conservation Assessments, and Species Fact Sheets. There are no known sites for any of the species on the R6 Sensitive Plant List (see Table 3-85) that are also on the Survey and Manage list (see Table 3-86) within or near any of the proposed activity areas in either of the action alternatives in the Five Buttes Project.

[17] A conservation strategy is the Forest Service’s documentation for the management actions necessary to conserve a species, species group, or ecosystem.

Table 3-86 reflects changes made to the Region 6 Sensitive Plant List (July 2004) for those species that are documented or suspected to occur on the Deschutes National Forest.

Table 3-86. Prefield Review Summary (2004 Sensitive Plant List).

R6 Sensitive Plant Species Documented or Suspected on the Deschutes National Forest	Range	Habitat	Occupied Habitat in Planning Area?/on Forest?	Probability of Occurrence in Project Area
Agoseris elata (vascular plant)	Washington and Oregon Cascades	Forest openings and forest edges adjacent to wet/moist meadows, lakes, rivers, and streams	No/Yes	Low; habitat marginal
Arabis suffrutescens var. *horizontalis* (vascular plant)	South-Central Oregon	Meadows, woods, summits, ridges, and exposed rock outcrops	No/No	Low; outside known range
Arnica viscosa (vascular plant)	South-Central Oregon Cascades, California	Scree, talus gullies, lava flows and slopes w/ seasonal runoff. May be in moraine lake basins or crater lake basins	No/Yes	Low; habitat marginal
Artemisia ludoviciana ssp. *estesii* (vascular plant)	Central Oregon	Upper riparian away from aquatic plants	No/Yes	Low; habitat marginal
Aster gormanii (vascular plant)	Northern West Cascades	Rocky ridges, outcrops, or rocky slopes	No/Yes	Low; outside known range
Astragalus peckii (vascular plant)	South-Central Oregon	Basins, benches, gentle slopes, and meadows.	No/Yes	Low; habitat marginal
Botrychium pumicola (vascular plant)	Central Oregon	Alpine-subalpine ridges, slopes, and meadows. Montane forest openings, open forest in basins with frost pockets, pumice flats	No/Yes	Low; habitat marginal
Calamagrostis breweri (vascular plant)	Oregon North Cascades and California	Non-forest moist-to-dry subalpine and alpine meadows, open slopes, streambanks, lake margins	No/No	Low; outside known range
Calochortus longebarbatus var. *longebarbatus* (vascular plant)	South-Central Oregon and adjacent Northern California, South Central Washington and adjacent north-central Oregon	LP-PP forest openings and forest edges of vernally moist grassy meadows, occasionally along seasonal streams	No/No	Low; outside known range
Carex hystricina (vascular plant)	Oregon, Washington, California, Idaho	Wet to moist conditions in riparian zones, in or along ditches/canals in prairies or wetlands	No/Yes	Low; habitat marginal
Carex livida (vascular plant)	Oregon Washington, California, Idaho	In peatlands, including fens and bogs; wet meadows with still or channeled water	No/No	Low; habitat marginal
Castilleja chlorotica (vascular plant)	Oregon east Cascades	LP-PP, mixed conifer forest openings. PP at lower and LP at mid, and mixed conifer at highest elevations	No/Yes	Moderate; suitable habitat present but species not yet documented on Crescent
Cicuta bulbifera (vascular plant)	East Cascades Oregon and Washington	Shoreline of marshes. TNC records only for margins of Klamath Lake in 1902, 1950. Persistence at these sites considered doubtful	No/No	Low; outside Oregon range

R6 Sensitive Plant Species Documented or Suspected on the Deschutes National Forest	Range	Habitat	Occupied Habitat in Planning Area?/on Forest?	Probability of Occurrence in Project Area
Collomia mazama (vascular plant)	South-Central Cascades, Oregon	Meadows (dry to wet, level to sloping); stream banks and bars, lakeshores and vernal pool margins; forest edges and openings; alpine slopes	No/No	Low; outside known range
**Dermatocarpon luridum* (lichen)	Oregon, Washington	On rocks or bedrock in streams or seeps, usually submerged or inundated for most of the year	No/No	Low; suitable habitat present; sought, but not yet detected on DNF
Gentiana newberryi var. *newberryi* (vascular plant)	Oregon east and west Cascades, California	Wet to dry alpine, subalpine, and mountain mixed conifer zones, in forest openings and meadows, commonly with tufted hairgrass	No/Yes	Low; habitat marginal
**Leptogium cyanescens* (lichen)	Oregon, Washington	Generally riparian but recently documented in upland settings on vine maple, big leaf maple and Oregon white oak	No/No	Low; habitat marginal
Lobelia dortmanna (vascular plant)	Oregon East Cascades, Washington	Shallow water at margins of lakes, ponds, and rivers or in standing water of bogs and wet meadows	No/Yes	Low; habitat marginal, outside proposed treatment units
Lycopodiella inundata (vascular plant)	Oregon, Idaho, California, Montana – Circumboreal	Deflation areas in coastal backdunes; montane bogs, including sphagnum bogs; less often wet meadows	No/Yes	Low; habitat marginal
Lycopodium complanatum (vascular plant)	Oregon, Idaho, Washington +	Edges of wet meadows; dry forested midslope with >25% canopy cover	No/No	Low; outside known range, habitat marginal
Ophioglossum pusillum (vascular plant)	Oregon, Washington, California, Idaho +	Dune deflation plains; marsh edges; vernal ponds and stream terraces in moist meadows	No/No	Low; outside known range, habitat marginal
Penstemon peckii (vascular plant)	Central Oregon east Cascades	PP openings, open PP forests; rine/mixed conifer openings; recovering fluvial surfaces	No/Yes	Low; outside known range
Pilularia americana (vascular plant)	Oregon, California +	Alkali and other shallow vernal pools, not recently used stock ponds, reservoir shores	No/No	Low; outside known range, habitat marginal
**Ramaria amyloidea* (fungus) S&M	Oregon, Washington, California	Mycorrhizal with true firs, Douglas fir, and western hemlock in humus or soil.	Yes/Yes	High; known site in project area, suitable habitat present; surveys impractical
**Rhizomnium nudum* (bryophyte) S&M	Oregon, Washington +	Moss found in moist coniferous forests. On DNF associates include lodgepole pine, Engelmann spruce, mountain hemlock, and western white pine	No/Yes	Moderate; suitable habitat present, not yet documented on Crescent; s&m strategic surveys considered complete
Rorippa columbiae (vascular plant)	Oregon, California, Washington	Wet to vernally moist sites in meadows, fields, playas, lakeshores, intermittent stream beds, banks of perennial streams, along irrigation ditches, river bars and deltas, roadsides.	Yes/Yes	2 sites found on Crescent RD in 2005 within Five Buttes planning area; no proposed units near sites.

R6 Sensitive Plant Species Documented or Suspected on the Deschutes National Forest	Range	Habitat	Occupied Habitat in Planning Area?/on Forest?	Probability of Occurrence in Project Area
Scheuchzeria palustris var. *americana* (vascular plant)	Oregon, Washington, California, Idaho +	Open to canopied bogs, fens, and other wetlands where often in shallow water	No/Yes	Low; outside known range, habitat marginal
**Schistostega pennata* (bryophyte) S&M	Oregon, Washington, circumboreal	Mineral soil in crevices on lower and more sheltered parts of root wads of fallen trees near streams or other wet areas	Yes/Yes	Low; habitat marginal in proposed treatment areas
Scirpus subterminalis (vascular plant)	Oregon, Washington, California, Idaho +	Generally submerged to emergent in quiet water 2-8 decimeters deep, in peatlands, sedge fens, creeks, ditches, ponds and lakes	No/Yes	Low; habitat marginal
**Scouleria marginata* (bryophyte) S&M	Pacific Northwest endemic; Oregon, Washington, Idaho, northern California, southwestern British Columbia	Exposed or shaded rocks in streams; seasonally submerged or emergent	No/No	Low; habitat marginal
Thelypodium howellii var. *howellii* (vascular plant)	Oregon East Cascades, Washington, California	No recent collections; closest TNC sites are Paulina Marsh, Tumalo State Park, Camp Polk, and Big Summit Prairie	No/No	Low; habitat marginal

* Also on the 2001 Survey and Manage List (As modified and amended through March 21, 2004)

Surveys were conducted for the R6 listed species in the above table in 1999 and 2000 in proposed units for the 7 Buttes Return project.

The Survey and Manage Standards and Guidelines provide benefits to species of fungi, lichens, bryophytes, vascular plants, invertebrate animals, and other species. Three basic criteria must be met for species to be included in the Survey and Manage Standards and Guidelines: 1) The species must occur within the NWFP area, or occur close to the NWFP area and have potentially suitable habitat within the NWFP area; 2) the species must be closely associated with late-successional or old-growth forest; 3) the reserve system and other Standards and Guidelines of the NWFP do not appear to provide for reasonable assurance of species persistence. Survey and Manage listed species in the 2001 ROD are placed in 6 Categories based on species' characteristics.

The six Categories are:

Category A – Rare, Pre-disturbance Surveys Practical
- Manage all known sites
- Conduct pre-disturbance surveys
- Conduct strategic surveys

Category B – Rare, Pre-disturbance Surveys Not Practical
- Manage all known sites
- Conduct strategic surveys
- Conduct equivalent-effort surveys (for non-vascular plants for projects with decisions in FY2006 or later and for fungal species for projects with decisions in 2011 or later)

Category C – Uncommon, Pre-disturbance Surveys Practical
- Manage high-priority sites

- Conduct pre-disturbance surveys
- Conduct strategic surveys

Category D – Uncommon, Pre-disturbance Surveys Not Practical
- Manage high-priority sites
- Conduct strategic surveys

Category E – Rare, Status Undetermined
- Manage all known sites
- Conduct strategic surveys

Category F – Uncommon, Status Undetermined
- Conduct strategic surveys

Prefield Review for Survey and Manage Plants
Survey and Manage fungal and plant species with known sites in the project area are summarized in Table 3-87. Category A and Category C (2003 Annual Species Review List) Survey and Manage vascular plants, bryophytes, lichens, and fungi requiring pre-disturbance surveys and lichens and bryophytes requiring equivalent effort surveys are listed in Bold in Table 3-88.

Table 3-87. S&M Fungal and Plant species with known sites in the Five Buttes Project Area (as of March 21, 2004).

Species	Category	Group	District	Notes
Albatrellus caeruleoporus	B	Fungus	CRE,SIS	West end Odell Lake Manage all known sites
Chaenotheca subroscida	E	Pin lichen	CRE	Maklaks Mt. on un-named trib of Odell Cr. Manage all known sites
Chalciporus piperatus	D	Fungus	CRE	In vicinity of (~1/4 mile) Unit 370 and in Trapper Creek CG Manage high-priority sites
Clavariadelphus ligula	B	Fungus	CRE,SIS	North side of Odell Lake Manage all known sites
Gastroboletus subalpinus	B	Fungus	CRE,BFR	Trapper Cr Trailhead Manage all known sites
Mycena overholtsii	D	Fungus	CRE	West end Odell Lake Manage high-priority sites
Ramaria amyloidea	B	Fungus	CRE	Trapper Cr Trailhead Manage all known sites
Ramaria rubripermanens	D	Fungus	CRE	North of Odell Lake in Roadless Area Manage high-priority sites
Rhizopogon truncatus	B	Fungus	CRE, BFR	Hamner Butte in vicinity of Unit 410 Manage all known sites
Schistostega pennata	A	Moss	CRE	Odell Lake,Trapper Creek and Crystal Creek Manage all known sites
Tritomaria exsectiformis	B	Liverwort	CRE,BFR,SIS	Dell Spring (in unit 678, Alt. C) and Ranger Creek Manage all known sites. Equivalent effort surveys required FY06+

Table 3-88. S&M plant taxa surveyed for in 1999 and 2000 for Five Buttes (7BR project). Species in bold require pre-disturbance (1999 and beyond) or equivalent-effort surveys (2006 and beyond).

Taxon and Group	2001 category	1994 category	Comments
Allotropa virgata vascular plant	OFF	1, 2	Removed from S&M list in 1999
Botrychium minganense vascular plant	A	1, 2	DES outside known range, low probability of occurrence
Botrychium montanum vascular plant	A	1, 2	DES outside known range, low probability of occurrence
Bridgeoporus nobilissimus fungus	A	1, 2, 3	Perennial conk; low probability of occurrence
Buxbaumia viridis bryophyte	OFF	1, 2	Removed from S&M list
Marsupella emarginata* var. *aquatica bryophyte	B	1, 3	No longer suspected on DES based on new information
Polyozellus multiplex fungus	B	1, 3	Surveys not required – impractical -- Equivalent effort surveys by FY2011
Pseudocyphellaria rainierensis lichen	A	1, 2, 3	DES outside known range, low probability of occurrence
Rhizomnium nudum bryophyte	B		Strategic Surveys completed, equivalent effort surveys not required
Schistostega pennata bryophyte	A	1, 2	Sites found within Five Buttes Planning Area, none in or near proposed units
Tetraphis geniculata bryophyte	A	1, 2	DES outside known range, low probability of occurrence
Tritomaria exsectiformis bryophyte	B	1, 3	Known sites at Dell Spring and Ranger Creek. Ranger Creek site was found during surveys in 1999 conducted for 7 Buttes Return project. Equivalent effort surveys required for projects analyzed in 2006 and later.
Ulota megalospora bryophyte	OFF	1, 2	Removed from S&M list

Survey Methods and Results

Sensitive Plants

Surveys for sensitive plants were conducted in 1999 and 2000 using DNF sensitive plant survey protocols. Surveyors inventoried plant populations and habitats using the controlled intuitive meander method. They traversed at least one-third of the total area of each unit in a semi-random fashion, but biased their search pattern to specifically include all areas that appeared to provide habitat for the suspect plants. Plant survey records are on file at Crescent Ranger District in the Botany files.

Survey and Manage Plants

Survey and Manage pre-disturbance plant surveys were conducted for the 7 Buttes Return Project in 1999 and 2000 using methods in the survey protocols that were available at that time. Proposed treatment units that were determined to have suitable habitat for Survey & Manage non-vascular and vascular plant species were inventoried by surveyors. Bryophytes and lichens that surveyors were not able to identify in the field were collected, tentatively identified in the office and sent to the local taxa expert (Rick Dewey) for verification.

Surveys were conducted for Survey and Manage plant taxa that were documented or suspected to occur on the DNF at that time. The S&M surveys done in 1999 and 2000 included all Category A and C plant species and lichens and bryophytes in Category B that are on the list in the 2001 ROD as modified and amended through March 21, 2004 (See Table 3-85). Equivalent-effort surveys for vascular and non-vascular Catergory B species are to be done for project analyses in 2006 and later. Surveys were and still are considered infeasible for fungi (Categories B, D, E, and F) except *Bridgeoporus nobilissimus* (Category A, perennial conk); the recommended protocol to determine presence/absence of fungal species is to survey a minimum of 3 times (every 2 to 3 weeks) for at least 3 years and preferably 5 years during the season in which each fungal species is expected to produce sporocarps. Equivalent effort surveys in potential habitats for fungal species in Category B are to be done for project analyses done in 2011 and later.

Survey and Manage surveys conducted in the Five Buttes Planning Area include: pre-disturbance surveys in 7 Buttes Return units determined to have suitable habitat; contracted surveys for non-vascular plants (bryophytes and lichens) for sale units in Grow, Hammy, Cowgirl, Royal, Haven, and Yard timber sales (7 Buttes EA); species found and identified by NWFP area experts for Survey and Manage taxa, which were then documented in the ISMS database (Interagency Species Management System); purposive surveys in areas determined to have suitable habitat for survey and manage species including Crystal Creek, old-growth area along Crescent Creek and upslope on Odell Butte, Maklaks Creek, and an un-named tributary of Odell Creek just south of Maklaks Creek; Strategic Survey CVS plot #s 2069174 (Cryder Butte), 2069166 (Hamner Butte), 1068152 (Diamond Peak Wilderness), 2071158 (Rosary Lakes), and 2073158 (Bobby Lake); and Known Site Surveys (KSS) for *Schistostega pennata* at Trapper Creek and west Odell Lake sites and for *Tritomaria exsectiformis* at Dell Spring and Ranger Creek sites.

The species and sites listed in Table 3-87 were documented in the Five Buttes project area as a result of the surveys.

Environmental Consequences

Sensitive Plants
After reviewing the GIS Sensitive Plant layer and past survey information (through the 2006 field season), *Rorippa columbiae*, a species on the current Region 6 Forester's Sensitive Plant List was found to occur in the Five Buttes Project Area. Two sites for this plant were found along Highway 58 in the planning area. No proposed units are located near these sites. No other Threatened, Endangered, Proposed, or Sensitive plant species were found to occur in the Five Buttes Planning Area.

Survey and Manage Plants
Several S&M plant species occur in the Five Buttes planning area based on survey records, databases, and GIS (see Table 3-86). Only one site for a survey and manage listed species is located in or near a proposed activity unit. *Tritomaria exsectiformis* occurs in Unit 678 (Alternative C) on Class III and IV decayed wood in the perennial, low-flow channel of Dell Spring. A 100-foot buffer from activities would be maintained and has been demonstrated on the district and forest (i.e. Charlie Brown project) to be an effective measure (DEIS, page 27). The sites for all other Survey and Manage species documented in the Five Buttes project area would not be affected by project activities because the sites are not in the proximity of units or road management activities proposed in the action alternatives.

The known site in the Five Buttes planning area for *Ramaria amyloidea* (Table 3-83) is not in or near any units proposed in the action alternatives. *Ramaria amyloidea* is in Category B.

Environmental Effects

Alternative A – No Action
Under the No Action alternative, current management plans would continue to guide management of the project area. Routine maintenance and response to environmental emergencies such as wildfires would continue to occur. The landscape would remain at an elevated risk to a large-scale disturbance event. However, there would be no direct or indirect effects to Sensitive or Survey and Manage plant species.

Alternative B – Proposed Action

Direct and Indirect Effects

Sensitive Plants: If Alternative B is selected there will be no direct or indirect effects to any R6 listed sensitive plants, including *Rorripa columbiae*, because no sites were found to occur in or near any of the units proposed in this alternative.

Survey and Manage Plants: There will be no direct or indirect effects to any Survey and Manage taxa known to occur in the Five Buttes project area (Table 3-83), including *Tritomaria exsectiformis*, because small diameter fuels reduction would not occur within 100' an existing population. There would be somewhat a reduction of risk to wildfire on a landscape scale, but the Dell Springs site would remain at an elevated risk.

Alternative C

Direct and Indirect Effects

Sensitive Plants: If Alternative C is selected there will be no direct or indirect effects to any R6 listed sensitive plants, including *Rorripa columbiae*, because no sites were found to occur in or near any of the proposed activity areas.

Survey and Manage Plants: There would be no direct or indirect effects to any listed Survey and Manage plants if Alternative C is selected. The site for *Tritomaria exsectiformis* in Unit 678 is located in the narrow, perennial, low-flow channel associated with Dell Spring. Proposed activities include thinning by hand up to 6" diameter material, handpiling, and disposal. A 100-foot buffer would be maintained between activities and the existing population. Without this measure, there would be potential to directly damage the plant or alter the habitat by changing the microsite.

Cumulative Effects

Limited presence, project design features, and mitigation measures avoid effects to sensitive and Survey and Manage species. Therefore, there would be no additive effects.

Invasive Plants

Invasive plants are undesirable in forest ecosystems because they tend to displace native plants, including, potentially, rare and protected species, degrade habitat for animal species, promote soil erosion, and lessen the value of recreational experiences. As continually disturbed, often open areas, roadsides are highly suitable habitats for many invasive plants. Many of the weed sites within the project area are located along roadsides. Relating to this, motorized vehicles are most likely the major vector for the introduction and/or spread of invasive plants within the project area. Vehicles may include those associated with public recreational use or harvesting of special forest products (e.g., firewood, mushrooms), or general forest management operations including commercial harvest, inventory, monitoring, road maintenance and fire suppression. Vehicles have the potential to transport weed seeds included in soil and muck stuck in tire treads or on undercarriages. Also, portions of whole, seed-bearing invasive plant species can become wedged in bumpers and within undercarriages when vehicles drive through patches of weeds. By these means, weed seeds can be imported to the project area or moved about within the project area.

The existing condition, proposed activities, and the risk of introduction and spread of invasive plant species, including noxious weeds, were assessed for the Five Buttes Project.

Management Direction

National Direction

The National Forest Management Act (1976) specifies that National Forest System lands "provide for a diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives." The implementing regulations (36 CFR 219.26) for the National Forest Management Act states that "forest planning shall provide for diversity of plant and animal communities and tree species consistent with the overall multiple-use objectives." In addition, 36 CFR 219.27 (g) states that "management prescriptions shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which would be expected in a natural forest, … reductions in diversity of plant and animal species from that which would be expected in a natural forest … may be prescribed only where needed to meet multiple-use objectives. Planned type conversions shall be justified by an analysis showing biological, economic, social, and environmental design consequences, and the relation of such conversions to the process of natural change."

The Noxious Weed Management Act (1974) contains provisions to prevent the dissemination of noxious weeds. Other provisions in the act authorize the cooperation of Federal agencies with agencies of State, districts, farmers' associations and similar organizations or individuals in carrying out operations or measures to eradicate, suppress, control or retard the spread of any noxious weed. In addition, 36 CFR 222.8 acknowledges the Agencies' obligations to work cooperatively in identifying noxious weed problems and developing control programs in areas where National Forest System lands are located.

Executive Order 13112 implemented on February 3, 1999 requires Federal agencies to use relevant programs and authorities to prevent the introduction of invasive species and not authorize or carry out actions that are likely to cause the introduction or spread of invasive species unless the agency has determined, and made public, documentation that shows that the benefits of such actions clearly outweigh the potential harm, and all feasible and prudent measures to minimize risk of harm will need to be taken in conjunction with the actions. The USDA Forest Service *Guide to Noxious Weed Prevention Practices* (July, 2001) supports implementation of Executive Order 13112 on Invasive Species.

Regional Direction

Region 6 of the Forest Service has prepared an Invasive Plant Environmental Impact Statement (R6 IP EIS). The Final EIS was released in June 2005 and the Record of Decision (ROD) was signed in October 2005; implementation began March 1, 2006. The R6 IP EIS applies to non-native invasive plant species, but not to native competing and unwanted vegetation. Standards and Guidelines in the R6 IP EIS are incorporated into Forest Plans in the region. The ROD is being appealed (December 29, 2005).

This project is compliant with the FEIS for Managing Competing and Unwanted Vegetation (USDAFS Region 6, 1988) and the associated Mediated Agreement.

Forest Direction

The Deschutes National Forest Land and Resource Management Plan is amended to incorporate Standards and Guidelines from the R6 IP EIS.

In 1998, the Deschutes National Forest Noxious Weed Control Environmental Assessment (DNF Weed EA) with its supplemental Deschutes National Forest Integrated Weed Management Plan (IWMP) was completed in accordance with the Regional Vegetation Management FEIS and Mediated Agreement. The Decision Notice from the DNF Weed EA selected an alternative that allows a variety of noxious weed treatments, including herbicides (USDA Forest Service, Deschutes National Forest, 1998).

The DNF Weed EA and IWMP identify and promote actions within the noxious weed management strategies of prevention, early treatment, maintenance, and awareness. Implementation of management strategies include analyzing the risk of noxious weed invasion during the project planning process and developing tactics to avoid introduction or spread of noxious weeds, clean equipment provisions in contracts, actions to prevent weed introduction and spread, and suggestions for increasing awareness of noxious weeds and the risks they pose, both within the Forest Service and with the public.

Since the early 1990s, gathering information of location and size of infestations for all known noxious weed sites has been underway. This information has been entered into a database and GIS and has been updated on an annual basis.

Under the authority of the DNF Weed EA, noxious weeds have been treated in the Five Buttes project area starting in 1999 using various methods, primarily manual control (hand-pulling). Herbicide use is authorized by the 1998 DNF Weed EA in the Five Buttes project area on the portion of Highway 46 (Cascade Lakes Highway) from the junction to East Davis Campground northward. The most recent available data on herbicide use from Oregon Department of Agriculture indicate that individual knapweed plants were treated on a total of approximately one-half acre with the herbicide Dicamba applied at a rate of 32 ounces per acre.

An Invasive Plants Environmental Impact Statement for the Deschutes and Ochoco NFs is in the process of preparation. This EIS is tiered to the R6 Invasive Plant EIS and is expected to be completed in 2006. The Deschutes/Ochoco/Crooked River National Grassland Invasive Plant EIS would provide site-specific analyses.

Existing Condition

Invasive plant surveys were performed in conjunction with Sensitive and Survey & Manage plant surveys in the Five Buttes Project area. Additional areas have been surveyed for other projects including in past harvest units scheduled for precommercial thinning treatments.

Invasive plants along major travelways in the project area have been manually treated (pulled) each year for the past several years.

Information currently in the Natural Resources Information System/Terra database (NRIS/Terra), the Deschutes National Forest GIS weed layer and past survey records document the presence, within the Five Buttes project boundary of 30 invasive plant species on 25 different invasive plant sites covering a total of approximately 2,277 acres. Eighteen of the 30 invasive plant species are currently being tracked in NRIS/Terra.

Brief descriptions and general locations of the invasive plants that occur in the Five Buttes project area follow. The invasive plants that are listed are from the R6 Invasive Plant FEIS Appendix B (2005).

Spotted knapweed: Spotted knapweed (*Centaurea biebersteinii*, CEBI2; formerly named *Centaurea maculosa*) is a biennial or short-lived perennial composite with a stout taproot (Mauer and Russo, 1991).

This species reproduces by seeds, which are dispersed by wind, vehicles, animals, or humans. The competitive superiority of this species suggests pre-adaptation to disturbance (Roche et al, 1986 in Mauer and Russo, 1991). The initial invasion of spotted knapweed, like other noxious weeds, is correlated highly to disturbed areas. Once a plant or colony is established though, it may invade areas that are relatively undisturbed or in good condition (Tyser and Key, 1988 and Lacey et al, in Mauer and Russo, 1991). Monitoring has shown that most spotted knapweed sites on the Deschutes National Forest have decreased in size and numbers of plants due to treatments with herbicides and manual treatments (hand pulling).

Spotted knapweed has been found and treated along Highway 46, the Crescent Cut-off Road and Highway 58 in and adjacent to the Five Buttes project area. Spotted knapweed has nine documented sites with 10.45 infested acres on a total of 652 acres.

Diffuse knapweed: Diffuse knapweed (*Centaurea diffusa*, CEDI3) is a highly competitive herb in the sunflower family (Asteraceae). The plants first form low rosettes and may remain in this form for one to several years. After they reach a threshold size they will bolt, flower, set seed, then die. Thus they may behave as annuals, biennials, or short-lived perennials (Carpenter and Murray, 1998a). Diffuse knapweed is a highly competitive and aggressive plant that forms dense colonies (Zimmerman, 1997 in Carpenter and Murray, 1998a). It is especially adept at spreading along rights-of-way and can spread rapidly (Allred and Lee, 1996 in Carpenter and Murray, 1998a). Disturbed lands are prime candidates for colonization, but diffuse knapweed will also invade undisturbed grasslands, shrublands, and riparian communities (Zimmerman, 1997 in Carpenter and Murray, 1998a).

Diffuse knapweed has been found as isolated plants and hand-pulled along the major travelways in the Five Buttes project area. Diffuse knapweed occurs on 4 documented sites with 5.5 acres infested on a total of 416 acres.

Canada thistle: Canada thistle (*Cirsium arvense*, CIAR4) is an erect perennial rhizomatous thistle distinguished from all other thistles by: 1) creeping horizontal lateral roots; 2) dense clonal growth; and 3) small dioecious flowerheads (male [staminate] and female [pistillate] flowers on separate plants) (Nuzzo, 1997). Canada thistle spreads primarily by vegetative growth of its roots, and secondarily by seed (Nuzzo, 1997). Despite its common name, Canada thistle is native to Europe and was apparently introduced to North America in the early 17th century.

Small infestations of Canada thistle are known to occur along the Crescent Cut-Off Road, Highway 58 near Odell Creek, and Highway 46 in the Five Buttes project area. A well-established dense infestation of Canada thistle was recently documented on the north shore of Davis Lake. Canada thistle has 12 documented sites on a total of 863 acres of which 22.6 acres are infested.

Bull thistle: Bull thistle (*Cirsium vulgare*, CIVU) is a biennial with a fleshy taproot. It reproduces solely from seeds that are dispersed by wind, water, animals, and human activities. Disturbed areas are prime habitat for bull thistle to invade (Beck, 1999). On the Deschutes National Forest, bull thistle has been sighted, but has not proven to be an aggressive noxious weed. When it occurs on a disturbed site, it seems to decrease and disappear when native vegetation regains its pre-disturbance levels (which may take many years). In areas that are continually disturbed, such as roadsides, bull thistle may invade and persist if not controlled. Due to a combination of limited funds and noxious weed species of higher priority, bull thistle has not been actively treated on the Deschutes National Forest.

Small infestations of bull thistle (one to a few plants) are found along the major travelways in the Five Buttes project area, with larger infestations occurring in some past harvest units, especially in landings and skid trails. Bull thistle occurs on 14 sites on a total of 944 acres of which 19 acres are infested.

Russian thistle: Russian thistle (*Salsola kali*, SAKA) is a summer annual that reproduces by seed. When the plant is mature it breaks off at the ground forming “tumbleweeds” that are tossed by the wind, scattering seeds. A single plant can produce 100,000 to 200,000 seeds. Seeds are dormant over winter allowing the seed to germinate in spring over a wide range of temperatures and with very little moisture, generally in late March or early April. Seed viability is short and rapidly declines after two years in the soil. A large, spreading root system enables plenty of shoot growth with little moisture (Morisawa, 1999).

Russian thistle is found occasionally when doing manual weed control along the major travelways on Crescent Ranger District. Russian thistle has been found to occur on 1 site with a total of 156 acres of which ½ acre is infested.

Dalmatian toadflax and common toadflax: Dalmatian toadflax (*Linaria dalmatica*, LIDA) and common toadflax (*Linaria vulgaris*, LIVU2) are perennial herbs in the figwort family (Scrophulariaceae). Both species are classified as weeds in Europe, Russia, Canada, and the United States, and are common throughout North America (Carpenter and Murray, 1998b).

A toadflax plant has from 1-25 vertical, floral stems. These floral stems have thick-walled, woody xylem and supporting fibers. Flowers are bright yellow and resemble snapdragons. The taproot may penetrate a meter into the soil. Horizontal roots may grow to be several meters long, and can develop adventitious buds that may form independent plants (Carpenter and Murray, 1998b).

Both species are persistent, aggressive invaders capable of forming colonies through adventitious buds from creeping root systems. These colonies can push out native grasses and other perennials, thereby altering the species composition of natural communities. In North America, both species of toadflax are considered strong competitors. They are quick to colonize open sites, and are capable of adapting to a wide range of environmental conditions (Carpenter and Murray, 1998b).

In North America, *Linaria dalmatica* and *Linaria vulgaris* primarily occur on sandy or gravely soil on roadsides, railroads, pastures cultivated fields, range lands, and clearcuts (Saner *et al*., 1995 in Carpenter and Murray, 1998b). Both species of toadflax reproduce by seed and vegetative propagation, and once established, high seed production and the ability for vegetative reproduction allow for rapid spread and high persistence (Saner *et al*., 1995 in Carpenter and Murray, 1998b). Both species of toadflax can adapt their growth to fit a range of habitats, and have a tolerance for low temperatures and coarse textured soils (Carpenter and Murray, 1998b).

Common toadflax and Dalmatian toadflax occur mainly along roadsides on Crescent Ranger District. Common toadflax occurs on 4 weed sites totaling 398 acres of which 0.4 acres is infested. Dalmatian toadflax has been found to occur on 5 sites with a total of 120 acres of which 1.8 acres are infested.

Tansy ragwort: Tansy ragwort (*Senecio jacobaea*, SEJA) is a member of the groundsel tribe (*Senecioneae*) of the sunflower family (Asteraceae). It is a biennial or short-lived perennial with one to a few coarse, erect purplish-red stems, simple except above (Macdonald and Russo, 1989).

Tansy ragwort is a disturbance area plant found on creek bottomlands, in pastures, forest clearcuts, overgrazed pasture, and along roadsides (Macdonald and Russo, 1989).

On the Crescent Ranger District it is found mainly in clearcuts and also occasionally along roadsides. Tansy ragwort occurs on a total of 87 acres on 6 sites, with a total of 8.4 acres infested.

Yellow starthistle: Yellow star thistle (*Centaurea solstitialis*, CESO3) is a winter annual that depends upon seeds for reproduction (DiTomaso, 2001). The seeds are primarily dispersed by birds, however, animals, whirlwinds, humans, and vehicles also disperse seeds. It has been noted to invade sites that have had recent disturbance.

In 2003, fewer than 10 yellow star thistle plants were found and pulled on two sites on Highway 58 on Crescent Ranger District. In 2004, one new site with fewer than 5 plants was found on Highway 58 and no plants were seen at the sites found in 2003. In 2005, no yellow starthistle was seen during weed control activities on Crescent Ranger District. Yellow starthistle has one documented site in the Five Buttes project area covering one-tenth of an acre with one-hundredth of an acre infested.

Scot's broom: Scot's (or Scotch) broom (*Cytisus scoparius*, CYSC4) is a perennial shrub of the legume (Fabaceae) family. Scot's broom grows best in dry, sandy soils in full sunlight (Hoshovsky, 1986). Scot's broom invades pastures and cultivated fields, dry scrubland and "wasteland", native grasslands and along roadsides, dry riverbeds and other waterways (Gilkey, 1957, Johnson 1982, Williams 1981 in Hoshovsky, 1986). Although it is primarily found west of the Cascades, it has been found growing on the eastern slopes as well (Gilkey, 1957 in Hoshovsky, 1986). It does not do well in forested areas but invades rapidly following logging, land clearing, and burning (Mobley, 1954, Williams, 1981 in Hoshovsky, 1986). Seeds can stay viable in the soil for 75 years or more.

On Crescent Ranger District, Scot's broom occurs mainly along roadsides from seeds most likely transported from the west side Cascades by vehicles. Scot's broom has 4 sites documented in the project area with 4.1 acres infested on a total of 623 acres.

St. Johnswort: St. Johnswort (*Hypericum perforatum*, HYPE) is a perennial species with a deep penetrating taproot. It is commonly referred to as goatweed or Klamath weed. This species can become established in degraded or pristine forest or rangelands. Any soil disturbance will decrease competition for St. Johnswort and will cause it to increase (Piper, 1999).

St. Johnswort is common along roadsides on all the major roads on Crescent Ranger District. St. Johnswort occurs on 10 sites in the project area with 4.1 acres infested on a total of 848 acres.

Common mullein: Common mullein (*Verbascum thapsus*, VETH) is a biennial, perennial or, rarely, an annual with a deep tap root. It grows 5-18 decimeters tall and can produce as many as 180,000 seeds per individual plant. Seeds may remain viable for over 100 years. Mullein depends on the presence of bare soil to germinate and establish. (Hoshovsky, 1986).

Common mullein is common in most disturbed sites (road sides, past harvest units, campgrounds, etc.) on Crescent district, especially in the Davis Fire area. Common mullein sites are not tracked in the DNF invasive plant geodatabase.

Field Bindweed: Field bindweed (*Convolulus arvensis*, COAR4) is a persistent, perennial vine of the morning-glory family (Convolvulaceae) which spreads by rhizomes and seeds. Habitats with little competition, repeated disturbance, and high light – such as roadsides – are ideal for growth of field bindweed (Lyons, 1998).

On Crescent Ranger District, field bindweed has been found in small isolated patches on Highway 58 and the Crescent Cut-off Road. Field bindweed occurs on 2 sites totaling 183 acres with 1.1 acres infested.

Hairy-pod whitetop: Hairy-pod whitetop (*Cardaria pubescens*, CAPU) is a hardy perennial with stout, erect or procumbent stems that can grow 2 to 5 decimeters tall. Hairy-pod whitetop can be distinguished from other weedy whitetop species by the hairy sepals and fruits, which are globose and remain inflated when dried. Hairy-pod whitetop can grow in a variety of non-shaded disturbed conditions, including roadsides, waste places, fields, gardens, feed lots, watercourses, and along irrigation ditches and is not particular about soil type (Hickman, 1995 in Lyons, 1998). *Cardaria* species are native to southwest Asia.

Hairy-pod whitetop was found on Crescent Ranger District along Highway 58 in the vicinity of Odell Butte on 1 site with one-tenth acre considered infested on a total of 23 acres.

Cheatgrass: Cheatgrass (*Bromus tectorum*, BRTE) is an erect winter- or spring- annual grass. Cheatgrass reproduces only from seeds, germinates in the fall or winter, expands its roots, and rapidly exploits the available water and nutrients in early spring. Cheatgrass can persist in unpredictable environments because seed germination is staggered from August until May (Carpenter and Murray, no date).

Notable cheatgrass infestations occur along roadsides and adjacent to units on the east shoreline of Davis Lake. Control is difficult. Cheatgrass sites are not tracked in the DNF geodatabase.

Sweetclover: Sweetclovers (*Melilotus alba* – white-flowered, MEAL; *M. officinalis* – yellow-flowered, MEOF) are annual, winter annual, or biennial legumes in the Pea Family (Fabaceae). The sweetclovers were introduced from Europe and Asia, becoming common along roadsides and waste areas. Sweetclover is often one of the first plants to appear on disturbed sites (Whitson et. al., 1992)

Sweetclover infestations on Crescent Ranger District occur mainly along Highway 58 where it was a contaminant in the seed mix used by fiber optics line contractors for revegetation after installation (McMahan, pers. comm.). Sweetclover occurs on 4 sites totaling 113 acres with 3.2 acres considered infested.

Reed canarygrass: Reed canarygrass (*Phalaris arundinacea*, PHAR3) is a cool-season perennial grass that grows successfully in northern latitudes. It can be invasive in wet habitats and so is often a target for control. Since reed canarygrass is tolerant of freezing temperatures and begins to grow very early in the spring, it can out compete many other species. Reed canarygrass spreads within sites by creeping rhizomes and forms dense, impenetrable mats of vegetation. New sites are colonized by seeds (Lyons, 1998).

Reed canarygrass has been referred to as a "Dr. Jekyll and Mr. Hyde kind of grass" (Hodgson, 1968 in Lyons, 1998). It is valued as a forage grass and for revegetating denuded ditchbanks. However, it can also overgrow irrigation ditches and small natural watercourses, alter soil hydrology, is poor forage for domestic stock when fresh, and invades native vegetation where it out competes desirable native species. Almost any moist, fertile habitat is suitable for this species. Reed canarygrass invades and dominates wetland and riparian areas. Human-caused disturbance and alteration of water levels encourage reed canarygrass invasion (Hoffman and Kearns, 1997 in Lyons, 1998).

Crescent district records show that reed canarygrass was seeded on 1955 in the area of the Davis Lake site (approximately 40 pounds of seed on twenty acres, along with alta fescue, meadow foxtail, and orchard grass) and again in 1965 in the Davis Lake C&H grazing allotment when 120 pounds of seed were planted in the vicinities of the mouths of Odell and Ranger Creeks. The Davis Lake reed canarygrass site now occupies 1256 acres. Reed canarygrass occurs on 3 sites in the Five Buttes project area totaling 1281 acres with 631 acres infested.

Other species of invasive plants in the Five Buttes project area that are on the Region 6 Invasive Plant List (FEIS 2005) that are not presently tracked in NRIS/Terra include:

- *Anchusa officinalis* (ANOF, common bugloss), one small site with few plants.
- *Centaurea debauxii* (CEDEx, meadow knapweed), one plant found and pulled in 2005 during weed control and inventory activities along Highway 58 (Odell Lake area).
- *Cichorium intybus* (CIIN, chicory), a few plants found and pulled along Highway 58 during weed control and inventory activities almost every year.
- *Daucus carota* (DACAx, wild carrot), a few plants found and pulled along Highway 58 during weed control and inventory activities almost every year.
- *Dactylis glomerata* (DAGL, orchardgrass) found occasionally along major travelways in the Five Buttes project area.
- *Hypochaeris radicata* (HYRA, hairy cats-ear) a few plants found and pulled along Highway 58 during weed control and inventory activities almost every year.
- *Leucanthemum vulgare* (LEVU, oxeye daisy) found along major travelways in the Five Buttes project area. Plants found are pulled during weed control and inventory activities.
- *Rubus discolor* (RUDI, Himalayan blackberry) one site known along Highway 58 in the Five Buttes project area. Plants found are pulled.
- *Tanacetum parthenium* (TAPA, feverfew) a few plants found and pulled along Highway 58 during weed control and inventory activities almost every year.
- *Tanacetum vulgare* (TAVU, common tansy) a small infestation was found and pulled at the pull-out at the 46/61 junction.
- *Verbascum thapsus* (VETH, common or wooly mullein) extensive infestations in many past harvest units and along roadsides in the Five Buttes project area.

Environmental Consequences

With regard to invasive plants, the possible consequences associated with any Alternative considered in this EIS mainly arise from further disturbances within the project area. Factors that increase weed risk associated with vegetation management projects include:

1. harvest activities, treatments to reduce fuels, and temporary road construction would increase the amount of disturbed, open ground available for infestation by invasive plants, and
2. increased activity and traffic would heighten the chance for the introduction and/or spread of invasive plant seeds and propagules by vehicles, equipment, and personnel.

Project Design Features and mitigations (site-specific recommendations) are proposed to reduce the risk of the introduction and/or spread of invasive plants. However, in projects such as this, where numerous invasive plant sites exist both within and adjacent to the project area, any action alternative will unavoidably be associated with an increased potential for the introduction and/or spread of invasive plants (see Figure 3-24 for locations of invasive species and activity units in the project area). The type of harvest system would affect weed risk, with systems involving less mechanical travel within and around harvest units being reasonably expected to have less risk. Helicopter logging, for instance, can be conducted with very low invasive plant risk. Skyline harvest would have more potential risk for invasive plants than helicopter harvest and less risk than conventional ground-based harvest. Where harvest systems within a project are similar, invasive plant risk can largely be equated with the number of acres of proposed harvest. For example, an alternative proposing conventional ground-based harvest on 1000 acres can be reasonably expected to pose a significantly greater risk than an alternative proposing conventional ground-based harvest on 500 acres. Specifically, acres of commercial harvest, acres of fuels reduction, and road management activities for the project including miles of temporary road construction, commercial hauling, road maintenance and reopening roads will be used to assess and compare invasive plant risks between alternatives.

All projects that propose ground-disturbing activities will have Project Design Features (PDFs) appropriate to the project. The PDFs are taken from the national *Guide to Noxious Weed Prevention Practices* (USDA Forest Service, 2001), the Region 6 Invasive Plant EIS, and the Deschutes and Ochoco National Forests and Crooked River National Grassland Invasive Plant Prevention Guidelines. Project Design Features have been shown to be effective in reducing the risk of the introduction and spread of invasive plants. The Region 6 Invasive Plant Final Environmental Impact Statement (FEIS) Record of Decision (ROD) (USDA Forest Service, 2005) adopted Standards and Guidelines that will be followed.

Standards in the R6 Invasive Plant FEIS that apply to the Five Buttes project are:

1. Prevention of invasive plant introduction, establishment and spread will be addressed in … vegetation management plans…. *R6 Standard #1*
2. Actions conducted or authorized by written permit (contracts) that operate outside the limits of the road prism, require cleaning of all heavy equipment (i.e., bulldozers, skidders, other logging equipment) prior to entering National Forest System Lands. *R6 Standard #2*
3. Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. (Gravel or other material used in road maintenance and construction/reconstruction associated with the project.) *R6 Standard #7*
4. Conduct road blading, brushing and ditch cleaning in areas with high concentrations of invasive plants in consultation with District or Forest-level invasive plant specialists, incorporate invasive plant prevention practices as appropriate (road maintenance and re-opening roads). *R6 Standard #8*

The Project Design Features for the Five Buttes Project are:

1. Noxious weed risk assessment and management will be considered in all NEPA planning activities where soil disturbance or invasive plant introduction or spread could result from the

activity. Prevention will be emphasized as the preferred strategy for invasive plant management. *Requirement R6 Standard #1.*

2. Remove mud, dirt, and plant parts from all heavy equipment that will operate outside the limits of the road prism prior to entering NFS lands AND before moving into a new or different project area. Cleaning must occur in areas where removed weed seeds will not create additional problems. *Requirement R6 Standard #2.*
3. Require all Forest Service employees to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and personal equipment prior to leaving a project site infested with weeds. *Guideline*
4. Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that are judged to be weed free by District or Forest weed specialists. *Requirement R6 Standard #7*
5. Environmental analysis for ANY and ALL ground-disturbing projects will evaluate weed risk and consider weed prevention in the development and evaluation of alternatives and mitigating measures. Silvicultural prescriptions, logging plans, road management, and other activities will include weed prevention measures (e.g., shade retention and minimal soil disturbance). Prevention will be emphasized as the preferred strategy for invasive plant management.

Direct and Indirect Effects
Risk assessment for all alternatives: An assessment of the risk of the introduction and spread of invasive plants associated with activities proposed in the alternatives was completed and is based on the amount of ground disturbance that would occur for each alternative.

Alternative A (No Action): Overall, this Alternative has a lower probability of introducing and/or spreading invasive plants than the action Alternatives. However, the Davis Fire created more favorable conditions for introduction of invasive plants than any activity considered in the Five Buttes project. This Alternative has the greatest potential for another uncharacteristic disturbance resulting in a heightened potential for favorable invasive plant conditions.

Alternatives B and C (Action Alternatives): The level of weed risk associated with these Alternatives appears to be directly correlated with the number of commercial harvest acres and fuels treatment acres proposed for each alternative. In order of increasing number of proposed acres, the rank of the Alternatives is B (5,522 acres) then C (7,832 acres). Based on the number of miles of proposed temporary roads associated with each alternative the rank of weed risk associated with Alternatives from least risk to greatest is C (5.9 miles) then B (6.4 miles). With regard to miles of roads where road maintenance and will take place the rank of weed risk (again, least risk to greatest) is B (110 miles) then C (118 miles). Based on the number of miles proposed for re-opening the weed risk is B (34 miles) then C (44 miles). Based on the miles of roads where commercial hauling would take place the weed risk is B (125 miles) then C (130 miles). Overall, the rank of weed risk for the Five Buttes project for the action alternatives is B (lower risk) then C (greatest risk).

Cumulative Effects
Invasive plant monitoring in the Davis Fire area has shown that existing sites for invasive plants, especially existing bull thistle and common mullein sites in past harvest units and along roadsides, are spreading to adjacent areas where the fire killed trees and created bare ground. One site for Dalmatian toadflax on the 6240-010 road that was found in 2000 before the fire was visited for the first time after the fire in 2006. One Dalmatian toadflax plant was found and pulled. Manual treatment in 2000-2002 reduced the infestation from about 50 plants to the one plant found in 2006.

Noxious weed inventory and treatment has been occurring on the Deschutes National Forest including the project area in past years. Accurate documentation of noxious weed sites began in the early 1990s. After the Deschutes National Forest Noxious Weed Control Environmental Assessment was approved in 1998, chemical treatment was permitted on selected sites, including a section of Cascade Lakes Highway east of Davis Lake in the project area. Past treatment of noxious weeds has reduced the density of weeds on many sites. Approximately ½ acre along Cascade Lakes Highway in the project area within the project area has been treated using dicamba applied at a rate of 17 ounces per ½ acre. The amount of herbicide needed every year is trending downward as the treatments have been very effective. ***The Five Buttes project would not increase the need or use of herbicides in the analysis area.***

The Deschutes and Ochoco National Forests are in the process of preparing an Environmental Impact Statement for Invasive Plants that would be site specific. This document will be tiered to the Region 6 Invasive Plant Final Environmental Impact Statement. At this time, there is insufficient detail to determine the additive effects. However, actions are expected to have a positive effect on reducing the potential for invasive plant introduction and spread on a large landscape (central Oregon).

Access to all forms of recreation, including Off Highway Vehicle use has potential for an additive effect. To date, the Crescent Ranger District has successfully managed a prevention program through monitoring and rapid response through handpulling of weeds. There is no indication the addition of the Five Buttes project would change this success.

Invasive plant monitoring in the Davis Fire area has shown that existing sites for invasive plants, especially existing bull thistle and common mullein sites in past harvest units and along roadsides, are spreading to adjacent areas where the fire killed trees and created bare ground. One site for Dalmatian toadflax on the 6240-010 road that was found in 2000 before the fire was visited for the first time after the fire in 2006. One Dalmatian toadflax plant was found and pulled. Manual treatment in 2000-2002 reduced the infestation from about 50 plants to the one plant found in 2006. As trees and other vegetation returns to the fire area, shading will increase and bare ground will decrease, which will have a positive effect over the long term in reducing the potential for invasive plant establishment and spread.

Table 3-1 was reviewed for foreseeable actions that are ground disturbing and have potential to contribute to an incremental effect combined with the Five Buttes project. None of these projects have a geographical zone of influence that overlaps.

Risk Assessment

The risk of the introduction and spread of invasive plants for all alternatives from highest to lowest is C, B, and A (Table 3-89). Figure 3-42 displays the location of invasive plant sites compared to proposed activity units. The assessment of the risk of the introduction and spread of invasive plants associated with activities proposed in the alternatives is based on the amount of ground disturbance that would occur for each alternative. For instance, ground-based logging systems would cause more ground disturbance than skyline or helicopter logging systems. Higher numbers of acres proposed in each alternative for commercial harvest and fuels reduction treatments would increase the risk of introducing or spreading invasive plants. The higher the number of miles of temporary road construction, road maintenance, and commercial haul routes, the higher the risk. The risk from road obliteration activities and road re-opening and closing is included in this analysis.

The total acreages of treatments are greater for Alternative C than for Alternative B. Total miles of road maintenance, re-opening closed roads, and commercial haul routes are greater for Alternative C than for Alternative B. Temporary road construction is greater for Alternative B than for Alternative C.

Alternative C poses the highest risk for invasive plant introduction and spread based on the greater number of acres of ground-disturbance and the greater number of miles of road maintenance, re-opening closed roads, and commercial haul routes, which will cause more negative effects to soils.

Alternative B poses the next highest risk with a fewer number of acres of ground-disturbance from commercial harvest, fuels treatments, and fewer miles of road management activities (except for 0.44 miles more of temporary road construction).

Alternative A, the No Action Alternative, poses the least risk of the introduction and spread of invasive plants when compared to the action alternatives. No commercial harvest, fuels reduction activities, or road management are proposed in this alternative, therefore there will be no additional ground-disturbance above existing levels.

Table 3-89. Invasive plant risk comparison by alternative.

Action	Alternative A (No Action)	Alternative B (Proposed Action)	Alternative C
Commercial Harvest (acres)	0	5,522	4,235
Logging Systems Ground-based (acres) Skyline or Helicopter (acres)	 0 0	 4,439 1,083	 3,453 782
Fuels-only Treatments*	0	0	3,563
Prescribed Underburning	0	3,998	3,939
Grapple Piling	0	4,439	3,453
Handling and disposal in commercial harvest units	0	2,275	2,221
Total Potential Ground-disturbance Acres	0	5,522	7,797
Road Management Temporary road Construction (miles) Commercial Hauling (miles) Road maintenance (miles) Re-open roads (miles)	 0 0 0 0	 6.4 125 110 34	 5.9 130 118 44
Comparative Ranking of Weed Risk (1 = lowest)	1	2	3

* This includes activities outside commercial harvest units; small tree thinning with upper diameter limit of 3-6”, handpiling, and disposal.

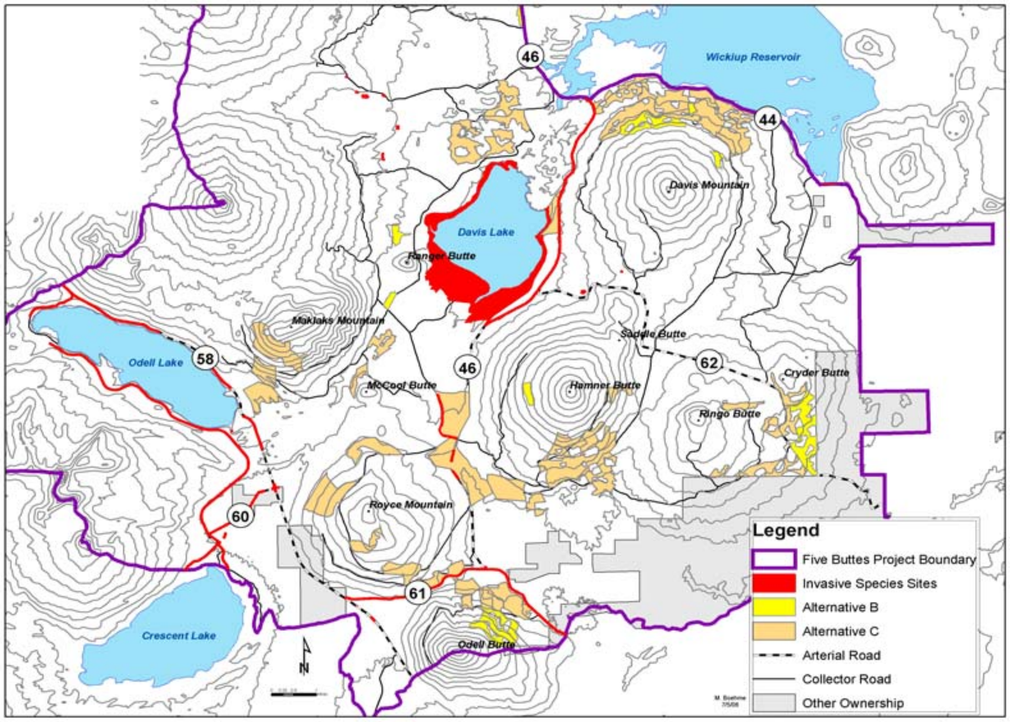


Figure 3-42. Locations of invasive plant species relative to activity units in the Five Buttes Project area.

Cultural Resources

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 January 2001), 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.

In general, the existing management direction asks the Forest to determine the effects on cultural resources when considering 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, which states that cultural resource properties located during inventory, will be evaluated for eligibility to the National Register.

CR-3, which states that in concert with inventories and evaluation, 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 will occur to the resources.

Existing Condition

Previously conducted cultural resource inventory survey has covered approximately 50.6% (81,067 acres) of the proposed approximately 160,000 acre project area. Some of this coverage represents more than one past survey in high probability areas. These survey acres are counted only once, because the purpose of new surveys is due to substantial changes in surface visibility conditions following the Davis Fire of July 2003.

During the 2005 field season, a small amount of additional survey inventory was completed. The purpose of this additional inventory was to examine approximately 589 acres of high probability where proposed activities are planned. The survey was accomplished in August 2005; no new cultural resources were identified.

Presently, there are 111 known cultural resource sites identified within the project area. Eighty-three of the sites have been evaluated for eligibility to the National Register and of these, 61 were found to be eligible while 23 were not eligible. The remaining 27 sites have not been evaluated for eligibility because they would be excluded from potential disturbance.

In addition to these 111 known cultural resource sites, three more sites are being newly reported to the State Historic Preservation Office (SHPO).

Site types represent nearly the full range of sites on the district and include lithic scatters with and without flaked and or ground stone tools, rock cairns, possible pit house depressions, cambium peeled trees, dugout canoes, and hunting blinds. Historic era sites represent early public and Forest Service administrative use. A fire lookout, a telephone line, a trail, historic roads, an early ranger station location, collapsed log structures, remnants of a sawmill, historic era tree carvings, a mining claim marker, and historic debris scatters are examples of historic site types present in the project area. There are 57 prehistoric sites, 37 historic sites, and 17 sites with both prehistoric and historic components.

The specific condition of each of the 111 cultural resource sites is difficult to address while retaining anonymity of site contents and location. In general, many of the sites are in some state of decay, either from natural or artificial (human) processes. In sites where there are artifacts or components made of perishable materials (wood, fiber, and metal, for example), natural processes have an effect of their preservation integrity. While the natural processes can not be altered, they can be recognized and planned for accordingly, depending on the specific site involved.

Factors that are considered important to monitor over time for the "health" of cultural resources include integrity of the soils in which artifacts are distributed, integrity of the artifacts and other material remains, and integrity of site context (contents and location).

Patterns of native life have changed dramatically in the last 500 years, yet traditions remain that tie these peoples to the native plants found in the project area, whether there is modern use of them or not. An example of this is an annual ceremony of the Klamath Tribes related to the yellow water lily (*Nuphar polysepalum)*, an aquatic species, that today, grows in Davis Lake.

Native plants found today in the project area are representative of current environmental conditions. Since these conditions have been subject to change over time, so too, have the native plants changed. Trees, shrubs, forbs, root crops, sedges, and grasses supplied such needs as food, tobacco, chewing gum, seed sources, teas, medicine, insect repellants, dyes, and materials for basketry and other building needs. Limited information is available about native plant use in the past in the project area. It may be inferred from evidence at archaeological sites in the area. Tools that fall into a category called "ground stone" are documented, including mortars, hopper mortars, manos, and metates. Grinding, mixing, pounding, and cooking activities are all indicated by these clues from the past.

There is also evidence of past native uses of plants dating to about the time of contact with non-native populations. A number of ponderosa pine trees have one or more scars formed by removing a segment of bark. The target part of this plant was likely the sweet cambium (growing) layer under the bark. These trees have healed somewhat, but the scars are hard to miss when identified. Analysis of core samples from a sample of these trees suggests that they are approximately 200 years old. This time is coincident with the arrival of Euroamericans with the Corps of Discovery under Lewis and Clark.

Due to the sensitive nature of cultural resource sites, documentation can be found on file at the Crescent Ranger District.

Consultation

During the early stages of this project, contacts were made with affected tribes (Klamath, Confederated Tribes of Warm Springs, and Burns-Paiute). On May 16, 2006, the Forest Supervisor met with the Burns-Paiute, presented the project, and no specific concerns were raised. Government-to-government consultation has been informal through meetings between the Deschutes National Forest supervisor and their representatives, scoping letters, and personal contact with natural resource members representing all there tribes. On April 5, 2007, the Five Buttes team briefed the Provincial Advisory Committee, a group which includes a representative in Natural Resources from the Confederated Tribes of Warm Springs. Also, the interdisciplinary team has offered to present proposed activities at the quarterly meetings for the Confederated Tribes of Warm Springs Reservation. No special concerns about Tribal resources were identified.

It is acknowledged that the Tribes may have lost the verbal history and they may not know where desired plant species and resources may be found. This affects their ability to tell Federal agencies where Tribal trust resources can be located on Federal lands. Restoration of the landscape would promote the types of plants, including those used for gathering by native peoples, so they would remain or increase in the project area.

Environmental Consequences

Alternative A

Alternative A is the no action alternative. There would be no change in current management direction or in the level of ongoing management activities.

In a passive management scenario, the potential for an uncontrollable wildfire remains as great as or greater than it was prior to the June 2003 Davis Fire (reference Fire and Fuels Report). This places vulnerable sites at risk to damage from heat and associated suppression and rehabilitation efforts. Activities associated with wildfires that affect cultural resource sites usually have very direct effects, such as building fire line through a sensitive site with both surface and buried components.

Fire suppression activities, including use of bulldozers or hand crews for fireline construction and mop-up activities, can destroy the integrity of a surface or subsurface prehistoric or historic archaeological site. This occurs when the sediments containing the cultural material are displaced, churned, compacted, and mixed with surface debris (limbs, needles, small shrubs, etc.).

Indirect effects caused by fire suppression would include the exposure of buried cultural materials in the fire lines or hand lines created by the machinery or fire crews. Once exposed, the artifacts are vulnerable to illegal collection, which is another way that site integrity is lost.

Fireline rehabilitation can also potentially affect the cultural resource. When bermed material is returned to the bulldozer or hand line and rearranged to conform more closely to pre-suppression contours, the already compromised archaeological context is again redistributed. Once fire lines are recontoured, they begin to “soften” through natural processes of erosion, deposition, and weathering. Eventually, rehabilitated firelines will revert to an undisturbed appearance. Future archaeological inventory surveys or other investigations will require knowledge of past fires in order to assess apparently undisturbed surfaces. If the earlier disturbances are not known or recognized in advance, the contexts observed and reported from these areas can be erroneously interpreted.

Another effect associated with wildfires is the exposure and increased visibility of artifacts previously hidden under the surface litter, understory vegetation, and ground cover. Vegetation patterns in parts of the Five Buttes project are distinctly lacking in heavy ground cover and understory plants, due in part to the abundance of Mazama tephras (air-fall pumice and ash). Once the vegetation is burned off, it can take decades to recover. Related to the loss of surface vegetation and needle litter is a potential short term effect of greater vulnerability of exposed artifacts to erosion, weathering, wind transport, and illicit collection.

The mixing of modern carbon (charcoal from burned vegetation) with sediments containing ancient cultural material is another effect of wildfires. This can be damaging to the cultural resource if it affects the integrity of the artifacts and their ability to be accurately carbon dated.

Effects Common to all Action Alternatives

Three activity units proposed in both Alternatives B and C overlap an eligible or potentially eligible cultural resource site. However, they would be protected by avoidance. There are no direct, indirect, or cumulative effects anticipated for cultural resources under either action alternative. There are no anticipated effects on cultural resources that would be an irreversible or irretrievable commitment of cultural resources.

If a new cultural resource site is discovered all applicable standards and guidelines would be met.

Based on the current knowledge about cultural use of native plants by American Indian tribes and the nature of the proposed action, there would be no effect. Access to potential culturally important areas, such as Davis Lake, would not change as a result of proposed actions.

Following guidelines in the 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 avoidance is the desired action for protection of the sites. The protection of eligible or potentially eligible sites from project effects leads to this finding as described in 36CFR800.49(d)(1) Federal Register Vol. 65, No. 239; Tuesday, December 12, 2000; page 77729.

Given this finding of No Historic Properties Affected, there should be no direct effects from the proposed alternatives on any eligible or potentially eligible cultural resource sites. The combination of protection through avoidance and monitoring (see the section titled "Resource Protection Measures" in Chapter 2 of this EIS) is an effective way to manage known cultural resources for long term preservation.

The Five Buttes project maintains consistency with Deschutes Forest Plan standards and guidelines by inventorying sites, evaluating their potential, and providing documentation.

There are no cumulative effects identified for the cultural resources.

Recreation

Existing Condition/Facilities

Several developed recreation sites are included in the Five Buttes project area. These include Odell Lake recreation residences and campgrounds, the Crescent Creek Campground, and the Davis Lake campgrounds. Recreation in the Five Buttes project area centers on Davis Lake, which provides a range of activities for recreational opportunities. These include fishing, hiking, hunting, boating, camping, horseback riding, sightseeing, mountain biking, mushroom picking and off-highway vehicle (OHV) use. Davis Lake has two developed sites (one with a fee system) and provides multiple sites for dispersed recreation.

The majority of the recreational activity occurs in lands designated for Intensive Recreation, and a Recreation Opportunity Spectrum (ROS) for Roaded Natural. This is characterized by a predominately natural-appearing environment with moderate evidence of the sights and sounds of humans. The remainder of the area is in Roaded Modified, characterized by a setting that is heavily modified by human activity and access is generally easy for highway vehicles.

The 2003 Davis Fire changed the way people use the lake, altering the recreational experience. The wildfire completely burned West Davis and partially burned East Davis developed campgrounds. West Davis campground sustained significant damage including 18 of 22 picnic tables, numbered campsite markers, informational signs, two bulletin boards, 1000 treated barrier posts, 500 linear feet of barrier logs and two recently installed toilet facilities. East Davis Campground lost one quarter to one half of the sites. Items that were destroyed consisted of approximately 4 of 33 picnic tables, informational signs, numbered campsite markers**,** 101 treated barrier posts, and 100 linear feet of barrier logs.

Most of the area that burned likely does not meet returning visitor's expectations as it relates to the recreation experience. Many of the dispersed campsites were burned over by high intensity fire. Most live vegetation that provides shade and screening from the view of adjacent sites in east and West Davis Campground and dispersed sites on the west shore has been removed. As a result of the fire, recreation facilities at Davis Lake now include only one fee campground operated under permit, East Davis. It operates for approximately 160 days.

Lava Flow is a developed campground on the eastern side of the lake and was untouched by the fire. Currently, there are no fees required for camping and it has six improved camp sites with picnic tables and fire rings that are used mainly during hunting season and holidays. The remaining sites are less used. Visitor use was expected to shift from the burned areas and increase at Lava Flow as it is the only developed site unaffected by the wildfire remaining on the lake. As of 2006, there has been a very slight increase of users and this cannot be attributed to any one factor. A seasonal closure for the bald eagle remains in effect.

Due to the current vegetative condition, Lava Flow campground provides an elevated level of risk to the remaining Late-Successional Reserve, due to the overcrowded conditions, its potential for a human-caused ignition source, and its position on the landscape – allowing a pathway for an uncontrollable wildfire from the campground to the upslope unburned portion of Davis Mountain.

There are approximately 10 miles of designated trails within the project area. Trail use consists of hikers, horse back riders, snowmobile, cross country skiers and OHV use throughout the year. The Metolius/Windigo trail is one of the designated trails affected by the fire and approximately 3.6 miles of the trail was relocated due to the hazardous conditions adjacent to the trail.

Also within the project area is the former industrial camping area at Dell Springs, which used to receive very limited recreational use. The former Dell Springs Wood Post Treatment Site is located near the intersection of County Road 61 and Cascade Lakes Highway 46 within the project area. It has been considered a contaminated site by the Environmental Protection Agency (EPA)[18]. Due to this and a deteriorated vegetative condition from lodgepole pine mortality, recreational use of Dell Springs has been reduced to incidental.

The level of unregulated camping with no-fee (dispersed) recreation throughout the remaining project area is considered high, especially during hunting season and holidays (especially Fourth of July, Labor Day, and Memorial Day). Dispersed areas around Davis Lake consist of approximately 20-30 sites. Frequently used sites are located on the 090, 095, and 096 spur off of the 4660 road.

There are a number of user-created Off Highway Vehicle trails within the project area or on the adjacent private lands. Due to a loss of natural barriers from the Davis Fire and a concern for potential resource damage, a closure order is now in effect restricting motorized use. In November 2005, the Final Rule for Travel management was released and published in the Federal Register. The Deschutes and Ochoco National Forests is currently implementing a public process to identify opportunities to designate motorized use and prohibit use outside of those areas.

For the purposes of this analysis and the potential for effects from proposed activities, as well as no action, the following discussions will center on Lava Flow campground and the people who use that area. All other recreation resources would be discussed in the appropriate context for their potential effect.

Environmental Consequences

Alternative A

Alternative A would continue the status quo for vegetation within the Lava Flow campground. Hazard tree management and other custodial activities would continue. Large yellow ponderosa pine that are the most integral part of the recreational experience would continue to be at risk to competition from smaller trees for scarce resources. Probability of another "problem fire" such as the 2003 Davis Fire would remain the highest in this alternative (see the section titled "Fire and Fuels" in Chapter 3 of this EIS). As one of the last remaining developed sites on Davis Lake, users would continue to have a dispersed, somewhat isolated/primitive camping experience with the amenities of more developed sites. Vegetation would continue to be dense in places; deterring off road Off Highway Vehicle use.

Another problem fire in the area has the potential to further change the recreational experience in the area, affecting the last remaining developed sites and reducing opportunities for dispersed camping at Davis Lake and surrounding areas.

Action Alternatives

In both Alternatives B and C, understory thinning prescriptions would be proposed to reduce the tree density within the campground and lessen the probability of another problem fire. Vegetative activities in Lava Flow Campground have been designed to favor the bald eagle, which is the focal wildlife species for the area, as described in the Davis Late Successional Reserve Assessment. All large trees would remain, as well as "clumps" of trees throughout to provide screening between camping sites and for diversity of vegetative conditions. Within the campground itself, and particularly in the riparian buffer (which is 300 feet from the high waterline), mechanized harvest equipment would be limited to identified skid trails and roads with no off-trail passes, in order to maintain soil quality and appearance. Landings would deck logs on the upper side of the lower Road 4600-850 only on the hardened surface. Post sale cleanup activities would be accomplished all by hand.

Within Lava Flow Campground, the objective is to maintain a recreational experience of "roaded and natural." To achieve this, commercial harvest activities would utilize seasonal restrictions, limiting operation to outside of the summer recreation season. The summer recreation season is considered to be from Memorial Day weekend through Labor Day weekend. Handpiling and disposal within one year on Highway 46, as well as marking guidelines, and measures to minimize evidence of management activities would complement the designed activities within the campground. Both scenery and soil productivity

[18] Refer to the section titled "Public Health and Safety" in Chapter 3 of this EIS for more information on the Dell Springs hazardous waste site.

measures have been used repeatedly on the forest, have been monitored, and are successful and effective for their intended purpose.

Although activities would occur outside the main recreation season, the few that use the campground in early spring or late fall may experience some short-term displacement during implementation. During the commercial operation, the campground would likely be closed. Those displaced would have similar opportunities at other places on the lake, or Wickiup Reservoir, as overall recreation use really diminishes during those times.

Returning visitors would probably notice a more open condition, but the Recreational Opportunity Spectrum would remain in a roaded natural condition. Large, yellow ponderosa pine would be even more noticeable. Thinning prescriptions would be designed to lessen the stress on the larger trees for at least ten more years, increasing their probability to mostly remain in a sustainable condition. Thinning and fuels reduction activities would also impede progress from a potential wildfire originating within or outside the campground area (see figures and discussion in the section titled “Fire and Fuels” in Chapter 3 of this EIS).

Potential for development of unauthorized user-created trails with Off Highway Vehicles would be more likely. More open conditions would present opportunities that were not present under Alternative A. Currently, there is a closure order for off road travel in effect for the entire Davis Fire area and it could be characterized as quite successful. This closure order would remain in place until approximately 2008, when a forest-wide travel management strategy is in place.

Cumulative Effects

There are no additive effects identified in addition to an active management scenario. The recreational experience in the one developed site affected would not appreciably change. On the forest and in the region, unrestricted recreation, specifically Off Highway Vehicle use, has been identified as one of the threats to the National Forest. The travel Management Rule of 2005 addresses this problem and an overall strategy is being developed. Off road travel in the Lava Flow campground is unauthorized and increased law enforcement and barriers may become necessary if unauthorized use becomes a problem before a designated system is established. It is unlikely a designated trail system would be authorized at this location due to management for bald eagles and adjacency to the Late-Successional Reserve.

Transportation System

This section is a summary of the Transportation System Report, which can be found in the Five Buttes Project file, Crescent Ranger District, Crescent, OR.

Management Direction
The current direction for management of the road system is found in the Deschutes LRMP, as amended by the NWFP. According to the LRMP, the goal of the Forest's transportation system is "to plan, design, operate, and maintain a safe and economical transportation system providing efficient access for the movement of people and materials involved in the use and protection of National Forest Lands" (LRMP page 4-71). The Seven Buttes Return decision analyzed access for the entire Five Buttes Project area. Since this analysis does not propose a change in access, a roads analysis is not required.

Desired Condition
The desired condition is to provide a road system that is safe, affordable, has minimal ecological effects, and meets immediate and projected long-term public and resource management needs.

The majority of the project area lies within the lands administered under the NWFP, which contains standards and guidelines that address roads and that must be met in each of the NWFP land allocations.

Late Successional Reserves (LSRs)

- Road construction in LSRs for silviculture, salvage, and other activities is generally not recommended unless potential benefits exceed the cost of habitat impairment. If new roads are necessary to implement a practice that is otherwise in accordance with these guidelines, these roads will be kept to a minimum, be routed through non late-successional habitat where possible, and be designed to minimize adverse effects.

Key Watersheds
(Odell Creek 6th Field Subwatershed is a Tier 1 Key Watershed)

- No new roads will be built in remaining unroaded portions of inventoried roadless areas located in Key Watersheds.
- Outside roadless areas reduce existing system and non-system road mileage. If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds.
- Key Watersheds have the highest priority for restoration.

Riparian Reserves

- For each existing or planned road, meet Aquatic Conservation Strategy (ACS) objectives by:
  - Minimize road and landing locations in riparian reserves.
  - Complete Watershed Analysis prior to new road construction.
  - Minimize disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface/subsurface flow.
  - Avoid wetlands entirely.
- Determine the influence of each road on the ACS through watershed analysis. Meet ACS objectives by:
  - Reconstructing roads that pose a substantial risk.
  - Prioritize reconstruction based on risk to riparian resources.
  - Decommission roads based on the effects to ACS objectives and considering short- and long-term transportation needs.
- Road crossings that pose a substantial risk to ACS objectives will be improved to accommodate at least the 100-year flood. Priority for upgrading will be based on the potential effects to riparian resources.
- Road crossings will be constructed and maintained to prevent diversions of streamflow out of the channel and down the road in the event of a crossing failure.

- Minimize sediment delivery from roads. Outsloping of the roadway is preferred. Route road drainage away from potentially unstable channels, fills, and hillslopes.
- Provide and maintain passage at all road crossings of existing and potential fish-bearing streams.
- Develop and maintain a transportation management plan that meets ACS objectives and that addresses:
    - Inspection/maintenance during and after storms.
    - Road maintenance that identifies and corrects drainage problems that contribute to degrading riparian resources.
    - Develop road management objectives that document the purpose of each road.

Existing Condition

Location and Distribution

The Five Buttes project area contains about 880 miles of road. Roads are distributed discontinuously in the project area; some areas are densely roaded while others are virtually or completely roadless. Roads occur on all manner of side slopes, from the relatively flat terrain east of Odell and Hamnter Buttes and Davis Mountain to the moderate slopes (between 15% and 40%) on most of the buttes and mountains. Some roads occur on the steeper slopes (greater than 40%) of Odell Butte.

Age and Development History of the Transporation System

The majority of roads in the Five Buttes project area have existed for over 30 years; some date back to the early years of the 20th Century. One of the oldest constructed roads through the project area is the Oregon Central Military Road, which crossed the Cascade Range near Summit Lake and east toward Crescent, passing through the southern part of the project area. Originally a wagon trail, this road came to be known as Willamette Pass. Today's Willamette Pass, Oregon State Highway 58, follows a different route through the project area; the original Willamette Pass is now known as Emigrant Pass. Other roads were developed in the vicinity in the early 20th Century to connect recreation areas, work centers, and fire lookouts.

The majority of the roads within the Five Buttes project area were constructed in the last several decades to provide access for timber harvest. Some roads in the Davis Mountain area were removed from the Forest Service transportation system in the 1970s but were not physically obliterated. Some of those roads became more visible following the Davis Fire of 2003, which burned much of the screening vegetation, but travel management restrictions as well as the conditions of these old roads has precluded their use.

Road Surface Types and Existing Maintenance Levels

The majority of the roads (87%) within the Five Buttes project area have a native surface. Those under Forest Service jurisdiction are managed as either Maintenance Level 2 (open for high-clearance vehicle traffic) or as Maintenance Level 1 (physically closed so that traffic is eliminated but is not prohibited by Order, and kept in a basic custodial status). Maintenance Level 2 roads are not maintained on a recurring basis, but are periodically reviewed to determine if maintenance is needed to protect adjacent resource values. Some Maintenance Level 2 roads are located on private land, and public access is determined by the wishes of the property owner or by the existence of public rights-of-way.

Six percent of roads in the project area are categorized as either improved native or aggregate-surfaced. Some of these roads are managed as Maintenance Level 3 (maintained to allow passenger car use), while others aren't specifically maintained for passenger car use but generally are traversable by passenger vehicles under most circumstances.

The remaining 7% of roads in the project area are asphalt or bituminous-surfaced facilities, with the most notable examples being Highway 58 and Cascade Lakes Highway (Road 46). Such roads are managed as Maintenance Level 4 or 5; these are roads on which passenger car use is encouraged and the primary emphasis is on traveler comfort and safety.

Table 3-90 summarizes the miles of road by maintenance level within the project area.

Table 3-90. Miles of road by maintenance level in the Five Buttes project area.

Operational Maintenance Level	Miles
M/L 1 (Closed)	240
M/L 2 (High Clearance Vehicles Allowed)	393
M/L 3 (Passenger Car Allowed; Low Speed)	17
M/L 4 (Passenger Car Accepted; Moderate Speed)	15
M/L 5 (Passenger Car Encouraged; High Speed)	34

Existing Road Management Objectives

The existing management objectives for roads under Forest Service jurisdiction fall into two categories:

- Administrative/land management access, and
- Recreation access.

Most roads in the project area are primarily managed for administrative access and are only secondarily managed to facilitate public usage. However, the roads are heavily used by the public, especially during hunting and Matsutaki mushroom harvest seasons. Roads immediately around Davis and Odell Lakes have recreational access as their primary focus. Arterial and collector roads (two- and four-digit roads) are generally managed to allow a mix of commercial and private traffic.

With the exception of roads that provide access to developed camp grounds, recreational residences, or resorts, the seven-digit roads are generally managed, when open, to be used by high clearance vehicles. While passenger car operation is possible on these routes, no special consideration or effort is devoted to allowing their use. During periods of log haul, the seven-digit roads are intended to be single-user facilities; their narrow travel ways and lack of frequent intervisible turnouts preclude opportunities to safely provide for mixed commercial/private use.

Road Densities

Open road densities within the analysis area can be expressed as either objective or operational based on previous access management decisions and the degree to which these decisions have been implemented.

- *Objective open road density* is the desired density that would be achieved if all roads were in their desired opened or closed status;
- *Operational open road density* is a reflection of the current opened or closed roads within a given sixth field subwatershed.

The Five Buttes project area area lies within all or a portion of twelve sixth field subwatersheds. Table 3-91 shows the overall road densities within those subwatersheds, including roads inside and outside the project area, roads under Forest Service jusrisdiction, and private roads. Acreage occupied by lakes and reservoirs has been subtracted from the total area of those subwatersheds where the failure to remove the acreage would skew the road density calculation in comparison to those subwatersheds without large water bodies.

Table 3-91. Road densities by subwatershed in the Five Buttes Project area and its vicinity.

Subwatershed	Operational Open Road Density	Objective Open Road Density	Total Road Density
Browns Creek			
Cold Creek (All roads)	2.30	2.17	2.75
Cold Creek (FS roads only)	1.49	1.37	1.95
Cryder (All roads)	4.48	4.45	4.49
Cryder (FS roads only)	1.78	1.48	2.11
Davis Creek*	3.45	2.91	4.42
Davis Lake*	2.63	2.63	4.42
Hamner	3.33	2.49	4.35

Subwatershed	Operational Open Road Density	Objective Open Road Density	Total Road Density
Lower Crescent Cr. (All roads)	4.35	4.09	4.64
Lower Crescent Cr. (FS roads only)	0.18	0.14	0.18
Middle Crescent Cr.	3.21	2.81	4.50
Moore Creek	0.86	0.55	1.26
Odell Creek	2.31	2.20	4.44
Odell Lake*	0.56	0.55	0.58
Wickiup* (All roads)	5.09	3.73	6.26
Wickiup* (FS roads only)	4.69	3.33	5.86

*Acreage of lakes has been removed from the total area of the subwatershed used to calculate road densities.

Fire Dynamic

Roads can influence the fire dynamic both directly and indirectly. As a devegetated patch of ground, a road can serve as a fire break against fires of lower intensity or as an anchor point for fireline construction or burnout operations, although its utility as a fire break under more extreme fire behavior is somewhat limited. Indirectly, roads provide the access for suppression resources and, by their location on the landscape, can influence the tactics used in suppression activities. Roads have also contributed negatively to the fire dynamic; the increased efficiency of fire suppression over the last 50+ years due to the distribution of roads has contributed to the build-up of fuels that has led to the extreme fire behaviors witnessed over the past several years.

Over time, the influence of roads on the fire dynamic would change to relatively the same degree spatially and temporally under any alternative.

Environmental Consequences

Alternative A - No Action

Under alternative A, the existing road system would not be changed from its current status and condition. Roads that are currently in custodial status (Maintenance Level 1) would remain closed, while open roads would continue to provide access for recreational, commercial and andministrative functions in the same manner that they currently do. Open roads would receive no maintenance beyond that which is normally scheduled; regular maintenance typically is focused on higher-standard roads.

Effects Common to All Action Alternatives

As a function of use during harvest activities, road maintenance activities would be conducted on roads designated for use. As a direct effect, some roads that do not receive recurring maintenance, primarily low standard roads in the Maintenance Level (M/L) 2 category, would see some improvements in both safe drivability and in their ability to handle surface runoff and the resultant sediment. Native surface M/L 2 roads, as a result of use and infrequent blade maintenance, tend to develop shallow ruts in their wheel tracks, which can concentrate shallow flow and lead to increased sediment rates (Foltz, 1991). Post-haul maintenance that would occur on these roads would restore flat road surfaces (without ruts) that would be capable of producing less sediment than their rutted counterparts; post-haul waterbarring would also remove surface runoff from the erosive road surfaces.

The type of work that would be expected to be performed as maintenance in timber sale contracts includes:

- Brushing for improved sight distances
- Removal of hazard trees
- Blading and shaping of traveled way
- Restoring existing surface drainage features, such as drain dips or outlet ditches
- Cleaning culverts and ditches

- Installing water bars after periods of haul

Dust abatement, primarily using water as the dust palliative, would be performed as necessary to maintain safe driving conditions. This would have a secondary effect of maintaining a relatively well-bonded road surface free of the highly erosive pulverized ash “flour” that can occur on native surface roads under heavy use conditions.

Temporary Roads
Temporary road construction is sometimes required to facilitate the economical harvest of trees from a particular harvest unit. Within the Five Buttes analysis area, implementation of either Alternative B or C would result in the construction of temporary roads to aid in completing silviculture treatments, and would result in the temporary commitment of acreage to use as road beds. Mileage and acres per alternative are shown in Table 3-92.

Table 3-92. Temporary road estimate by alternative.

Alternative	Estimated Mileage	Estimated Acres
Alternative A	0.0	0.0
Alternative B	6.4	12.34
Alternative C	5.9	11.49

Temporary roads would be constructed primarily on flat ground (slopes less than 10%) and excavation and construction of embankments would be negligible. These temporary roads would be built to low construction standards, with constraints of grade, curve radius, compaction, surfacing, and width being tailored to the minimum capabilities of the intended user vehicles. By doing so, they would be constructed in a manner that would minimize disturbance and effects to adjacent resources.

Temporary roads, by their nature, are not intended for mixed vehicle use, nor are they intended to remain as identifiable facilities after the administrative need for their use has ended. At the completion of harvest and post-harvest activities (treatment of residual slash), all temporary roads would be barricaded to eliminate motor vehicle access and would be subsoiled as part of post-harvest soil remediation activities to facilitate their return to vegetative productivity.

Effects of temporary roads stem directly from compaction and include loss of infiltrative capacity, increased erosion potential, and dramatically reduced vegetative productivity. Compaction results in increased bulk density and reduced porosity, primarily through the loss of macropores, leading to reduced aeration and drainage, as well as disruption to microbial populations that causes that reduced productivity and increased erosion potential (Elliot et al., 1999). Several studies have shown that bulk density reduces tree growth not only within the compacted area itself, but also for trees adjacent to the compacted area because of root zone compaction (Froehlich, 1979; Heilman, 1981; Helms and Hipkin, 1986; Conlin and van den Driessche, 1996) as a result of increased root impedance and disrupted microbial processes. Natural recovery from compaction can be variable, with the more dramatic reduction in bulk density coming near the surface of the soil profile, but in general the rate of natural, unassisted recovery is slow (Froehlich et al., 1985). These effects would be reduced by subsoiling so that they generally apply only over the short term – five years or less. Because of the moderate ground slopes and high to excessive infiltration rates of the soils adjacent to these temporary road beds, sedimentation effects would be localized to upland areas immediately adjacent to the roads.

Alternative B
Commercial haul activities and other vegetative treatments proposed in this Alternative would result in the use of approximately 126 miles of system roads under U.S.D.A.-Forest Service jurisdiction (Table 3-93). During the course of treatment activities, 27 miles of roads currently closed and in custodial status as M/L 1 roads would be opened. While this would result in some short-term increase in open-road densities. The majority of maintenance work, in particular blading and brushing, would be performed on 110 miles of M/L 1 and 2 roads used for commercial activities.

Table 3-93. Haul road miles by maintenance level in Alternative B.

Operational Maintenance Level	Length (miles)
1 – Basic Custodial Care (Closed)	27.4
2 – High Clearance Vehicles	82.6
3 – Suitable For Passenger Cars	5.3
4 – Moderate Degree of User Comfort	10.4
Total	125.7

Alternative C

Under this alternative, 130 miles of system roads would be used for commercial haul activities and other vegetative treatment proposals (Table 3-94). Treatment activities would result in the opening of 34 miles of M/L 1 roads, resulting in a short-term increase in open road density, but, as with Alternative B, not all roads would be opened at the same time and all would be closed at the end of treatment activities. Under this Alternative, approximately 118 miles of M/L 1 and M/L 2 roads, in particular the native surface roads, would receive the majority of maintenance effort.

Table 3-94. Haul road miles by maintenance level in Alternative C.

Operational Maintenance Level	Length (miles)
1 – Basic Custodial Care (Closed)	34.1
2 – High Clearance Vehicles	83.5
3 – Suitable For Passenger Cars	4.5
4 – Moderate Degree of User Comfort	7.9
Total	130.0

Cumulative Effects

There are no cumulative effects identified. Past and present access management has been included in the discussions of direct and indirect effects.

Inventoried Roadless Areas

Within the area planned for activities, there are no unroaded, Inventoried Roadless Areas, or wilderness areas as defined by Forest Service Manual 7712.16a "Contiguous Unroaded Areas." Unit 345 on Maklaks Mountain is located approximately 500 feet (167 m) from the boundary of the Maiden Peak Inventoried Roadless Area. The vegetative prescription calls for thinning to 90 percent Upper Management Zone with a multistory objective. Proposed activities also include prescribed underburning. The proposal is to use an advanced harvest system, which would likely be helicopter. No additional temporary roads would be needed and helicopter landings would be located at lower elevations, further away from the IRA boundary.

The following values often characterize inventoried roadless values:

High quality or undisturbed soil, water and air
Activities do not overlap the IRA; therefore effects to soil, water, and air quality are as disclosed in those sections of this FEIS. The IRA is uphill from the proposed activity and any potential affects to water quality would be down slope. No actions associated with this project would change the condition of any waterway or water body in the project area. Prescribed fire managers will use smoke management forecasts in order to minimize smoke from fuels reduction activities from entering into places where smoke is undesirable, including Class 1 airsheds. The IRA is located between the project and northeast of the Diamond Peak Wilderness; therefore, ambient air quality would remain unchanged. Prescribed fire operations would be scheduled during the approved Visibility Protection Period, between July 1 and September 15.

Inventoried Roadless Areas provide large, relatively undisturbed blocks of important habitat for terrestrial and aquatic species, as well as providing for diversity of animal and plant communities.
Important terrestrial species that have potential to utilize the IRA are the wolverine, Pacific fisher and the northern spotted owl. Activities are not expected to affect wildlife movement or change associated unique ecological values for habitat. The effects are within the realm as discussed in the FEIS for the wolverine, Pacific fisher, and northern spotted owl dispersal and connectivity to west side late and old forested conditions. There would be no effect to aquatic plant or animal species or their life cycles.

Activities do not overlap or influence botanical resources in the IRA. Risk of introduction of invasive plant species is disclosed in the FEIS and effect to the adjacent IRA is within those parameters. Clean equipment in unit 345 would be utilized, as well as advanced harvest systems, which typically have a lower risk rating due to less potential for soil disturbance. Since no ground-disturbing activities would overlap the IRA, the main vector for introduction or spread of invasive plants would not be present.

The Five Buttes project would maintain a full suite of plant and animal species to ensure adaptability for a wide range of climatic conditions. There would be no identified effects to animal or plant diversity within the IRA.

Inventoried Roadless Areas often provide a range of outstanding recreational opportunities.
Human use of the Maiden Peak area is concentrated near the Willamette Pass Ski area, Rosary Lakes, and trails that link to the Pacific Crest Trail. There would be no effect to these areas beyond those described in Chapter three of the FEIS. The Maiden Peak IRA would remain in a condition similar to wilderness-like values. Immediately adjacent to unit 345 may experience short-term (1-2 year) seasonal and intermittent noise associated with harvest systems and hauling, but it is not likely to this would overlap with human presence or effect recreational opportunities.

Implementation provides an overall beneficial effect to attributes associated with unroaded characteristics by providing a landscape scale risk reduction for a potentially large-scale wildfire originating from the project area and burning into the Maiden Peak IRA.

Unroaded Areas

Unroaded areas as defined in the FEIS for the Roadless Area Conservation Final Rule are "any area, without the presence of a classified road, of a size and configuration sufficient to protect the inherent characteristics associated with its roadless condition. Unroaded areas do not overlap with the inventoried roadless areas." Unroaded areas are not usually inventoried and are, therefore, separate from inventoried roadless areas (see the national inventoried roadless area website for the identification of IRAs: http://roadless.fs.fed.us/). This document uses the term "unroaded area" to differentiate these areas from inventoried roadless areas. There are no Forest-wide or Management Area standards specific to unroaded areas in the Deschutes Forest Plan.

On the north end of Davis Lake, there is an area of approximately 1,200 acres of lava flow that is mostly unroaded, except for an old and closed road that accesses the southern section. The area is likely considered secondary or incidental to other recreation locations and activities in the area. It is very hard to traverse due to the deep rock fissures and sharp lava rock. There would be no activities that would occur within this unroaded area. However, in Alternatives B and C, units 250, 265, 755, 756, and 785 are adjacent. The prescriptions for these units can be characterized as understory thinning and the units are integral to the fire landscape strategy to modify the likelihood of an active crown fire originating from Lava Flow campground accessing Davis Mountain.

Access to the unroaded area would not change for motorized vehicles, as the lava is not accessible and access from the highway and campground would remain the same following completion of the timber sale. As discussed in the "Recreation" section (in Chapter 3 of this EIS), a more open landscape may increase the chance for unauthorized cross country travel, although such travel is restricted by a forest order.

For those hikers strong enough to access the lava flow, feelings of seclusion, remoteness, and solitude would not change. Risk of invasive plants would be limited to the area of disturbance; a discussion of risks associated with invasive plants species can be found in the section titled "Invasive Plants" in Chapter 3 of this EIS. Mitigation measures listed in Chapter 2 have proven to be effective on the nearby Davis Fire as well as on similar projects on the Forest and are expected to be effective in limiting the introduction and spread of invasive plants into the unroaded areas.

Scenery Resources

Existing Condition

The scenery in the Five Buttes Project area is undergoing a gradual but noticeable change. Previous regeneration harvest, lack of fire, and mortality from insect and disease have caused the scenery to develop characteristics that do not represent the historic, or expected appearance of central Oregon's high desert forests. Since around the late 1990s and 2000, understory thinning projects are beginning to appear along the scenic views and change this trend. However, remaining in the foreground are landscapes where encroaching shade-tolerant tree species, such as white fir, block views and prevent the development of large diameter ponderosa pine and Douglas-fir, the tree species that historically dominated these forests. Large trees make up a desired component of scenic quality and they likely represented a greater portion of the landscape in the past.

The major scenic corridors in the Five Buttes project area are Cascade Lakes Highway (Highway 46), which is also designated a National Scenic Byway, and County road 61 which accesses Highway 58 from the town of Crescent, Oregon. The 2003 Davis Fire and subsequent salvage operations caused the views along Highway 46 to be more open where mortality was classified as mostly moderate to high. Salvage operations are visible, and a short-term site specific forest plan amendment allowed tree removal and slash to be visible to the "casual observer" for longer periods than under the existing Standards and Guidelines on approximately 100 acres. Currently, textural changes are occurring as snags begin to fall and grasses and herbaceous material return.

In some pockets on either end of the fire perimeter, the fire burned less intensely, creating various mosaic patterns within a forest of mixed tree species. Although this fire may visually appear "natural" to some forest visitors, many perceive the landscape as unhealthy.

The wildfire created a landscape characterized as unique (Forest Service Manual 2380, Landscape Management). In areas where stand replacement occurred, the fire has created numerous views, including "filtered views" and "open vistas" toward distant buttes, Davis Lake, and its grassy meadows. Although wildfires create openings, they also tend to highlight road building and other evidence of humans that can transform the visitor's encounter to a lesser quality experience.

Along the remaining portions of Highway 46 and in much of the scenery along County Road 61, understory thinning of trees has opened the stands to allow filtered views of the larger trees and middle ground landscape.

On a larger landscape, large wildfires and other forest disturbance processes are especially visible and accessible to the forest visitor along major travel corridors. These include the Davis Fire (Highway 46), Road 18 and Bessie Butte Fires (Highway 97), Awbrey Hall Fire (Highway 46 near Bend), and the Skeleton Fire, B&B, Cache Mountain and Link Fires (Highway 20). These events tend to change the landscape character to "distinctive," altering scenery to a degree that is perceived by many to have deviated from the landscape constituents valued for their aesthetic quality (that is, it no longer appears as natural, or whole). Landscapes are primarily viewed by two types of public: casual forest visitors who mainly are from outside the Central Oregon area, and local residents who tend to be more familiar with forest succession and processes.

Table 3-95 displays the Scenic Views categories (by Visual Quality Objective or VQO) within the Five Buttes project area.

Table 3-95. Acres of scenic views management area by visual quality objective in the Five Buttes Project area.

Visual Quality Objective	Acres
Retention Foreground	3082
Partial Retention Foreground	4308
Retention Middle ground	368
Partial Retention Middle ground	22642
Total	30400

Environmental Consequences

Direct and Indirect Effects

Alternative A

The main potential for effects to the scenery resource is within the foreground area. The No Action alternative, or passive management scenario, would allow the current trend to continue. Dense stands with large trees would continue to be at risk to a large-scale disturbance, blocking views into the stands as the understory develops. The shift in shade-tolerant species appears unhealthy, with fire tolerant species such as ponderosa pine, sugar pine, and Douglas-fir replacement trees being many decades away.

Over the last 5-10 years, the scenery along major travel corridors has noticeably changed, largely due to tree mortality from wildfire and other disturbance events. This alternative has the highest likelihood of another large disturbance in the Five Buttes project area (see the sections titled "Forested Vegetation" and "Fire and Fuels" in Chapter 3 of this EIS). Therefore, this alternative has the greatest potential to alter scenery from what most visitors expect to see in central Oregon.

Alternatives B and C

Prescriptions for the action alternatives are designed to thin the understory and retain the largest trees (Table 3-96 displays in summary the total treatment acres proposed in the various Scenic Views categories by Visual Quality Objective). Tables 3-97 through 3-100 display the treatments proposed in more detail, showing the type of treatment in each VQO category. In general, prescriptions designed to retain a multi-layer canopy will be less evident and open up fewer vistas than those with a single-layer objective. For example, stands thinned with moderate intensity prescriptions to a single layer structure (HTH6S) would appear more open, with more of the lodgepole pine and white fir removed and the large trees being more visible. This would also allow more filtered views into stands, making some features such as lava flows and distant landscapes more visible. Light intensity, single layer prescriptions (HTH9S), would also create more open stands than currently exist, but would leave more trees so that the openings would not be as apparent.

Within the immediate foreground, large overstory trees would dominate the views. In middle ground, prescriptions would appear to blend into existing forest texture; therefore, the activities would not be noticeable. Slopes in the Five Buttes area are generally moderate and changes to the forest canopy would be subtle. Those activities coded as "fuels only" would look very similar to the roadside thinning projects; activities would include removing trees averaging 3-6 inches, trimming limbs, and reducing dead and downed material.

Activities would be noticeable along the foreground areas, including the Scenic Byway on Highway 46, and they have been designed to be consistent with the standards and guidelines for scenery within the Deschutes Forest LRMP. Machinery has the potential to alter the texture of soils and make them more visible. Therefore, skid trails and landings would be designed to minimize visibility. Landings closer than 200 feet as viewed from the roadway would be approved on a case by case basis. Retention areas and topography allow for screening from the roadway. Slash would be handpiled within 200 feet of scenic areas and disposed within one year. No marking paint, tags, ribbons, and boundary signs would be visible following project completion. Large diameter trees (24 inches and greater) would not be harvested unless they meet specific ciriteria related to forest health and public safety, as described in the Forest Plan.

These measures have been used on the nearby Davis Fire Salvage Sale as well as numerous other sales on the forest. They have proven to be highly effective and practical to implement. Without these measures, human activity would be much more evident and would not be consistent with standards and guidelines for Retention areas.

Table 3-96. Active management in Scenic Views.[1]

Visual Quality Objective	Alt. B Acres	Alt. C Acres
Retention Foreground	36	616
Partial Retention Foreground	270	420
Retention Middle ground	18	18
Partial Retention Middle ground	1466	1109
Total	1790	2163

[1] The difference between Alternative B and C in the scenic corridor is largely fuels-related activities such as limbing, small tree thinning, and ground fuel reduction. Less commercial harvest occurs in Alternative C.

Table 3-97. Prescriptions in Foreground Retention.

Treatment	Alt. B Acres	Alt. C Acres
Light Thinning Single-layer	0	0
Light Thinning Multi-layer	0	0
Light Combination Single/Multi.	0	0
Moderate Thinning Single-layer	34	34
Moderate Thinning Multi-layer	0	0
Moderate Combination Single/Multi.	2	2
Salvage	0	0
Fuels Treatments only	0	580
Total	36	616

Table 3-98. Prescriptions in Foreground Partial Retention.

Treatment	Alt. B Acres	Alt. C Acres
Light Thinning Single-layer	132	0
Light Thinning Multi-layer	0	0
Light Combination Single/Multi.	0	0
Moderate Thinning Single-layer	0	21
Moderate Thinning Multi-layer	14	14
Moderate Combination Single/Multi.	92	92
Salvage	32	0
Fuels Treatments only	0	293
Total	270	420

Table 3-99. Prescriptions in Middle Ground Retention.

Treatment	Alt. B Acres	Alt. C Acres
Light Thinning Single-layer	0	0
Light Thinning Multi-layer	0	0
Light Combination Single/Multi.	0	0
Moderate Thinning Single-layer	0	0
Moderate Thinning Multi-layer	0	0
Moderate Combination Single/Multi.	18	18
Salvage	0	0
Fuels Treatments only	0	0
Total	18	18

Table 3-100. Prescriptions in Middle Ground Partial Retention.

Treatment	Alt. B Acres	Alt. C Acres
Light Thinning Single-layer	253	0
Light Thinning Multi-layer	234	332
Light Combination Single/Multi.	196	0
Moderate Thinning Single-layer	121	121
Moderate Thinning Multi-layer	447	153
Moderate Combination Single/Multi.	216	216
Salvage	0	0
Fuels Treatments only	0	287
Total	1467	1109

Cumulative Effects

The projects identified in Table 3-1 were reviewed for potential overlap in space and time within the Five Buttes project. The zone of influence is the major travel corridors connected to the project area at key locations. Foreseeable actions listed in the table as "planning" would not be within sight and would not be noticeable to most travelers with a destination of the Five Buttes area. All other relevant activities past and present with potential for additive effects have been incorporated into the existing condition and this section.

The Air Timber Sale from the Seven Buttes Return was recently completed. Approximately 415 acres were implemented within the foreground. Along county Road 61, understory thinning highlighted the large ponderosa pines in the stand, opening up views of lava flows in the background. This sale is directly across the road from the Demo Butte project, which also highlighted the large trees, mainly consisting of ponderosa pine. Prescribed fire was returned into the stand along the roadway. For almost six miles west from the edge of Demo Butte until Highway 58, a roadside understory thinning project removed trees up to 6 inches in diameter within 300 feet of the roadway.

North from the Road 61 and Highway 46 junction, the Air timber sale thinned dense areas of lodgepole pine and removed down material, also highlighting the largest trees that were on site. In addition, small diameter trees were thinned along the road side on 100 acres, nearly up to the boundary of the Davis Fire. For approximately five miles, the Davis Fire and salvage operations are evident. Across from Lava Flow campground is the Goose Timber Sale (Seven Buttes Return EA) which had an understory prescription very similar to those proposed in the Five Buttes project.

Five Buttes project actions would appear between existing thinning projects, complementing the work that has been accomplished. The result would be that large trees would be more visible and the landscape would appear more similar to the historic landscape than it did in the 1990s, except within the Davis Fire perimeter. In the Davis Fire, much of the remaining trees that appeared live a few years ago after the fire are now dead. As shrubs, grasses, and tree seedlings return to the wildfire area, and dead trees fall, the stark contrast between live and dead stands would soften.

Consistency with the Forest Plan

All activities planned in Alternatives B and C are consistent with Goals, Objectives, and Standards and Guidelines in the Deschutes National Forest Plan because:

In Retention areas, visible results of active management would not be noticeable to the casual forest visitor within one year in Retention Foreground (High Scenic Integrity) and two years in Partial Retention (Medium Scenic Integrity). The greatest potential for change would be on Highway 46, the National Scenic Byway, in units 250, and 265. The vegetative prescription for these units would be characterized as understory thinning, favoring the largest diameter trees and the healthiest crowns and forms (M9-6). Mixed conifer stands would be managed to perpetuate and enhance the characteristic landscape (M9-20). Mitigation measures to comply with M9-8 and M9-9 (for Partial Retention) include handpiling and disposal of tops and limbs within one year, and measures to minimize evidence of management activities such as marking guidelines that are discreet from viewer locations. These measures should also complement designed activities within the Lava Flow Campground while maintaining the Recreational Opportunity Spectrum. Measures such as these have been successfully implemented for activities along sensitive viewer locations such as the Charlie Brown project and the Davis Fire Recovery EIS and have proven to be successful.

Public Health and Safety

Dell Springs Wood Post Treatment Site

The former Dell Springs Wood Post Treatment Site is located within the Five Buttes project area near the intersection of County Road 61 and Cascade Lakes Highway 46. It has been considered a contaminated site by the Environmental Protection Agency (EPA). The contamination has been considered not time critical and the source material at the former site consists of pentachlorophenol and dioxin/furan-contaminated soil.[19]

A risk evaluation was performed to determine if concentrations of contaminants remaining onsite would affect human or ecological receptors. The following is summarized from the report:

- The site is located in a remote area with no adjacent population center.
- Land uses are limited to forest watershed management, timber harvesting, and recreational activities.
- Recent fieldwork determined the groundwater is greater than 100 feet below ground surface. Therefore, there are no complete pathways for groundwater. Soil is the only contaminated media of concern.
- The receptors of concern were identified as the US Forest Service worker and a camper during development of the conceptual site model, based on the future land use.

The remedy for the site is offsite removal of soil approximately one foot below the surface for a 60 foot radius from the source of the contamination. These areas would be backfilled with clean topsoil or similar fill material. A liner would be placed over the former excavation to reduce percolation of rainwater and snowmelt. Last, engineering controls which include soil cover and road closure would be utilized to reduce risk of exposure to remaining soils on site. These actions were accomplished in 2006.

Unit 678 of Alternative C surrounds the cleanup site. If selected, activities in this unit would possibly be implemented in 2008. The prescription calls for small tree thinning (6 inches or less) and disposal. Cleanup activities include activities that discourage entrance to the area and thinning activities would not change access to the site.

On September 6, 2006, "CES Natural Solutions for Water" issued a final report on the removal of contaminated soil from Dell Springs. This report states that the area is no longer a threat to wildlife or humans. As an extra precaution the area has been signed "No Camping" and motor vehicle access to the site will be blocked. Planned activities in Alternative C are in an area that is isolated from access to the site. The final report is on file at the Crescent Ranger District.

Public Escape Routes in the Event of a Wildfire

Alternatives B and C provide a safer ingress and egress from the Davis Lake area and Lava Flow Campground. Currently, vegetation surrounding access and camping sites is in a condition that favors the transition of fires from ground to crown; crown fires are very difficult to control. In the event of a wildfire, active management proposed in Alternatives B and C would improve the safety provided by escape routes for the public and would improve safety for fire suppression personnel.

Public and Worker Safety

Under each action alternative, danger trees would be removed from along all haul routes. The signing of project activity areas in addition to notification of additional project-related traffic would promote a safe environment for forest visitors during project implementation. To facilitate public safety, commercial

[19] December 3, 2004, Abbreviated Engineering Evaluation/Cost Analysis Report by Cascade Earth Sciences

activites at Lava Flow Campground would utilize seasonal restrictions that limit operation to outside of the summer recreation season.

Implementation of action alternatives would increase the potential for encounters on roadways between forest visitors and equipment associated with harvest. This elevated level of risk would be present for the short-term (approximately 5 years). Safety measures such as informational signing, flaggers, and road maintenance activities, such as brushing roads for increased visibility, would be enforced in the timber sale contract.

The work environment during all phases of logging operations would be physically demanding and hazardous; effects to worker health and safety would be possible. Activities with the highest potential for serious injury would include tree felling and helicopter operations. All project activities carried out by Forest Service and Forest Service contract employees would comply with State and Federal Occupational Safety and Health Administration (OSHA) standards. All Forest Service project operations would be consistent with Forest Service Handbook 6709.11 (Health and Safety Code)

Air Quality and Human Health

The Clean Air Act lists 189 hazardous air pollutants to be regulated. Some components of smoke, such as polycyclic aromic hydrocarbons (PAH) are known to be carcinogenic. Probably the most carcinogenic component is benzo-a-pyrene (BaP). Other components, such as aldehydes, are acute irritants. In 1994 and 1997,[20] air toxins were assessed relative to the exposure of humans to smoke from prescribed and wildfires. The five toxins most commonly found in prescribed fire smoke were:

Particulate matter - Particulates are the most prevalent air pollutant from fires, and are of the most concern to regulators. Research indicates a correlation between hospitalizations for respiratory problems and high concentrations of fine particulates (PM2.5, fine particles that are 2.5 microns in diameter or less). Particulates can carry carcinogens and other toxic compounds. Overexposure to particulates can cause irritation of mucous membranes, decreased lung capacity, and impaired lung function.

Acrolein - An aldehyde with a piercing, choking odor. Exposure severely irritates the eyes and upper respiratory tract.

Formaldehyde - Low-level exposure can cause irritation of the eyes, nose and throat. Long-term exposure is associated with nasal cancer.

Carbon Monoxide - CO reduces the oxygen carrying capacity of the blood, a reversible effect. Low exposures can cause loss of time awareness, motor skills, and mental acuity. Also, exposure can lead to heart attack, especially for persons with heart disease. High exposures can lead to death due to lack of oxygen.

Benzene - Benzene causes headache, dizziness, nausea and breathing difficulties, as well as being a potent carcinogen. Long-term exposure can cause anemia, liver and kidney damage, and cancer.

The closest Designated Area to the project area is the city of Bend, Oregon; the communities of Crescent, Chemult, Sunriver, and La Pine are closer to the project area but are not as highly populated. The greatest risk of exposure to airborne toxins from prescribed fires or wildfires would be to firefighters and forest workers implementing the prescribed burning. It is unlikely the general public would be exposed to toxin levels adverse to human health during implementation of prescribed burning operations in the Five Buttes Project area because of the distance from populated areas and the application of prescriptions designed to lessen the release of particulate matter. People who suffer from breathing ailments may experience some difficulty during periods of prescribed burning, especially during atmospheric conditions that do not favor

[20] Results of an April 1997 conference to review the results of health studies and develop a risk management plan for the protection of fire crews were published by Missoula Technology Development Center in Health Hazards of Smoke, Technical Report 9751-2836-MTDC.

dispersion of smoke. The Forest Service voluntarily follows the guidelines assigned by Oregon Smoke Management to limit state-wide exposure on a cumulative basis, in compliance with the Clean Air Act.

Forest workers and firefighters can face unhealthy levels of smoke when patrolling or holding fire lines on the downward edge of a wildfire or prescribed fire, or while mopping intense hot spots. In most cases, measures such as education on the effects of short and long term exposure, rotation out of the smoke, and the use of respirators can reduce exposure levels. OSHA regulates exposure to hazardous materials in the workplace. All project activities carried out by Forest Service and Forest Service contract employees would comply with State and Federal OSHA standards.

Economic and Social Analysis

The purpose of the Five Buttes project includes strategic manipulation of forest vegetation to lessen the risk of uncharacteristic disturbance events such as wildfire. These can lead to large-scale loss of forest, especially late and old-structured stands and large trees. The byproduct of proposed activities has the potential to contribute to the local and regional economies by providing timber and other wood fiber products. The project underwent two public scoping periods in 2004 and 2005. Feedback from these processes focused primarily on the differing social and biological concerns that are associated with this project.

The social importance of protecting threatened and endangered species was codified into law with the passage of the Endangered Species Act in 1973. Two federally listed threatened species, the northern spotted owl and the northern bald eagle, have habitat within the project area. The population of northern spotted owls continues to decline in the Pacific Northwest. It is recognized that the recent increase in the size and frequency of wildfires affects their habitat and is a factor in their declining populations (reference the section on Threatened and Endangered Species in Chapter 3 of this document).

In 2003, the Davis Fire resulted in the loss of all or most of two owl home ranges adjacent to the Five Buttes project area. At the time of the fire the Five Buttes project area contained habitat for up to ten pairs of spotted owls; only seven owls are known to occupy the project area at this time.

The 2004 release of the Scientific Evaluation of the Status of the Spotted Owl, a report by the US Fish and Wildlife Service, recognized that past fire suppression practices, fuel accumulation, and the trend of forest development in dry forest ecosystems increase the risk of habitat loss. The following point summarizes the situation in the Davis LSRA and many others:

> "...threats from catastrophic habitat loss have increased on the east side of the Cascade Range and some locations within the Klamath region. ...In some areas, managing the threat of habitat loss by wildfire should be a habitat management priority....In addition, it has been hypothesized that succession toward shade-tolerant understory trees on the east slope of the Cascade Range may reduce owl occupancy (presumably because of reduced prey abundance and/or access. If true, this would represent another growing threat resulting from lack of tree density control, which is a consequence of fire suppression."

Differences in public opinion over how to protect existing owl home ranges from wildfire while maintaining a healthy, diverse forest habitat range arose in the public scoping process. Some commenters believe that the Forest Service should do little or no commercial treatment within the project area, while others thought that the proposed treatments were not enough to make a difference on the landscape. The social attitudes towards commercial logging are balanced by equally important environmental concerns about the need to thin the forest to protect critical spotted owl habitat in a fire dominated ecosystem (reference the summary of scoping comments in the project analysis file, Crescent Ranger District).

Decisions that balance these competing social and biological interests have an economic effect on the makeup of the communities of Central Oregon. This section will focus on the changing local, state and national work and unemployment data and specific industries directly and indirectly affected by this project. Social factors important to Central Oregon will also be addressed, specifically those related to land and forest management as a source of local income. These include the region's rural setting and its history of farming and ranching; the manner in which the local population utilizes resources for recreation; the collection of wood for fuel, fish and game for sport; and the significant effect of an increasing population on the region's job market and economy.

Existing Condition

The Five Buttes project is located in southern Deschutes County and northern Klamath County. The Deschutes LRMP (1990) identified agriculture, wood products manufacturing, and recreation and tourism as the three most important basic industries in the local area. Implementation of this project could result in economic and social effects that echo (to a lesser extent) the regional effect on the Oregon economy of salvage sales that occurred in 2004 and 2005 from the Davis Fire. Logs from Davis Fire sales were trucked to mills in Gilchrist, Warm Springs, John Day, and Prairie City in Oregon and Weed, California. As many as 170 logging operators from communities in Oregon, Washington, Idaho and Montana participated in the salvage efforts. This influx of workers resulted in a noticeable increase in local community activity during this period, with grocery stores, RV parks, motels and restaurants in Crescent Lake, Crescent, Gilchrist and La Pine showing a dramatic upturn in business during operation of the Davis Fire timber sales.

Mill workers and workers in secondary wood processing industries that used the lumber from these milled logs were primarily located in five Central and South Central Oregon counties: Klamath, Lake, Jefferson, Crook, and Deschutes Counties (hereafter referred to as the “five county area”). Recreation use in the area also primarily comes from these five counties. Commercial mushroom pickers also migrate through the area on a seasonal basis. The social and economic effects of commercial timber sales, as displayed by the ripple effects of commercial salvage efforts on the Davis Fire, can affect the entire region; however, to limit the scope of this analysis only the five county area will be considered.

Demographics

The total population for the five county area during the 1995 Census totaled 224,763. Estimates, made by the Population Resource Center at Portland State University place the population at over 257,500, or a 13 % increase, in 2000, a half a decade later. This dramatic population increase is even more significant in Crook, Deschutes and Jefferson Counties. Between 1995 and 2005, the Central Oregon population in these three counties grew by 53%. Most of this growth is due to in-migration. According to census data, Central Oregon's three counties (Crook, Deschutes and Jefferson) were among the fastest growing in Oregon during the past decade. Deschutes led the state with a 53% population growth rate and was among the top five percent gainers in the nation. Jefferson and Crook ranked fourth and fifth fastest growing in the state at 39% and 36% respectively. Bend is the largest city in the region with a population of over 70,000 in 2005, substantially exceeding recent growth forecasts.

In contrast, Lake and Klamath Counties have grown by less than 1% during that same period. Data from Chiloquin in Klamath County, which is the closest incorporated community in Klamath County adjacent to Crescent, Gilchrist and Crescent Lake, the three unincorporated communities near the project area, has grown by 0.93% in the past fifteen years. This very slow growth needs to be balanced with growth in La Pine and Sunriver in Deschutes County, about 20 miles northeast of the project area. The growth in these areas averaged 8% during the same period, certainly less than the metropolitan areas further north, but still substantially more the Northern Klamath County.

Because of the rapid growth in Crook, Jefferson and Deschutes Counties in Central Oregon, more current data is available for analysis from these counties than from Lake and Klamath Counties. Tables 3-101 and 3-102 show populations over the last half decade in the five county area. Tables 3-103 and 3-104 show population projections through 2025.

Table 3-101. Actual Populations in Deschutes and Jefferson County Communities, 1990 - 2005.

Counties & Cities	2005	2004	2003	2002	2001	2000	1995	1990
Crook County	21,150	20,650	20,300	20,200	19,850	19,182	15,700	14,111
Prineville	9,082	8,640	8,500	8,150	7,750	7,356	8,205	5,355
Unincorporated	12,068	12,010	11,800	12,050	12,100	11,826	9,947	8,756
Deschutes County	143,481	135,450	130,500	126,500	122,050	115,367	89,500	74,958
Bend	70,328	65,210	62,900	57,750	55,080	52,029	29,425	20,469
Redmond	21,110	18,100	17,450	16,110	14,960	13,481	9,650	7,163
Sisters	1,706	1,490	1,430	1,080	960	959	765	679
Unincorporated[1]	50,337	50,650	48,720	51,560	51,050	48,898	49,660	46,647
Jefferson County	20,600	20,250	19,900	19,850	19,400	19,009	15,400	13,676

Counties & Cities	2005	2004	2003	2002	2001	2000	1995	1990
Culver	1,019	850	840	840	800	802	600	570
Madras	5,592	5,430	5,370	5,290	5,200	5,078	4,290	3,443
Metolius	804	790	780	770	660	635	540	450
Warm Springs	NA	NA	NA	NA	NA	5,727	NA	NA
Unincorporated	13,185	13,180	12,910	12,950	12,740	6,767	9,905	9,213
Total Area Population	185,231	176,350	170,700	166,550	161,300	153,558	120,600	102,745

U.S. Census Bureau
Annual estimates - Portland State University Population Research Center
[1] Includes recently incorporated city of La Pine.

Table 3-102. Actual Populations in Klamath and Lake County Communities, 1990 - 2005.

Counties & Cities	2005	2004	2003	2002	2001	2000	1995	1990
Klamath County	65,055	64,800	64,600	64,550	61,200	63,900	63,775	57,702
Bonanza	425	420	420	420	420	420	415	323
Chiloquin	720	720	720	720	720	715	715	673
Klamath Falls	20,400	20,220	20,190	19,680	19,580	19,510	19,460	17,737
Malin	800	800	800	800	800	635	640	725
Merrill	915	910	910	910	900	900	897	837
Unincorporated	41,795	41,730	41,560	42,180	41,820	41,720	41,648	37,402
Lake County	7,505	7,500	7,400	7,450	7,500	7,480	7,422	7,186
Lakeview	2,625	2,480	2,480	2,480	2,480	2,475	2,474	2,526
Paisley	250	250	250	250	250	245	247	350
Unincorporated	4,630	4,770	4,670	4,720	4,770	4,4730	4,701	4,310

US Census Bureau Annual estimates-Portland State University Population Research Center

Table 3-103. Deschutes County Population Projections.

	2005	2010	2015	2020	2025	% Growth 2005-2025
Bend	66,357	78,042	87,953	98,689	107,632	62%
Redmond	21,582	27,873	34,795	41,051	47,169	119%
Sisters	1,572	2,390	3,085	3,872	4,837	208%
Non-Urban County	52,327	56,094	60,132	64,461	69,101	32%
County Total	141,838	164,399	185,965	208,073	228,739	61%

Source: Deschutes County Coordinated Population Forecast

Table 3-104. Central Oregon Growth Population Projections.

County	2005	2010	2015	2020	2025	2030	2035	2040
Crook	21,035	23,051	25,249	27,590	30,125	32,796	35,569	38,553
Deschutes	139,994	158,792	178,418	197,150	214,479	229,933	244,069	257,088
Jefferson	20,491	22,168	24,079	26,065	28,298	30,831	33,390	36,094
Tri-County Total	181,520	204,011	227,746	250,805	272,902	293,560	313,028	331,735

Source: Oregon Bureau of Economic Analysis

The major population centers within the area are: Klamath Falls (20,400), Prineville (9,082), Bend (70,328), Redmond (21,110), Madras (5,592) and La Pine (5,799). Future population projections mimic that of the past decade. Deschutes, Crook, and Jefferson Counties are expected to continue with aggressive growth with an average increase of 61% expected by 2025 while more rural counties like Lake and Klamath County will continue to lag.

The population in the Central Oregon area is becoming both older and more diverse. However, Bend, Redmond, Prineville, and Madras had lower median ages than the state of Oregon in general, and the median age in Prineville, Madras and Redmond has actually decreased since 1990. More rural counties like Northern Klamath County and unincorporated areas such as La Pine are much older than the National or Oregon average and tend to consist more of retired people.

Although racial diversity is increasing, with the Hispanic population increasing the fastest, Central Oregon, except for Jefferson County, is less racially diverse than Oregon as a whole. According to the 2000 census, Lake is 91% white with the Hispanic population increasing 50%; Crook is 93% white with the Hispanic population increasing 179% since the 1990 census; Deschutes is 95% white with the Hispanic population increasing 182%; Jefferson is 69% white with the Hispanic population increasing 133%. Klamath County echoes Oregon as a whole is 87% white with a Hispanic population increase of 66%.

The education attainment level, except for Deschutes County, within Central and South Central Oregon echoes Oregon as a whole. The percentage of the high school graduates in the population ranges from lows of 47% in Crook and 44% in Jefferson Counties to highs of 56% in Deschutes and 49% in Klamath and Lake Counties. For Oregon as a whole it is 53%.

Employment

A recovering national economy, population growth and increased economic activity have created better employment opportunities in Central Oregon. The overall unemployment rate in Oregon fell to 5.3% in January 2006, the best rate in five years, but only Deschutes County's unemployment rates is within the national average. Unemployment rates in Crook and Jefferson Counties still exceed 6% and Lake and Klamath Counties exceed 7 %. This was still much better than the 2005 unemployment rates in the individual counties which were: Klamath 7.9%, Crook, 8.4 percent; Deschutes, 6.4 percent, Jefferson, 5.6% and Lake, 6.4%. The unemployment rate in Oregon as a whole in 2005 was 7.6%.

The last complete census of the civilian labor force in the region occurred in 2000. At that time Klamath County's labor force was 28,753, up 6% since the 1990 census, Crook's 7,525, up 12% since the 1990 census, Jefferson's 8,570, up 31% since the 1990 census, Deschutes', 57,614, up 40 % since the 1990 census, and Lake's, down 4% since the 1990 census. The labor force in Oregon as a whole increased 18% during the preceding decade. In Klamath County the largest sectors were finance, insurance, and real estate (5,580,), trade (5,510) and government (5,400). In Crook County the three largest sectors were wholesale trade (1,640), lumber and wood products (1510), and government (1,180). In Deschutes County the three largest sectors were Finance/Insurance/Real Estate (14,170), trade (13,080), and government (6,900). In Jefferson County the three largest sectors were government (2,460), trade (1250), and lumber and wood products (1,150). In Lake County, the three largest sectors were government (940), trade (500), and lumber and wood products (290).

Unemployment in the region is projected to remain higher than Oregon and U.S. as a result of 1) rapid population growth (rather than economic stagnation) and 2) ongoing industry and trend shifts in the wood products industry. What this means to existing and new employers is a larger labor pool of applicants vying for available jobs. More importantly, because many of the "unemployed" have actually left previous employment elsewhere to move to the region, they have more work experience and generally higher skill levels in whichever sector they worked in the past.

Because there are more people looking for employment than there are jobs available, many Central Oregonians work less than full-time or must settle for lower skill, lower wage jobs. The total number of people who are underemployed in the region is difficult to quantify because this phenomenon is not currently being tracked. Anecdotal evidence suggests, however, that underemployment is prevalent in Central Oregon. The majority of new residents, both young and old, move to the region without first securing employment, and as a result, these "lifestyle" migrants must often settle for jobs that underutilize their talents in order to make ends meet. About half of the new jobs created in the region come from the retail and service sectors, leaving skilled workers and professionals with limited employment alternatives. Another way to look at the health of local economies is to examine unemployment, median household income (which usually involves more than one wage earner versus per capita income that addresses only one) and the poverty rate in Central Oregon compared to the State of Oregon at large. Tables 3-105 and 3-106 display the most recent statistics on this, which come from the USDA Economic Research Service focus on three Central Oregon counties.

Table 3-105. Percent Unemployed 1997-2003 and Median Household Income (2003).

Location	1997	1998	1999	2000	2001	2002	2003	Medium Household Income 2003	% of State Medium Income
Crook	10.1	9.7	8.9	8.4	9.7	10.4	10.8	$34,583	82.7%
Deschutes	8.0	7.2	6.4	5.3	6.4	7.7	7.7	$42,860	102.5%
Jefferson	6.7	6.7	6.5	5.7	7.9	7.6	7.4	$35,218	84.3%
Oregon	5.8	5.6	5.7	4.9	6.3	7.5	8.2	$41,789	100%

Table 3-106. Poverty Rates in Central Oregon Counties (2002).

Location	% of total population	% Children
Crook County	12.4	16.0
Deschutes County	10.0	13.8
Jefferson County	14.5	20.2
Rural Oregon as a whole	11.3	15.1

The economies of Deschutes and Jefferson Counties are the most robust in the Zone. In Deschutes County, although there has been an increase in the number of jobs created, the huge increase in the labor force (up 40%) has negated much of this success, at least in terms of the unemployment rate. But, due to their economic diversity, both counties' economies are expected to maintain their health. This is partially due to a diversification in the wood products industry where specialized woodworking shops focused on new home construction are playing a larger role in the industry as primary milling industries have declined.

Central Oregon's labor force has experienced dramatic changes over the past two decades. The most significant has been its growth. Fueled by an ever-expanding population, the region containing Crook, Deschutes and Jefferson counties has seen its labor force double since 1980. The challenge of growing job opportunities along with an expanding population is one most of the communities in the region have addressed. The region has diversified its employment by bringing in companies in new and emerging industries. This is changing the industrial make-up of the area and has helped soften the blow from slowdowns in any one particular sector.

The benefits of a diverse economy were particularly evident during the most recent national recession that began in 2001. During this time, Central Oregon's unemployment rates climbed, as did the state and national figures. Still, they didn't climb as abruptly or to the level they reached during the recession of the early 1980s. At that time, Central Oregon was heavily dependent on the wood products industry, which lost jobs due to high interest rates and a slowdown in the housing industry. This translated into unemployment rates in the region above 15 percent, as activity related to the wood products industry slowed – and the overall local economy with it. During the most recent recession, diversification of the local economy toward employment in hospitality, trade, high-tech manufacturing and government helped the region skim through with rates reaching only 8 percent.

Table 3-107 displays future projections for continued slow growth and diversification in Central Oregon with most of the growth focused in these primary industries listed in these recent statistics compiled by the Oregon Employment Department.

Table 3-107. Growth Projections for Primary Industries in Central Oregon.

County	Industry	Total Employment
Crook	Agriculture	540
	Distribution & Warehousing	1,364
	Education & Health Services	558
	Tourism	421
	Wood Product Manufacturing	1,007
Deschutes	Computer & Electronic Manufacturing	354
	Distribution & Warehousing	851
	Health & Social Assistance	6,062
	Professional, Scientific & Technical Services	1,893
	Recreational & Transportation Equipment	1,065
	Tourism	7,772
	Wood Product Manufacturing	1,798
Jefferson	Agriculture	620
	Health & Social Assistance	201
	Manufacturing & Fabrication (includes Wood Product Manuf.)	1,542
	Recreational Equipment Manufacturing	250
	Tourism	494

Source: Oregon Employment Department

On the other hand, Lake and Klamath Counties, with their overall low economic diversity, dominated by either one manufacturing sector industry (lumber and wood products), have seen their economies lag behind Oregon's as a whole. South Central Oregon's unemployment rate has remained higher than the statewide average for more than 23 years. This is not uncommon in Oregon's less-populous rural counties because their economies are often less diverse than the state's more populated areas, and their employment often is highly seasonal. The employment diversification seen in heavily populated areas helps the economy remain strong if any one sector is struggling. The employment base in Klamath and Lake Counties is slowly diversifying. It has become less reliant on wood products manufacturing and has recruited a number of new employers. The highly seasonal nature of many of the region's employers – including agriculture, manufacturing, leisure and hospitality and trade – also contributes to high unemployment rates. Seasonal employment patterns make it difficult for the region's workforce to find year-round work. Employment varies widely between summer and winter months. When averaged over the course of the year, this variation results in higher unemployment.

Wages

The region's cost of labor has remained relatively flat throughout the 1990s. The average wage for all industries increased by a mere 1.4% from 1990 - 1999 for Central Oregon compared to an increase of 13.6% for the state as a whole. Many of Central Oregon wages are significantly lower than state averages. For example, the average wage in the manufacturing sector at the state level was $13,539 higher than that for Central Oregon. This trend is projected to continue as regional population growth strains the area job market. Competition for available jobs tends to keep wage inflation in check.

Per capita personal income in 1999, as reported by the U.S. Department of Commerce, Bureau of Economic Analysis by county were as follows: Lake $20,285, Jefferson, $18,808, Klamath $20,886, Crook, $21,168 and Deschutes, $26,077. Because of lower wages the per capita income in the area is also traditionally lower than Oregon's as a whole ($26,958). This gap has been a widening mainly due to the loss of relatively high paying jobs in the lumber and wood products industries and an increase in service jobs in lower paying industries like tourism.

The forest sector has also traditionally provided relatively high average wage level jobs. In 1999 the statewide average wage for all industries in Oregon was $25,516 compared to a much higher average of

$31,811 for the forestry sector as a whole. In contrast, forestry services average a relatively low wage of $17,983 a year.

Even though forest sector jobs have been declining, Deschutes County's per capita income, which is the highest in the area, and close to Oregon's as a whole, is attributable to a number of factors. The first is that, although Deschutes County also lost significant jobs in the wood products industry, they have been replaced by other high-paying finance and real estate related jobs. In addition, the increase of high-paying "high" tech jobs and an influx of wealthy new comers have bolstered all income measures (per capita, total personal income, and median family income) as compared to the other counties.

The downturn in the primary lumber industry, driven by a lack of consistent forest supplies, automation, and a changing global economy, has affected local forest workers, whose incomes have declined because of steep competition for fewer job opportunities. This is especially true in Central Oregon where in Deschutes County 84% of the land base is dominated by BLM and Forest Service managed lands.

Table 3-108, although dated, reflects average annual wages in various industries in Oregon. Primary and secondary products fall under lumber and wood products while forestry services fall under Agriculture, Forest and Fish.

Table 3-108. Average annual wages in Central Oregon 1990 – 1999.*

Industry	1990	1999	Change	Percent Change
All Industries	$25,152	$25,516	$363	1.4%
Private Coverage	$24,089	$24,617	$527	2.2%
Agriculture, Forest and Fish	$19,630	$17,983	($1,647)	-8.4%
Construction and Mining	$29,156	$28,532	($625)	-2.1%
Manufacturing	$30,633	$30,807	174	0.6%
Lumber and Wood Products	$31,251	$31,811	560	1.8%
Other Manufacturing	$29,028	$29,547	520	1.8%
Trans., Comm., and Utilities	$33,963	$35.231	$1,267	3.7%
Wholesale and Retail Trade	$18,510	$19,415	$905	4.9%
Finance, Insurance and Real Estate	$26,286	$28,468	$2,181	8.3%
Services	$21,493	$23,264	$1,771	8.2%
Government	$30,760	$30,485	($274)	-0/9%

Sources: Oregon Covered Employment & Payrolls by County and Industry

Mobility

The mobility of the workforce is increasing in Central Oregon. Over the course of the 1990s, the number of residents commuting out of Crook and Jefferson counties to work has increased markedly, as the number of non-farm jobs in Deschutes County has skyrocketed from 32,620 in 1990 to 52,600 in 2000. This could be due to a number of factors including lower housing costs in these counties, a loss of jobs in some key sectors of the economy like manufacturing, or the growth of communities that straddle county lines.

In 2000 many more workers traveled on the local highways to jobs in Deschutes County. In 1990, there were 2,886 workers commuting into the county; that number increased by two-thirds to 4,805 workers in 2000. Over the same period, the number of jobs in the county, according to the commuting data, shot up by nearly 60 percent from 35,183 in 1990 to reach 55,294 in 2000.

Crook County's share of residents that worked outside of the county went from one in every seven residents in 1990 to nearly one in every five, or 20 percent of its residents. This happened during a time period when the county lost a little over 400 lumber and wood products manufacturing jobs, this from an industry that makes up roughly 90 percent of the county's manufacturing base.

Jefferson County saw the highest percentage in the region of its residents commuting to other counties for work. In 2000, nearly one out of every four county residents worked in another county. This occurrence may be the result of the Crooked River Ranch straddling the Jefferson and Deschutes county line. Residents living near this county line in the ranch find it easier to commute to jobs in Redmond or Bend than residents living closer to Madras. The same might be said for those that live in Camp Sherman and work in Sisters. The number of jobs in the county held by county residents dropped slightly to 85.5 percent.

Klamath County's relative isolation is primarily due to its largest city's, Klamath Falls, distance from other major cities in Southern Oregon. The largest commuting force into the county came from its neighbor to the north, Deschutes County, as a number of workers possibly crossed the county line from La Pine to work at the mill in Gilchrist in Northern Klamath County. There is no way of truly knowing if these workers come from the La Pine area, because this data was only tabulated at the county level. However, this is probably the case based on geography.

Lake County also revealed quite a bit of isolationism within its labor market. Of its residents, only 5.7 percent commuted to other counties for work in 2000. This was up from the 4.5 percent who worked in other counties according to the 1990 Census count. Of those that did work outside the county, the largest portion worked in Deschutes County. Again, most residents in the Christmas Valley/Fort Rock area of Northern Lake County commuted to Southern Deschutes County for work.

The Agriculture Economy

Agriculture is an important use in Central Oregon. Leading crops include cattle, and forage and hays. In Jefferson and Klamath Counties there is also a substantial amount of seed and vegetable products. Total agricultural sales for each county in 2000 were as follows: Crook, $34,604,000; Deschutes, $21,855,000; Klamath, $128,806,000; Lake, $54,508,000 and Jefferson, $46,431,000. Although farm income is a very small portion of total personal income in the area, the agriculture sector’s role in the local economies is substantial in all but Deschutes County.

The Tourism Economy

The Oregon State Tourism Commission reported that tourism generated $3.0 billion in total spending in 2005, $1.8 billion in earnings and providing 88,900 Oregonians with jobs. The Commission report also states: “Rural areas of Oregon are more dependent on tourism than urban areas, even though the latter have higher absolute levels of tourism spending.” The report also shows a tourism industry slowly recovering from a sudden downturn suffered after 9/11/2001.

Employment and income statistical references do not specifically track recreation and tourism as a sector. Instead, recreation and tourism contributes to several sectors, transportation, services (accommodations, eating and drinking, recreation), retail trade, and even government. The Oregon Tourism Commission publishes an annual report with estimates to total travel related spending in each County. The last available estimates for 2004 were $23.6 million in total travel spending in Crook, $392.5 million in Deschutes, $113.9 million in Klamath, $10.1 million in Lake and $43.5 million in Jefferson.

Estimated employments from these expenditures in industries supporting recreation and tourism are as follows:

- In Crook, 470 people, representing 4.8 percent of all wage and salary employment in the county;
- In Deschutes County, 5,350 people, representing 6.1 per cent of salary employment in the county;
- In Klamath, 1,760 people, representing 5.4 percent of all wage and salary employment in the county;
- In Jefferson, 760 people, representing 8.7 percent of all wage and salary employment in the county;
- In Lake, 210 people were employed, representing 4.8 per cent of all wage and salary employment in the county.

Because of the seasonal nature of the tourism in Oregon, wages in the Oregon service industry are significantly lower than in other sectors of the economy, with an average income of $23,264 per year in 2002 (compared to an average income of $34,400 for the state as a whole or $40,600 in the timber sector). In Maine, where extensive research has focused on the tourism industry because it is the single largest employer in the state, one third of all tourism workers did not receive a livable wage, which they defined as the minimum income needed for basic food, shelter, health care and other necessities for a family of two.

The Timber Economy:
Table 3-109 summarizes data regarding the economics of the forest sector in Oregon in 2000. In Oregon as a whole in 2000, the forest sector directly accounted for 4% of the employment or over 85,000 direct jobs, nearly 5% of the wage income and over 6% of the output value of the state. Primary forest products represented the single largest share of total output value, wages income and employment-followed by forestry services and then secondary products.

Table 3-109. Oregon Forest Sector Economic Impact Summary (2000).

Forest Sector Grouping	Output (billions)	Wage Income	Jobs
Primary Products	$7.162	$1.756	35,300
Secondary Products	$2,331	$0.635	17,200
Forestry Services	$3.148	$1.078	33,100
Forest Sector Direct	$12.641	$3.469	33,100
Forest Sector w/Indirect	$22.373	$7.646	85,600
All Economic Sectors	$200.765	$73.430	2,133,500

Source: IMPLAN as adjusted by E. D. Hovee & Company. Estimates are preliminary and subject to revision. Numbers may not add precisely due to rounding.

When economic multiplier effects are considered, more than 190,000 jobs were directly and indirectly affected by Oregon's forest sector or 9% of Oregon's total economy. Multipliers reflect the additional spending and jobs created as companies and public agencies in core forest sector activities and their employees make second and subsequent round expenditures for goods and services throughout Oregon. The average job multiplier is 1.75 for all Oregon forest sectors, ranging from a high of 2.81 for primary products to a low of 1.64 for forest services. With this multiplier effect, total output supported directly or indirectly by Oregon's forest sector increases to 11% of the output value contributed by all sectors of the state's economy.

Although the decade from 1990 to 2000 saw a 10% decrease in total forest sector employment in Oregon (with a loss of approximately 9,600 jobs statewide), the industry is still an important contributor to the local economies of Central Oregon. Also, as jobs in the primary and secondary forest product sectors have declined, there has been a reported employment growth in firefighting, ecological restoration and other contract services that fall within the forestry services sector.

Forest sector employment has far more impact in Central Oregon than for the State of Oregon as a whole. Wood products manufacturing is still the single largest industrial employer in Jefferson County and the second largest industry in Crook County. In Deschutes County, according 2005 Oregon Employment Department, 1,798 people were employed in wood products manufacturing. This places it a distant third behind tourism (7,772 jobs) and Health and Social Assistance (6,062 jobs), but these jobs do represent the seventh highest average paying jobs in the county and 9 per cent of primary industrial jobs, a far higher average than for Oregon as a whole.

Both Crook and Jefferson Counties, with smaller populations and a less diversified economic base, are much more dependent on the timber industry. In Crook County, 1,007 people were employed in wood products manufacturing in 2005, placing it second behind Distribution and Warehousing (Les Schwab). This accounts for 24 percent of all primary industrial employment in the county, and represents the third highest paying jobs in the county. In Jefferson County, 1,798 people were employed in wood products manufacturing and related industries in 2005. This accounts for a significant 49 percent of primary industrial employment in the county while also representing the third highest paying jobs in the county.

In Klamath County 3,180 people were employed in the lumber and wood products industry, accounting for 19 percent of all wage and salary employment. In Lake County, 13 per cent of all wage and salary employment was in the lumber and wood products industry. In Jefferson County, 1,150 people were employed in the lumber and wood products industry. This accounts for 19 percent of all wage and salary employment, and represents the third highest paying job in the county

With a long history of dependence on the primary forest products sector (lumber production), the region and Oregon as a whole has been capitalizing on market opportunities in value-added or secondary wood products sector. Industry pioneers like Madras-based Brightwood Corp., and Jeld-Wen (based in Klamath Falls) produce a variety of moldings, doors, and casings and have grown to be the largest private employers in the region. Prineville is home to the largest concentration of both primary and secondary wood products firms such as Clear Pine Mouldings, and Woodgrain Millwork - all of which are on the region's top employer list.

Kevin Preister, a professor of sociology at the University of Oregon prepared a report for the Forest Service and BLM in July 2000 that summarized the economic situation in Crescent and Gilchrist, the two communities closest to the Five Buttes Project: "The big mill in Gilchrist is the main source of employment…Ranchers and farmers are having a tough time unless they have big operations. Schools and Mid-State Electric Cooperative are now the biggest employers. As in other parts of rural Oregon, commuting to the urban zones for jobs is now the dominant economic pattern." The Gilchrist mill was sold in 2005 to Interfor Pacific. It is still one of the largest remaining sawmills in Klamath County and a major employer in northern Klamath County

Table 3-110 identifies the largest private employers in Central Oregon. The timber manufacturing industry is still a leading private sector employer in Central Oregon with the Bright Wood Corporation being the second largest employer (after St Charles Hospital) with 1,466 employees working in all three counties. Clear Pine Moldings, Inc in Prineville follows as the ninth largest employer with 597 employees. Other examples include Jen Weld Window and Door of Bend with 521 employees, Woodgrain Millwork in Prineville with 365 employees, Jen Weld Millwork of Bend with 225 employees and concluding with Warm Springs Forest Products with 128 employees, making it the 44th largest industry in Central Oregon and the largest private employer in Jefferson County.

Table 3-110. Central Oregon's Largest Private Employers.

Private Sector Company	Number of Employees
St. Charles Medical Center (Bend - 2,023 Redmond - 314)	2,337
Bright Wood Corporation (Region Wide) (Bend – 142 Madras – 1,107 Redmond - 217)	1,466
Les Schwab Tire Center (Region Wide)	1,142
Sunriver Resort (Sunriver-Seasonal)	870
Mt. Bachelor, Inc. (Bend-Seasonal)	750
T-Mobile (Redmond)	674
Beaver Motor Coaches (Bend)	654
iSKY (Bend)	625
Clear Pine Mouldings, Inc. (Prineville)	597
JELD-WEN Windows & Doors (Bend)	521
Eagle Crest Partners, Ltd. (Redmond-Seasonal)	500
Safeway (Region Wide)	490
Hap Taylor & Sons (Bend)	465
Bend Memorial Clinic (Bend)	460
The Lancair Company (Bend)	447
Wal-Mart (Region Wide)	445
Fred Meyer (Region Wide)	411
Woodgrain Millwork (Prineville)	365
Black Butte Ranch (Sisters)	350
Kah-Nee-Tah (Warm Springs - Seasonal)	350
Seaswirl Boats (Culver)	269

Private Sector Company	Number of Employees
Hooker Creek Companies (Region Wide)	258
Albertson's Supermarkets (Region Wide)	248
The Bulletin (Bend & Redmond)	244
Opportunity Foundation of Central Oregon (Region Wide)	240
Hilltop Health Care of Oregon (Region Wide)	237
Bank of the Cascades (Region Wide)	236
JELD-WEN Millworks Manufacturing (Bend)	225
Lifewise - A Premera Health Plan Inc. (Bend)	216
Fuqua Homes (Bend)	200
Brooks Resources (Bend-Seasonal)	200
Mt. View Hospital District (Madras)	196
The Riverhouse (Bend)	175
Pioneer Memorial Hospital (Prineville)	175
PCC Schlosser (Redmond)	175
Interfor Pacific (Gilchrist)	170
Home Depot (Bend)	156
Advanced Power Technology (Bend)	153
Keith Manufacturing (Madras)	150
Inn of the Seventh Mountain (Bend-Seasonal)	150
Edge Wireless (Bend)	149
Bend Research Inc. (Bend)	145
Pioneer Cut Stock Inc. (Prineville)	141
Deschutes Brewery (Bend)	140
Warm Springs Forest Products (Warm Springs)	135
Kirby Nagelhout (Bend)	130
The Center Orthopedic & Neurosurgical Care & Research (Bend)	128
BendBroadband (Bend)	125
Unicel (Region Wide)	115
Wells Fargo (Region Wide)	109
US Bank (Region Wide)	108

Source: EDCO, March 2005; Interfor Pacific, 2006.

Special Forest Products

A subset of the forestry services sector includes special forest products. Special forest products include such diverse harvesting activities as decorative florals and grasses, green bows, cones, mushrooms, and huckleberries. Each is especially attractive to specific cultural groups, ranging from Native Americans to Southeast Asians.

Over the past two decades special forest products, specifically mushroom harvests, have also played a role in the economies of these communities. Harvesters are traditionally Southeast Asian extended family groups, who migrate to the area from homes in the Sacramento valley. They traditionally camp each fall in the local area, following the mushroom harvest through the Pacific Northwest.

Morels, a spring mushroom, often appear after soil disturbing activities and fires. Morels proved to be a temporary boom for the local communities in the spring of 2004 after the B&B Complex Fire and Davis Fires of 2003. In 2004 over 3,000 free use mushroom permits were issued (up from 1,200 in 2003) for the Sisters Ranger District alone. In 2006, sales of permits for morels in the Davis Fire have declined to almost prefire levels.

In the spring of 2004, for the first time in Central Oregon, large Hispanic crews from the Willamette Valley joined Southeast Asians in harvesting mushrooms in the areas burned by the two fires. They were apparently hired by commercial mushroom harvesters when prices were relatively high. Because of over supply world wide, wholesale mushroom prices collapsed in the fall of 2004, resulting in a dramatic decline in commercial harvest activity on the Deschutes National Forest.

In 1992 the wholesale trade in Oregon, Washington and Idaho generated $41 million, according to a Washington State University study. At that time, commercial pickers could earn up to $15/pound for the distinctive fungi, and wholesale buyers can fetch three to nine times that price from gourmet restaurants, specialty shops and grocers in Europe, Asia and America. A single fire on the Payette N.F. yielded more than $3 million in 1994 with buyers purchasing $10,000 to $15,000 worth of mushrooms a day. Forest Service mycologists estimated the morel harvest was nearly as valuable as the salvaged timber.

In 2003 Matsutake mushroom permit sales from the Fremont-Winema, Deschutes, Umpqua and Willamette National Forests totaled $144,050 for 1,527 permits. This was significantly lower than the 1997 season when permit sales topped $365,000 for almost twice as many permittees. Within the Five Buttes Project area, most Matsutake habitat exists in the Davis LSR, which is closed to Matsutake harvest.

Social

Surrounding physical and biological environments influence human social life. This is most evident in rural areas where the variety and quality of available natural resources often determines the chief means of economic livelihood and what leisure activities people are likely to pursue and, therefore, influence local preferences for the use of public lands. From a historical perspective, it is evident that all of the local community's cultures were natural resource based and to a certain degree, especially in the more rural, still are. Livestock, agriculture and timber were the backbone of the economic structure and as a result strongly shaped the social fabric that still defines the communities today. Since much of the surrounding land is administered by federal agencies, chiefly the Ochoco, Deschutes, Winema and Fremont National Forests and the Prineville District of the BLM, changes in federal land use policies can affect the socioeconomic and socio-cultural way of life.

Various communities, and the individuals within them, contain a broad spectrum of perceptions and values related to the road system and use of resources on the surrounding national forests. These same communities and individuals also have interests that span multiple geographic and political scales simultaneously.

The following descriptions portray communities only in the most simplistic terms and do not capture the full community richness. Many of the communities (rural industrial, as defined in the Deschutes LRMP) within Central and South Central Oregon, such as La Pine, Crescent, Gilchrist and Crescent Lake, are closely tied to the Forests in work, subsistence, and play, and are directly affected by what happens on the Forests. The relationship between the Forests and these communities is based in part by: logs for their harvesting, manufacturing, and transportation businesses; and catering to recreationists and tourists drawn to the area. People from these communities also use fuel wood, fish, special forest products and game for part of their subsistence and/or recreational activities. Recreation (often roaded and/or motorized) is also an important component of the life styles for many of the people living in these communities.

Because La Pine, Gilchrist, Crescent and Crescent Lake are unincorporated, there are no official population figures for the area. However, because the area offers popular home sites, typically with larger acreages on flat, wooded mountain valleys, a majority of new residential building permits in unincorporated areas of Deschutes County have been issued in the La Pine area. Estimates for the La Pine area (south of Sunriver and North of the Klamath County line) are between 15,000 and 18,000 residents – making it potentially the second largest population “center” in the Central Oregon region and the largest unincorporated community in the state. Overall, nearly 40% of Deschutes County, or about 42,400 residents, live in unincorporated areas throughout the county.

The La Pine area offers some of the least costly housing in the region, and on average, lots considerably larger than those in incorporated cities in Central Oregon. This, combined with the fact that most are wooded, provides an atmosphere of privacy and seclusion preferred by many residents of Deschutes County. La Pine is one of the fastest growing unincorporated areas in the state. Located approximately 30 miles from Bend and 15 miles from Sunriver, it is also close enough to take advantage of the sizeable commercial/retail market in Bend.

The commercial area of La Pine has several large developments underway or recently completed, including a new multi-million dollar senior/assisted living facility, elementary school, several new commercial/retail businesses, a new industrial park, new sewer district, a new well, distribution system and 250,000 gallon storage reservoir managed by La Pine Water District.

The one over-riding demographic trend in the area is that of rapid population increase through in-migration. With the general gentrification that is occurring through the area and the influx of retirees, many of whom are well to do, and professionals from many specialty areas, is resulting in rapid economic and social change.

This gentrification is also occurring in La Pine, the largest community near the Five Buttes project. La Pine was zoned for relatively small parcels in the 1970s before land use laws. According to residents, it used to be that the majority of landowners were absentee, and used retreat cabins for vacations. Many are semi-retired now and most commute to Bend for employment opportunities. La Pine has grown from this time of rampant land speculation, like what occurred in Christmas Valley in nearby Lake County, to more gradual growth. The gentrification is less evident in the small communities of Crescent and Gilchrist, closer to the project area. These communities are still losing small businesses, with the recent closure of a local café and restaurant in Crescent being but one example of a shrinking economic base.

Communication in these communities appears to be problematic, since there is no city government, local media outlets or high-density city centers. Nevertheless, informal communication is effective and relied upon. Local stores, service stations, and restaurants are gathering places, as are the schools. Many people use e-mail. Network communication is high, although the level of rumors indicates that important networks do not get connected.

Effective community leadership has been emerging in recent years, in part because of the population shift from absentee to full-time residents. Thanks to development of local Community Action Teams, with most local organizations as members, these communities now have the ability to come together twice a month and are developing multiple subcommittees to focus on local issues.

Communities such as those found along the shores of Crescent and Odell Lakes are defined by their recreation opportunities and recreation residences (rural recreation and residential, as defined in the Deschutes NF Forest Plan). Environmental and scenic amenities and nearby recreational opportunities play a major role for their existence. Local service-oriented businesses are a major economic driver in these communities. These communities don't typically depend on extraction-based activities; instead, scenic amenities and recreation opportunities have more economic and social influence on these communities.

Bend (Central Oregon Urban Center, as defined in the Deschutes NF Forest Plan), is the dominant community in the zone. It has a large industrial sector with wood products, especially secondary industries like cabinetry and flooring, playing a major role, and a large service sector based on recreation, tourism and medical services. In addition, its financial and real estate sectors, and economy as whole, have increased substantially as people have moved into the area because of the amenities the surrounding area provides, much of which is associated with the national forests. It is also the major shopping and service center for most of the communities within the area. Because of its population size and density, and economic and social diversity, the health of the wood products and service sectors of the economy, along with environmental and amenity values, play an important role in defining what is important to the Bend community.

Communities such as Prineville, Redmond, and Madras from a historically perspective, better fit the "rural industrial" community described above. But with their exploding populations and diversifying economies, they are developing a more diverse set of interests more along the lines of Bend's. With the recent strengthening of the Central Oregon economy, thanks to in-migration of new residents and new industries ranging from call centers to prisons, these communities are slowly weaning themselves of their historic dependence on the woods product industries both economically and culturally.

Other communities within the area (e.g. Paulina, Silver Lake) can generally be defined as ranching or farming communities. These communities are closely tied to the Forests in work, subsistence, and play, and are directly affected by what happens on the Forests. These communities are linked more economically because of the need for summer forage for livestock, not timber, and to provide services for recreation and tourists. These communities generally have no manufacturing based industries and have small, undiversified economies. Like "rural industrial communities," the people who reside in these communities also use fuelwood, fish, and game for part of their subsistence and/or recreational activities.

Economics

Forest Service Handbooks 1909.17 and 2409.18 direct the evaluation of Economic Efficiency for proposed projects. There are many methods available to meet different objectives and compare alternatives. This document will identify the method used, costs and assumptions used, and comparison of alternatives for the Five Buttes Project. The objective is to compare financial efficiency among alternatives along with disclosures of effects to resources in order to assist the responsible official and the public to identify the desired alternative for the Five Buttes project.

Evaluation of efficiency is a basic type of economic and social analysis and is an integral part of the planning process. Economic efficiency is a term used to describe how well inputs are used to achieve outputs when all inputs (activities) and all outputs (including market and non-market) are identified and valued. All costs and all benefits to society are included; amounts of each output are not pre-established but are produced in amounts intended to maximize net public benefits. Financial efficiency is a comparison of estimated financial costs and revenues from the planned activities.

Uncertainty exists about evaluated quantities; to deal with this uncertainty the analysis uses the best estimates of all inputs, outputs, prices and costs. The analysis can be used to compare alternatives, not to give an absolute number for the outputs. Information of how the results would vary should strengthen the basis for choices.

Data and Analysis of Stand Treatments

Timber volume estimates were made for each alternative. The volumes were estimated using cruised stand data from three similar timber sales in the area with similar stand characteristics and prescriptions. A factor of 15% was subtracted to account for retention areas. Also, it is assumed approximately 40% of the volumes would be fiber and all optional material would be included. This is based on current markets and the national trend to utilize more biomass. Table 3-111 displays predicted volumes by action alternative and harvest method.

Table 3-111. Comparison of volumes by alternative in hundreds of cubic feet (CCF).

Five Buttes Project Volume Estimates (CCF[1]) by Logging System	
Logging System, Alternative B	
Ground-based	29,252
Advanced (Helicopter or Skyline)	7,088
Total	**36,340**
Logging System, Alternative C	
Ground-based	22,591
Advanced (Helicopter or Skyline)	5,121
Total	**27,712**

[1] Multiply by .00052 for a rough conversion to Million Board Feet.

Cost Analysis

Cost analysis considers all costs through the stage of processing at which the benefits are valued. These include costs for post sale work that may or may not be funded by the timber sale, but reflect the entire work to be accomplished in order to achieve the desired ecological outcome. Only the cost differences between the active management scenarios are considered. An emphasis is made on variable costs, which will differ among the alternatives being considered and thus affect 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; these costs are displayed in Table 3-112.

Table 3-112. Forest Service General Costs.

Activity	Alternative A	Alternative B	Alternative C
Project Planning	$\$300,000.^{00}$	$\$1^{.97}$/ccf	$\$1^{.97}$/ccf
Sale Preparation	$\$0.^{00}$	$\$19^{.00}$/ccf	$\$19^{.00}$/ccf
Sale Administration	$\$0.^{00}$	$\$10^{.01}$/ccf	$\$10^{.01}$/ccf

Logging Costs

Operation costs for the Five Buttes project were developed. Cost to the purchaser was developed using logcost50.xls which includes a stump-to-truck costing program ($/CCF, MBF, Tons). The information for input and selection of equipment to use and limitations of each was discussed with Forest Service employees who are acquainted and most knowledgeable with the needs of the Five Buttes project. The generated outputs display the costs per hundred cubic feet per unit to remove the material.

The logging costs by unit were added to costs of activities, including mitigation measures, to meet the resource objectives of the Five Buttes project. These include:

- Cleaning of equipment to reduce the potential of spreading nonnative invasive plants.
- Temporary road construction for access.
- Fuels Treatments to reduce the potential fuels loadings to levels suitable for application of prescribed fire in order to mimic historical fire processes. These include:
    - Grapple piling (on ground-based salvage units) with machinery along skid trails.
    - Felling of small diameter non-merchantible trees.
    - Handpiling, utilization or burning of slash accumulated from salvage operations and small diameter fuel reduction activities.
    - Prescribed burning in all plant association groups where ponderosa pine and Douglas-fir are the focal species.
- Decompaction or subsoiling of temporary roads and areas in excess of forest and regional soil quality standards and guidelines to increase soil productivity.

able 3-113 identifies activity costs using fixed and overhead assessments.

Table 3-113. Treatment Costs after Harvest.

Activity	Cost	Unit of Measurement
Invasive plant equipment cleaning	$43.50	Per individual machinery from offsite
Invasive plant monitoring and inspection of source sites for rock	$1,000	Certified botanist wages
Temporary road construction and removal	$10,000	Per mile
Grapple piling for fuels reduction	$125.00	Per acre
Small tree felling, handping, disposal	$235.00	Per acre
Prescribed burning and smoke management in appropriate stands	$245.00	Per acre
Subsoiling or decompaction of soils	$300.00	Per acre
Creation of snags in deficient stands prior to activities	$1000.00	For entire contract
Replacement/upgrade of wildlife guzzler	$15,000	One

Economic Efficiency

Economic or Financial Efficiency analysis for the Five Buttes project EIS was conducted with the available costs and expected timber volumes. All costs and revenues are expressed as common year dollars which follow Forest Service Manual (FSM 1909.17) direction. There is probably not one "best " measure of economic efficiency, it being dependent on which input is most scarce or most limiting for the project. This analysis uses the investment and operating funds required to put and keep lands in production of desired resources. This analysis will use Present Net Value (PNV) which is the Present Benefit Value (PVB, present revenue values) less the Present Cost Value (PVC). The Present Net Value allows comparison of alternatives as to the differences in net value of the outcomes. Positive values indicate more revenues than costs while a negative value indicates more costs than revenues. The other measure used is the Benefit/Cost Ratio (B/C). This is the present value of benefits (PVB, present revenue values) divided by the Present Value of Costs (PVC). It is a simple gauge of the relative efficiency of amounts of investment and operating funds to produce benefits. A Benefit/Cost ratio greater than one indicates more revenue than cost, while a ratio less than one indicates more costs than revenues. The efficiency analysis does not provide the final decision itself, but rather provides an understanding of the different efficiencies of each alternative.

To assess the economic efficiency of the alternatives, the costs and anticipated timber volumes were entered into TEA.ECON at (http://www.fs.fed.us/r6/nr/fp/FPWebPage/ForestProducts/ForestProducts.htm). This program is an economic analysis tool developed by Steve Rheinberger, a logging systems specialist for the USDA Forest Service. It allows the user to evaluate timber sale economics at the planning or sale layout level. The timber sale economics are based on current and/or future sale data specified by the user. The spreadsheet uses price and cost data based on dollars per CCF (hundreds of cubic feet or cunits). The spreadsheet includes "cash flow" and "non-timber value" screens as well as screens which summarize net present value and benefit-cost ratios. Timber sale projects can be evaluated by individual units or by the sale-as-a-whole. The spreadsheet uses the Transaction Evidence Appraisal (TEA) system to generate basic gross timber values and estimated advertised rates. Values for timber are generated using advertised rates in the economic zones of the Forest. These rates were updated for the analysis on June 30, 2006. This analysis is best used as a comparative analysis of alternatives.

Table 3-114 shows the estimated volumes for each alternative, the estimated Present Net Benefits (Revenues), Present Net Costs, Present Net Value and the Benefit Cost Ratio. The first table includes costs associated with the timber sale, as well as post harvest activities, such as small tree thinning, handpiling and disposal, prescribed burning, wildlife enhancement projects, temporary road construction and rehabilitation, and required mitigation such as soil decompaction and invasive plant equipment washing and monitoring. Notice that costs exceed revenues for both action alternatives, and that Alternative C is the most costly because of the extended fuels reduction activities.

Table 3-114. Financial efficiency by alternative (current and future activities included).

	Estimated Volume CCF	Estimated Volume (Million Bd. Ft.)	Discounted Costs	Discounted Revenues	Net Present Value (NPV)	Benefit Cost Ratio (B/C)
Alternative A	0		$0	$300,000[1]	-$300,000	0
Alternative B	36,340	18.897	$2,166,464	$2,075,218	-$91,245	0.96
Alternative C	27,712	14.41	$2,129,260	$1,271,619	-$857,641	0.60

[1] Includes planning costs for the Five Buttes EIS.

Environmental Consequences

Alternative A

Selection of this alternative would result in no active management of the resources except for custodial activities such as fire suppression, routine maintenance, and the associated economic benefits related to those activities. Alternative A would generate no likely goods and services to the local and regional economies, except (essentially) those related to emergency actions. There is a cost displayed from the expenditure of the Interdisciplinary Team and associated analysis for the Five Buttes project in order to provide the public and responsible official consequences of action versus no action.

In relation to likely employment within the closest counties to the Five Buttes project area, this alternative would produce the fewest timber-related jobs in the short term and the long term.

Alternative B

Alternative B was determined to be a viable timber sale from a perspective that it is likely there would be interested bidders. Although the Net Present Value displays a negative value (-$91,245), this reflects all the project costs that are not necessarily related to the timber sale, such as small diameter thinning, prescribed burning, and wildlife enhancement projects. The financial efficiency of this alternative is the highest with the Benefit/Cost Ratio of 0.96. When the timber related unit revenues and costs alone are analyzed, the Net Present Value becomes a positive value at $943,068 and the Benefit Cost Ratio is 1.83.

This alternative has the potential to produce the most employment opportunity for timber related jobs. Additional potential employment opportunities would be afforded through small diameter thinning contracts and prescribed burning on 5,522 acres. For comparison purposes only, Interfor Pacific mill in Gilchrist, Oregon, which is the closest mill to the project area, needs approximately 300,000 board feet to operate an 8 hour shift. This alternative would provide 18,897 thousand board feet, which translates to approximately 63 shifts at the local mill.

Alternative C

Alternative C was also determined to be a viable timber sale. This alternative is less economically efficient than Alternative B, with approximately 4.4 million board feet less commercial timber harvested and approximately 2,276 additional acres of fuel reduction associated with small diameter thinning, limbing of trees, and ground fuel modification.

The Net Present Value displays a negative value of -$857,641 and also reflects project costs that are not necessarily related to the timber sale. Greater emphasis on strategic placement of fuel treatments drove the costs higher than in Alternative B. The financial efficiency of this alternative is the second highest of the three alternatives with the Benefit/Cost Ratio of 0.60.

When the timber related unit revenues and costs alone are analyzed, the Net Present Value becomes a positive value at $573,634 and the Benefit/Cost Ratio is 1.82. This ratio is very close to Alternative B.

In terms of potential woods-related jobs produced, this alternative would also be very similar to Alternative B. This alternative has an additional 2,276 acres of activities that do not produce a byproduct of commercial opportunities associated with timber, but provide a more strategic landscape-scale approach to reducing the potential of a problem fire. Fuels activities on these areas, and the opportunities for jobs they would provide, have the potential to offset the woods-related jobs afforded in Alternative B. This alternative would provide 14,410 thousand board feet, which translates to approximately 48 shifts (15 fewer than Alternative B) at the local mill.

Cumulative Effects
Cumulative effects, or those that are additive to the Five Buttes project alternatives from a social-economic aspect, are difficult to quantify. The present economic opportunities in Central Oregon are likely strong enough at present to offset any additional downturns in local and regional timber-related jobs.

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, people with disabilities, the elderly, and low-income groups.

Environmental Justice is defined as the pursuit of equal justice and protection under the law for all environmental statutes and regulations, without discrimination based on race, ethnicity, or socioeconomic status. The minority and low income populations groups living in counties surrounding the fire 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, such as La Pine, Crescent, and Gilchrist, Oregon.

Environmental Consequences

Alternative A – No Action

This alternative would continue the local economic situation as described in the section titled "Economic and Social Analysis" in Chapter 3 of this EIS. Opportunities for employment of minority and low income workers may arise through contract activities for various forest work, such as annual thinning, conifer planting, and various small business contracts related to work outside the Five Buttes area, but there are no known disproportionately high effects to any ethnic minorities, people with disabilities, and low-income groups.

Effects Common to all Action Alternatives

There would be no change in access and no known adverse effects that would be disproportionately high to any ethnic minorities, people with disabilities, and low-income groups as a result of implementation of either action alternative in the Five Buttes project. Within the social context presented, the action alternatives developed for this project have the potential to bring in workers from the outside to perform logging and post harvest activities such as small tree thinning and handpiling.

While the outside workforce is more likely to be racially diverse than the local resident population, the residents have worked effectively with and supported anticipated fluctuations in the workforce expected with the implementation of an action-based alternative. The primary services needed by the workers would be food and shelter. Local businesses that can supply food (grocery stores and restaurants) and other services would capture most of the money being spent by the workers in the area. Since these businesses have supported similar workforces in the past, capitol expansion would probably not be required.

There would be no permanent change in access to the Five Buttes project area.

Air Quality

Smoke produced from wildland or prescribed fires can have significant effects on a large urban landscape. Approximately 75,000 people live in the surrounding communities. Many of the residents in the area live in the large city of Bend, or small towns such as Sunriver, Lapine, Crescent, Gilchrist, and Crescent Lake Junction; however, a significant percentage of the populations live in the wildland/urban interface in the countryside surrounding these cities and towns. County roads and state highways are high-speed and are typically heavily traveled.

Description of the Airshed

Class 1 Airshed
Class I areas are protected by the Prevention of Significant Deterioration (PSD) program and include national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value.

The Oregon Department of Forestry Smoke Management Plan (OAR 629-043-0043) considers Diamond Peak wilderness area a Class I airshed and a "smoke sensitive area" and requires restrictions on prescribed burning during the Visibility Protection Period July 1 to September 15.

Class 2 Airshed
Class 2 areas are attainment areas that are neither industrialized nor meet the specific requirements for classification as Class I areas. They are protected by the PSD program. The Five Buttes project area is a Class 2 area.

Designated Area
The term "Designated Area" refers to those areas identified as principal population centers or other areas that require protection under state or federal air quality laws or regulations.

The Five Buttes project area is located approximately 35 miles southwest of Bend, Oregon. Bend is classified as a "Designated Area" by the Oregon Smoke Management Report.

Smoke Drift Restrictions:
(a) Smoke drift away from designated area: No specific acreage limitation will be placed on prescribed burning when smoke drift is away from designated area. Burning should be done to best accomplish maximum vent height and to minimize nuisance effect on any segment of the public.

(b) Smoke drift toward designated area:

(A) Smoke plume height below designated area ceiling, includes smoke that for reasons of fire intensity, location, or weather will remain below the designated area ceiling. Also included are fires that vent into layers of air, regardless of elevation, that provide a downslope trajectory into a designated area:

(i) Upwind distance less than 10 miles outside designated areas. No new prescribed fires will be ignited.

(ii) Upwind distance 10-30 miles outside designated area boundary. Burning limited to 1,500 tons per 150,000 acres on any one day.

(iii) Upwind distance 30-60 miles outside designated area boundary. Burning limited to 3,000 tons per 150,000 acres on any one day.

(iv) Upwind distances more than 60 miles beyond designated area boundary. No acreage restriction unless otherwise advised by the Forester.

(B) Smoke will be mixed through the deep layer at the designated area. This section includes smoke that will be dispersed from the surface through a deep mixed layer when it reaches the designated area boundary:

(i) Upwind distance less than 10 miles from designated area boundary. Burning limited to 3,000 tons per 150,000 acres on any one day.

(ii) Upwind distance 10-30 miles from designated area boundary. Burning limited to 4,500 tons per 150,000 acres on any one day.

(iii) Upwind distances 30-60 miles outside designated area boundary. Burning limited to 9,000 tons per 150,000 acres on any one day.

(iv) Upwind distances more than 60 miles beyond designated area boundary. No acreage restriction unless otherwise advised by the Forester.

(C) Smoke above a stable layer over the designated area. Smoke in this group will remain above the designated area, separated from it by a stable layer of air:

(i) Upwind distance less than 10 miles outside designated area. Burning limited to 6,000 tons per 150,000 acres on any one day.

(ii) Upwind distance 10-30 miles outside designated area. Burning limited to 9,000 tons per 150,000 acres on any one day.

(iii) Upwind distances 30-60 miles outside designated area. Burning limited to 18,000 tons per 150,000 acres on any one day.

(iv) Upwind distances more than 60 miles beyond designated area boundary. No acreage restriction unless otherwise advised by the Forester.

(D) Smoke vented into precipitation cloud system. When smoke can be vented to a height above the cloud base from which precipitation is falling, there will be no restrictions to burning, unless otherwise advised by the Forester.

(E) Changing conditions: When changing weather conditions, adverse to the Smoke Management objective, occur during burning operations, aggressive mop-up shall be initiated as soon as practical and no additional burning shall be initiated.

Existing Condition

The Five Buttes project area is considered to be in attainment of the National Ambient Air Quality Standards (NAAQS) for Class II airsheds. The project area is composed of a Class II airshed, and within the boundaries of a Designated Area, Bend Oregon. The project area is adjacent to a Class I airshed, Diamond Peak Wilderness.

Environmental Consequences

Prescribed burning operations associated with all action alternatives would incorporate the project design features described above, as well as the specific project design features intended to minimize effects to wildlife and habitats described in Chapter 2 of this EIS. There are no effects to human health (also see the section titled “Public Health and Safety: Air Quality and Human Health” in Chapter 3 of this EIS), visibility, Class 1 airsheds, designated areas, wildlife species or wildlife habitats expected from the implementation of any action alternative.

First Order Fire Effects Model (FOFEM)

The First Order Fire Effects Model (FOFEM) is a computer program that was developed to meet the needs of resource managers, planners, and analysts in predicting and planning for fire effects.

Development of FOFEM involved a search of the fire effects literature for predictive algorithms useful to managers. These algorithmswere screened to evaluate their predictions over a range of conditions. Documentation of these algorithms was examined to determine the conditions under which each algorithm is best used. Thus, a major internal component of FOFEM is a decision key that selects the best available algorithm for the conditions specified by a user.

Analysis of the Five Buttes alternatives used FOFEM to generate Tables 3-115 and 3-116, which summarize fuel consumption and smoke emission information. Alternative A was modeled under a problem fire scenario. Alterantives B and C include emissions from planned pile disposal and prescribed underburning. These estimates are conservative for the action alternatives because the market demand for biomass could utilize piles instead of burning for disposal. This would lower the emissions and carbon output.

Table 3-115. Fuel Consumption Summary (tons per acre).

		Wood	Wood	Wood	Wood				Crown	Crown
	Litter	0-¼ “	¼-1”	1-3”	3+”	Duff	Herb	Shrub	Foliage	Branch
Alt. A	0.60	0.34	1.00	1.2	4.56	7.52	0.2	0.21	9	2.25
Alt. B	0.60	0.23	0.67	0.8	1.94	7.52	0.2	0.21	3	0.75
Alt. C	0.30	0.12	0.34	0.4	1.85	7.52	0.2	0.21	6	1.25

Table 3-116. Smoke Emission Summary.

	PM10	PM2.5	CH4	CO	CO2	NOX	SO2
	Lbs/acre	Lbs/acre	Lbs/acre	Lbs/acre	Lbs/acre	Lbs/acre	Lbs/acre
Alt. A	894	758	441	9402	81637	79	56
Alt. B	639	541	322	6945	45343	31	33
Alt. C	630	534	312	6666	54850	51	38

PM10: Particulate Matter that is 10 micrometers or smaller in size
PM2.5: Particulate Matter that is 2.5 micrometers or smaller in size
CH4: Methane
CO: Carbon Monoxide
CO2: Carbon Dioxide
NOX: Nitrogen Oxide
SO2: Sulphur Dioxide

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).

The Multiple Use – Sustained Yield Act of 1960 requires the Forest Service to manage National Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available for future generations. Salvage and thinning activities that provide a commercial product, or use of standing timber, can be considered a short term use of a renewable resource. As a renewable resource, trees can be re-established and grown in again if the productivity of the land is not impaired.

Maintaining the productivity of the land is a complex, long-term objective. All alternatives protect the long-term objective of the project area through the use of specific Forest plan Standards and Guidelines, mitigation measures, and BMPs. Long-term productivity could change as a result of the various management activities proposed in the alternatives. Timber management activities would have a direct, indirect, and cumulative effect on the economic, social, and biological environment. Those effects are disclosed in Chapter 3 of this analysis.

Soil and water are two key factors in ecosystem productivity, and these resources would be protected in all alternatives to avoid damage that could take many decades to rectify. Sustained yield of timber, wildlife habitat, and other renewable resources all rely on maintaining long-term soil productivity. Quality and quantity of water from the analysis area may fluctuate as a result of short-term uses, but no long-term effects to water resources are expected to occur as a result of timber management activities.
All alternatives would provide the fish and wildlife habitat necessary to contribute to the maintenance of viable, well distributed populations of existing native and non-native vertebrate species. The abundance and diversity of wildlife species depends on the quality, quantity, and distribution of habitat, whether for breeding, feeding, or resting. Management Indicator Species are used to represent the habitat requirements of all fish and wildlife species found within the project area. By managing habitat of indicator species, the other species associated with the same habitat would also benefit. The alternatives vary in risk presented in both fish and wildlife habitat capability.

None of the alternatives would have an effect on the long-term productivity of timber resources.

Unavoidable Adverse Effects

Several unavoidable adverse effects, including some that are minimal and/or short term, were identified during the analysis. Adverse effects are associated with all alternatives, including the No Action and the Action alternatives. Resource protection measures or mitigations were identified for each adverse effect associated with an Action alternative as a means to lessen or eliminate such effects on specific resources. See the section titled "Resource Protection Measures" in Chapter 2 of this EIS. Resource areas determined to have potential adverse effects (resulting from any of the alternatives – including No Action and the Action Alternatives) are documented within the appropriate Environmental Consequences sections of each resource in Chapter 3.

Soils

Reference the section titled "Soils" in Chapter 3 of this EIS. Productivity of soils in proposed activity units would be

- Alternative B would increase the amount of detrimental soil condition in the project area by 666 acres.
- Alternative C would increase the amount of detrimental soil condition in the project area by 697 acres.

Wildlife

Northern Spotted Owl

Reference the northern spotted owl discussion in the section titled "Threatened and Endangered Species" in Chapter 3 of this EIS.

- Alternative B would result in a short-term loss of 2,822 acres of spotted owl Nesting, Roosting and Foraging (NRF) habitat.
- Alternative C would result in a short-term loss of 2,023 acres of spotted owl NRF habitat.

Other Resources

Analysis has determined that adverse effects from any of the proposed alternatives may occur to the following resources:

- Bald Eagle (see section titled "Wildlife: Threatened and Endangered Species");
- Bufflehead duck, gray flycatcher, California wolverine (see section titled "Wildlife: Regional Forester's Sensitive Species");
- Bats (see section titled "Wildlife: Northwest Forest Plan Survey and Manage Species");
- Deer and elk (see section titled "Wildlife: Big Game - Deer and Elk");
- Habitat for bull trout and redband trout (see section titled "Fisheries");
- Risk of introduction and/or spread of invasive plant species (see section titled "Invasive Plants");
- Scenery resources (see section titled "Scenery Resources").

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

The action alternatives are expected to create effects that could cause irreversible damage to soil productivity. There is low risk for mechanical disturbances to cause soil mass failures (landslides) due to the inherent stability of dominant landtypes and the lack of seasonally wet soils on steep slopes. Careful planning and the application of Best Management Practices and project design elements would be used to prevent irreversible losses of the soil resource.

The development and use of temporary roads and logging facilities is considered an irretrievable loss of soil productivity until their functions have been served and disturbed sites are returned back to a productive capacity. The action alternatives include soil restoration activities (subsoiling) on portions of activity areas estimated to exceed the 20 percent standard following implementation of the fuels and commercial harvest activities, including subsoiling temporary roads and logging facilities. Subsoiling would improve the hydrologic function and productivity on detrimentally disturbed soils.

Incomplete and Unavailable Information

Predictions of effects were made with the most current information available. The Five Buttes Project ID Team did not identify any types of incomplete or unavailable information that meet the criteria described in the CEQ Guildelines (Sec. 1502.22 Incomplete or unavailable information).

Effects on Wetlands and Floodplains

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. See discussions related to this topic in the hydrology, fishery and soils resource sections in Chapter 3 for more information.

Effects on Prime Farmland, Rangeland and Forest Land

All Alternatives were consistent with the Secretary of Agriculture memorandum 1827 for the management of prime farmland. The Five Buttes Project area does not contain any prime farm land or rangelands. Prime Forest Land, as defined in the memorandum, is not applicable to lands within the National Forest System.

Energy Requirements of Alternatives

Under the action Alternatives, additional consumption of fossil fuels and human labor would be expended for the use of vehicles transporting Forest workers, chainsaws, heavy equipment and trucks. Fossil fuel would not be a retrievable resource. There are no irregular energy requirements involved in implementing any of the action alternatives.

CHAPTER 4. CONSULTATION AND COORDINATION

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

Preparers

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Experience: Forest Service 24 years; biologist with Forest Service 16 years

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Jim Stone, USDA Forest Service, Deschutes National Forest, Data Analyst/Silviculturist
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Slater Turner, USDA Forest Service, Deschutes National Forest, Crescent Ranger District, Natural Resources Team Leader

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Education:	BS Forest Operations Management, Alabama A&M University, 1989
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Ronnie Yimsut, USDA Forest Service, Landscape Architect

Contribution:	Review of Scenery Resources analysis
Eductation:	BS Landscape Architecture, University of Oregon, 1987
Experience:	Forest Service - 19 years

Distribution of the Environmental Impact Statement

Draft Environmental Impact Statement

The Forest Service consulted with or received project comments from the following individuals, agencies, tribes, and non-Forest Service persons during the development of the draft environmental impact statement.

Federal Agencies
US Enviornmental Protection Agency
US Fish and Wildlife Service
Advisory Council on Historic Preservation
USDA APHIS PPD/EAD
Natural Resources Conservation Service
USDA Office of Civil Rights
NOAA Office of Policy and Strategic Planning
National Marine Fisheries Service, NW Region
U.S. Army Engr., Northwestern Division
US Navy, Environmental Protection Division
Northwest Power Planning Council
USCG Environmental Impact Branch, Marine Environmental and Protection Division
Federal Aviation Administration
Federal Highway Administration
US Department of Energy

State Government
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife

Tribes
Confederated Tribes of the Warm Springs
Confederated Tribes of the Umatilla

Organizations
American Forest Resources Council
Blue Mountains Biodiversity Project
Bohemia Sno-Sledders
Cascadia Wildlands Project
Central Oregon Flyfishers
Forestry Action Committee
Forest Service Employees for Environmental Ethics
Native Plant Society
Sunriver Owners Association
Walker Rim Riders
Businesses
Bend Bulletin
C & B Construction
Greystone Environmental Consultants
KLE Enterprises
Ochoco Lumber Company
US Timberlands Services

Individuals
Greg Aitken
Steven Chasing
Johnnie Gogenola
Wayne & Linda Higgins
Rebecca McLain
Joni Mogstad
Bob Mullong
Asante Riverwind

Final Environmental Impact Statement and Record of Decision

A letter will be sent to the Crescent Ranger District's mailing list advising recipients when the Record of Decision is signed; copies of the final environmental impact statement and Record of Decision will be sent to those who request it. In addition, hard copies and/or CDs of the final environmental impact statement and Record of Decision will be distributed to the following agencies as well as individuals or organizations who submitted substantive comments on the draft EIS.

Federal Agencies
Department of the Interior, Office of Environmental Policy and Compliance
US EPA, Office of Federal Activities
US EPA, Region 10
US Fish and Wildlife Service
USDA, National Agricultural Library

Organizations/Businesses
Blue Mt. Biodiverstiy
Native Forest Council
Sierra Club
The Nature Conservancy
Cascadia Wildlands
Americal Forest Resources Council
Ochoco Lumber

Individuals
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Jim Larsen
Laurie Solomon
Robert D. Irwin
Barbara Sachau
John Williams

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Glossary

A

Adfluvial **-** Fish that live in lakes and migrate into rivers or streams to spawn.

Advanced Regeneration - Small trees, usually less than 1" dbh, which are growing under mature trees prior to planned harvest activities.

B

Bald Eagle Management Areas (BEMAs) - Areas managed under the Deschutes National Forest Land and Resource Management Plan for the protection of the threatened northern bald eagle. BEMAs provide nesting and roosting habitat for the species.

C

Canopy - The uppermost spreading branchy layer of a forest.

Condition Classes - A function of the degree of departure from historical fire regimes. Condition class 1 is within or near historical conditions; class 3 is significantly altered from historical regimes.

Crop Trees -Trees which are considered suitable to meet long term management objectives for a project area. These may also be referred to as healthy or manageable trees. This may include both the physical make-up of the tree as well as the species.

Cryic - Soils in this temperature regime have a mean annual temperature higher than 0°C but lower than 8°C.

Cycle - As applied to uneven-aged management, it is the time interval between harvest entries. It should be noted that harvest entries in uneven-aged management are to leave residual levels of growing stock which should not need treatment for at least one cycle length.

D

Desirable Species - Any species of plant or animal which is considered to be compatible with meeting management goals and objectives.

Disturbance - Events that disrupt the stand structure and/or change resource availability or the physical environment (Oliver, 1996).

Diurnal - Active during the daytime, resting during the night.

E

Early Seral - Plants which inhabit a disturbed site within the first few years subsequent to the disturbance.

Epilimnion - The top-most layer in a thermally stratified lake, occurring above the deeper hypolimnion. It is warmer and typically has a higher pH and dissolved oxygen concentration than the hypolimnion. Being exposed at the surface, it typically becomes turbulently mixed as a result of surface wind-mixing. It is also free to exchange dissolved gases (ie O_2 and CO_2) with the atmosphere.

Excess Trees - Trees which are considered not needed in the stand in order to meet management objectives.

Extirpated - Local extinction.

F

Fire Regime - A function of the historical frequency of fire and the degree of severity of those fires.

Fuels - Vegetative matter, dead or alive, that burns in a fire. It is broadly characterized by the following categories:

- **Surface or ground fuels** are within a foot or so of the ground surface.
- **Ladder fuels** exist when you have a continuous vertical arrangement of fuel that allows fire to easily go from ground level into the tree canopy.
- **Crown fuels** are the tree limbs and leave that can burn with enough heat and/or wind.
- **Live fuels** are the green (live) herbs and shrubs.

G

Gentrification - The restoration and upgrading of deteriorated urban property by middle-class or affluent people, often resulting in displacement of lower-income people.

Group Selection - A stand management method in which silviculturists identify groups of trees which need to be removed from a stand of trees in order to meet management objectives.

H

Hypolimnion - The dense, bottom layer of water in a thermally-stratified lake. Typically the hypolimnion is the coldest layer of a lake in summer, and the warmest layer during winter. Being at depth, it is isolated from surface wind-mixing during summer, and usually receives insufficient irradiance (light) for photosynthesis to occur.

Hyporheic - a region beneath and lateral to a stream bed, where there is mixing of shallow groundwater and surface water. The flow dynamics and behavior in this zone (termed **hyporheic flow**) are not well understood, although it is recognized to be important for surface water/groundwater interactions, as well as fish spawning, among other processes.

I

Individual Tree Selection - A stand management method in which silviculturists identify individual trees that need to be removed from a stand of trees. In these method specific types, sizes, or qualities of trees are identified for either removing from the stand or remaining in the stand.

M

Mechanical Thinning - Reducing the number of trees in a stand using a factor which is independent of tree quality. The use of spacing for thinning is one type of mechanical treatment. For example, the closest tree to the points of a 15' by 15' grid would be left, regardless of tree quality.

N

NEPA - An acronym for National Environmental Protection Act.

NFMA - An acronym for the National Forest Management Act.

Noxious Weeds (Invasive species) - Non-native plants listed by the State that generally have either economic or ecosystem impacts, or are poisonous to wildlife and/or livestock. They aggressivley invade disturbed areas such as fires, road sides, and construction areas.

P

***Piscivorous* -** Fish-eating.

Prescribed Fire - Fire which is planned and used as a tool to meet specific management objectives.

Project Area - An area, regardless of size, which is being considered for one or more management activities through the NEPA analysis process.

R

Rotation - A pre-determined time frame in which an even-aged forest stand will reach maturity and be harvested.

S

Salvage - Activity, usually removal or chipping, of material killed by a disturbance event such as insects, fire, wind, etc. Where possible, this material is used as some form of forest product of commercial value, such as firewood, pulp, and/or chips.

Seral Stages - Seral stage describes the phase of development of a plant community. Early seral species are those species you would expect to find on a site soon after a major disturbance, like fire. These are species such as pines, Douglas-fir, snowbrush, fireweed, etc. They are generally shade intolerant species. Late seral are the species that can come in under a fully developed vegetative canopy, such as true firs, prince's pine, lichens, etc.

Silviculture -The theory and practice of directing forest establishment, composition, and growth for the production of forest resources to meet specific management objectives. The word is derived from the Latin word sylva, which means "forest" and from cultura, which means "to develop and care for." So, it is the development and caring for the forest.

Silviculturist - One who plans, assists in and supervises the implementation of silviculture projects. The silviculturist determines (prescribes) the vegetative treatments necessary to meet the objectives for vegetation on a given site.

Site - A specific location where management activity is considered, planned, or operating.

Site Potential - The specific ability of a site to grow vegetation. It includes the soil, topographic, and climatic conditions that determine the resources available for growing vegetation.

Site Preparation - The removing or rearranging of vegetation or woody debris to meet specific management objectives. Most often it is used to describe the process(es) used to expose mineral soil areas suitable for planting or seeding desirable species of plants.

Stand - A group of trees of similar canopy structure, species composition, and/or size growing on a continuous area . A stand is distinct from neighboring stands in either structure, growing conditions, or management objectives.

Stand Dynamics -The changes in forest stand structure with time, including stand behavior during and after disturbances (Oliver, 1996).

Stand Structure - The physical and temporal distribution of trees and other plants in a stand (Oliver, 1996).

Subnivean - Living underneath snow.

T

Thinning **-** Any cutting or removal of vegetation (trees, brush, etc.) resulting in a reduction of competition for water, light, and/or nutrients between individual plants. Thinning is commonly referred to as **commercial thinning** and **small tree thinning**.

- **Commercial thinning** refers to removing material that has an established dollar value on the open market and can be sold with at least a minimal net value sufficient to pay for the thinning activity.
- **Small tree thinning** may or may not have a dollar value and usually includes the need to pay someone to accomplish the work. This is sometimes called small-tree thinning because the trees are smaller than the sizes that have a commercial value.

Thrifty trees - Trees which have at least a 40% live crown ratio and with little or no evidence of disease or insects are called thrifty. They should also show evidence of good growth with long leaders and a good color, usually dark green.

Treatment - A term used to broadly refer to the vegetative changes made to meet management objectives. It may include thinning, cutting of undesirable trees, prescribed fire, salvage, or any manipulation of the vegetative conditions.

U

Underburn - Using prescribed fire under the canopy of an existing stand of trees.

Undesirable Species - Any species of plant or animal which is NOT considered to be compatible with meeting management goals and objectives.

Ustic - A soil moisture regime in which moisture is limited but is present at a time when conditions are suitable for plant growth.

W

Woody Debris - Dead pieces of woody vegetation such as stems, limbs, or leaves which are on a site.

X

Xeric **-** A soil moisture regime in which soil is dry for 45 or more consecutive days in the 4 months following the summer solstice, and moist for 45 or more consecutive days in the 4 months following the winter solstice.

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APPENDIX A - CONSISTENCY WITH CURRENT LAWS AND MANAGEMENT DIRECTION

Current Laws and Management Direction

Development of this Environmental Impact Statement follows implementing regulations of the National Forest Management Act (NFMA); Title 36, Code of Federal Regulations, Part 219 (36 CFR 219); Council of Environmental Quality, Title 40; CFR, Parts 1500-1508, National Environmental Policy Act (NEPA).

The American Antiquities Act of 1906

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

The National Historic Preservation Act of 1966, as amended

This Act requires Federal agencies to consult with American Indian Tribes, State and local groups before nonrenewable cultural resources, such as archaeological and historic structures, are damaged ore destroyed. Section 106 of this Act requires Federal agencies to review the effects proposed projects may have on the cultural resources of the project area.

The Endangered Species Act of 1973, as amended

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

The Migratory Bird Treaty Act of 1918

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

The National Environmental Policy Act (NEPA) of 1969, as amended

The purposes of this Act are "To declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damaged to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nations; and to establish a Council on Environmental Quality" (42 U.S.C. Sec. 4321). The law further states "it is the continuing policy of the Federal Government, in cooperation, to use all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of the present and future generations of Americans. This law essentially pertains to public participation, environmental analysis, and documentation.

The National Forest Management Act (NFMA) of 1976

This final rule describes the National Forest System land management planning framework; establishes requirements for sustainability of social, economic, and ecological systems and developing, amending, revising, and monitoring land management plans; and clarifies that land management plans under this final rule, absent extraordinary circumstances, are strategic in nature and are one stage in an adaptive cycle of planning for management of National Forest System lands. The intended effects of the final rule are to streamline and improve the planning process by making plans more adaptable to changes n social, economic, and environmental conditions; to strengthen the role of science in planning; to strengthen collaborative relationships with the public and other governmental entities; and to reaffirm the principle of sustainable management consistent with the Multiple-Use Sustained-Yield Act and other authorities.

The Clean Water Act, as amended in 1977 and 1982

The primary objective of this Act is to restore and maintain the integrity of the Nation's waters. This objective translates into two fundamental national goals: 1. Eliminate the discharge of pollutants into the nation's waters; and 2. Achieve water quality levels that are fishable and swimmable. This Act establishes a non-degradation policy for all federally proposed projects. Under Section 303(d) of the Clean Water Act, the State has identified water quality-limited water bodies in Oregon. Odell Creek is the only water body in the project area that is on the 303(d) list.

The Clean Air Act, as amended in 1990

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

Multiple-Use Sustained-Yield Act of 1960

The Multiple Use – Sustained Yield Act of 1960 requires the Forest Service to manage National Forest System lands for multiple uses (including timber, recreation, fish and wildlife, range, and watershed). All renewable resources are to be managed in such a way that they are available for future generations. The harvesting and use of standing timber can be considered a short-term use of a renewable resource. As a renewable resource, trees can be re-established and grown in again if the productivity of the land is not impaired.

Migratory Bird E.O. 13186

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

Forest Order 12962 (aquatic systems and recreational fisheries)

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

Executive Order 13112 (invasive species)

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

Forest Plan Direction

Guidance for management activities is provided by the Deschutes National Forest Land and Resource Management Plan of 1990 (LRMP) as amended. The LRMP establishes goals, objectives, standards, and guidelines for each specific management area of the Forest, as well as Forest-wide standards and guidelines. Management Areas and associated standards and guidelines are described in Chapter 4 of the LRMP.

M1: Special Interest Area (approximately 4,276 acres; 3% of the project area)
(Deschutes LRMP, p 4-90)
The Davis Lake Special Interest Area primarily includes the shoreline of Davis Lake. The goal of Special Interest Areas is to preserve and provide interpretation of unique geological, biological, and cultural areas for education, scientific, and public enjoyment purposes, where the primary benefiting uses will be for developed and dispersed recreation, research, and education opportunities. The Davis Lake Special Interest Area is Administratively Withdrawn under the NWFP

M3: Bald Eagle (approximately 9,224 acres; 6% of the project area)
(Deschutes LRMP, p 4-94)
Habitat within Bald Eagle Management Areas (BEMAs) is to be managed to enhance the carrying capacity of bald eagles. Objectives include protecting and enhancing nesting habitat and foraging areas, providing suitable nesting sites on a continuing basis, and emphasizing old growth stands with large trees. Currently, the greatest risk to BEMAs in the project area is related to retention of existing nest trees and recruitment of new nesting and roosting habitat.

M6: Wilderness (approximately 18,033 acres; 11% of the project area)
(Deschutes LRMP, p 4-103)
Wilderness on the Deschutes National Forest is intended to feature a natural setting and provide opportunities for solitude, challenge, and inspiration. The wilderness MA will provide recreational, scenic, scientific, educational, conservation, and historic uses.

M8: General Forest (approximately 51,155 acres; 32% of the project area)
(Deschutes LRMP, p 4-117)
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. This MA provides the most opportunities to offset costs and provide products to stimulate the economy.

M9: Scenic Views (approximately 30,400 acres; 19% of the project area)
(Deschutes LRMP, p 4-121)
The project area contains scenic views in the foreground and midground. The goal of scenic views management areas is to provide high quality scenery that represents 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. Currently along Highway 46 (a scenic byway) and County Roads 61 and 62 the large trees that many Forest visitors desire to see are often obscured by dense stands of smaller trees.

M11: Intensive Recreation (approximately 6,979 acres; 4% of the project area)
(Deschutes LRMP, p 4-135)
The goal of this MA is to provide a wide variety of quality outdoor recreation opportunities within a Forest environment where the localized settings may be modified to accommodate large numbers of visitors and where undeveloped recreation opportunities may occur. Within M11, Lava Flow Campground poses a high risk of human-caused fires due to its position on the landscape. The density and high fuel loading in adjacent tree stands contribute to this risk.

M12: Dispersed Recreation (approximately 17,900 acres; 11% of the project area)
(Deschutes LRMP, p. 4-140)
The goal of this MA is to provide a range of quality recreation opportunities in an undeveloped forest environment, although some recreational development may occur.

M15: Old Growth (approximately 4,067 acres; 3% of the project area)
(Deschutes LRMP, p 4-149)
The project area contains seven Old Growth Management Areas (OGMAs) ranging in size from about 200 acres to about 1500 acres. OGMAs 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. Vegetative removal intended to maintain or enhance old growth characteristics is appropriate in this MA (LRMP M15-4, p. 4-150). Prescribed fire (in ponderosa pine and mixed conifer stands) is an acceptable method of fuel reduction in this MA, and other methods may be considered (LRMP M15-19 and 15-20, p. 4-151).

M17: Wild and Scenic River (approximately 1,273 acres; 1% of the project area)
(Deschutes LRMP, p. 4-155)
The goal of this MA is to protect and enhance the outstandingly remarkable values that qualified segments of some streams on the Deschutes National Forest for inclusion in the National Wild and Scenic Rivers System. The portion of Crescent Creek running through the planning area is part of the national Wild and Scenic River System. A specific river management plan has not been completed for this stream and so any proposed management must not preclude meeting river management goals as described in the LRMP Standards and Guidelines (MA 17). Specific river values that warrant protection are defined in the Crescent Creek Resource Assessment. Portions of three treatment units lie within the quarter mile corridor currently defined for Crescent Creek. Vegetation management activities would be allowed if they are oriented to protect the immediate river environment, water quality, scenic quality, fish and wildlife, riparian plant communities, and other values.

Davis Lake and Maklaks Key Elk Areas (1,750 acres)
(Deschutes LRMP, p 4-55)
These are two of the 11 Key Elk Areas (KEAs) on the Deschutes National Forest. KEAs overlap the other management allocations, and represent key habitats in which management activities will provide conditions needed to support certain numbers of summering and wintering elk. Standards and Guidelines address recreation, road, and vegetation management.

Management Indicator Species (MIS)
(Deschutes LRMP, p 4-52 - 4-56)
During the preparation of the Deschutes National Forest Land and Resource Management Plan (USDA 1990), a group of wildlife species were identified as management indicator species (MIS). These species were selected because their welfare could be used as an indicator of other species dependent upon similar habitat conditions. Indicator species can be used to assess the impacts of management actions on a wide range of other wildlife with similar habitat requirements. Standards and Guidelines for all MIS are applicable Forest-wide. Most of these species are not assigned Management Areas; however, MAs have been established for bald eagles, osprey, elk, and mule deer, and management areas for northern spotted owls have been established under the Northwest Forest Plan. Management Indicator Species selected for the Deschutes National Forest are listed in Chapter 3.

Northwest Forest Plan

In 1994, the Record of Decision for Amendments to the Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (Northwest Forest Plan) amended the Deschutes Forest Plan. About 133,565 acres (84%) of the project area are within the area managed under the Northwest Forest Plan. The following Land Allocations occur within the project area:

Late Successional Reserve (approximately 49,120 acres, 31% of the project area)
The objective of Late Successional Reserves is to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl (NWFP, p C-9). Standards and guidelines for LSRs include guidelines for salvage, which is defined as "removal of trees from an area following a stand replacement event" (NWFP, p C-13). The Davis Late Successional Reserve covers approximately 50,000 acres. An LSR Assessment was completed in 1995 and updated in 2006.

Matrix (approximately 41,664 acres; 26% of the project area)
This management allocation consists of federal lands outside the other categories of designated areas. Most timber harvest and other silvicultural activities would be conducted in the matrix where there is a suitable forest land, according to standards and guidelines. Most scheduled timber harvest takes place in the matrix (NWFP, p C-39).

Administratively Withdrawn (approximately 21,882 acres; 14% of the project area)
These are areas identified in current Forest and District Plans or draft plan preferred alternatives that are already being managed to provide benefit to late and old species. Management emphasis precludes scheduled timber harvest (NWFP, p C-29). In the Five Buttes Interface Vegetation Management project area, the Administratively Withdrawn allocation overlays the Davis Lake Special Interest Area, Old Growth Management Areas, and Dispersed and Intensive Recreation areas identified in the Deschutes LRMP.

Congressionally Reserved (approximately 19,086 acres; 12% of the project area)
Congressionally Reserved areas include Wildernesses, Wild and Scenic Rivers, and other federal lands not administered by the Forest Service or BLM. Congressionally Reserved acres within the project area overlay the Diamond Peak Wilderness Area and the Crescent Creek Wild and Scenic River corridor

Riparian Reserve (approximately 800 acres; 4% of the project area)
Riparian Reserves overlay other management allocations and are one of the four components of the Northwest Forest Plan's Aquatic Conservation Strategy (NWFP, p B-12). They are portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply that prohibit and regulate activities that retard or prevent attainment of the Aquatic Conservation Strategy objectives.

Key Watershed (approximately 3,085 acres; 15% of the project area)
The Odell Creek 6th field watershed (1707030204) is a Tier 1 Key Watershed, which contributes directly to the conservation of the threatened bull trout and resident fish populations. As another component of the Aquatic Conservation Strategy, key watersheds provide high quality habitat for at-risk stocks of resident fish species. They are to serve as refugia for maintaining and recovering habitat for these at-risk species. The key watershed designation overlaps other management allocations (NWFP, p B-18).

Current Vegetation and Fuels Management Direction

Guidance for vegetation and fuel management on federal land is found in the following documents:

- The Deschutes National Forest Land and Resource Management Plan, 1990
- The National Fire Plan, Managing the Impacts of Wildfires on Communities and the Environment, September 8, 2000;

- Protecting People and Sustaining Resources in Fire-Adapted Ecosystems, a Cohesive Strategy, October, 2000;
- Wildland and Prescribed Fire Management Policy, January, 2001
- A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment, A 10 Year Comprehensive Strategy, August, 2001;
- Healthy Forest, an Initiative for Wildfire Prevention and Stronger Communities, August 22, 2002.
- Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl, April 1994.

Standards and Guidelines and Best Management Practices for Protection of Soil and Water Quality

The following Deschutes National Forest Standards and Guidelines and Best Management Practices (BMPs) are applicable to the sites in the project area where management activities are proposed. These Standards and Guidelines and BMPs will protect and maintain slope stability and all stream courses will be protected. All instream large woody material will be protected.

Deschutes National Forest Standards and Guidelines

- **SL-1** Soil Productivity "Land management activities shall be planned and conducted to maintain or enhance soil productivity and stability."
- **SL-3** Leave a minimum of 80 percent of an activity area in a condition of acceptable productivity potential for trees and other managed vegetation following land management activities. Including all system roads, landing, spur roads, and skid roads.
- **SL-4** Any sites where this direction cannot be met will require rehabilitation. Applicable Best Management Practices include T-9 and T-11.
- **SL-5** The use of mechanical equipment in sensitive soil areas will be regulated to protect the soil resource. Operations will be restricted to existing trails and roads when feasible.
- **SL-6**, which provides ground cover objectives to minimize accelerated erosion rates on disturbed sites with unprotected soils.

Guidelines (FSM 2500, R-6 supplement 2500-98-1) describe conditions detrimental to soil productivity and outlines Soil Quality Standards to limit the extent of these conditions to less than 20% of an activity area. Detrimental soil conditions are described in the Soil Quality Standards as follows:

- Detrimental soil compaction in volcanic ash/pumice soils is an increase in soil bulk density of 20 percent or greater over the undisturbed level.
- Detrimental puddling occurs when the depth of ruts or imprints is six inches or greater.
- Detrimental displacement is the removal of more than 50 percent of the A horizon from an area greater than 100 (10' x 10') square feet and at least 5 feet in width.
- Detrimental burn damage requires significant color change of the mineral soil surface in an area greater than 100 (10' x 10') square feet to an oxidized reddish color, with the next one-half inch below blackened from organic matter charring as a result of heat conducted from the fire.
- Detrimental erosion requires visual evidence of surface loss over an area greater than 100 (10' x 10') square feet, rills or gullies, and/or water quality degradation from sediment or nutrient enrichment.

Best Management Practices Applied in the Five Buttes Project Area
Best Management Practices were utilized in designing the proposed activities in the Five Buttes project area, with the following requirements in place:

1. Select and design BMPs based on site-specific conditions, technical and economic feasibility, and water quality standards for those waters potentially impacted.
2. Implement and enforce BMPs.
3. Monitor BMPs to ensure correct application and effectiveness as designed in attaining water quality standards.
4. Mitigate to minimize impacts caused by activities when BMPs do not perform as expected.

5. Adjust BMPs when there is evidence that beneficial uses are not protected and water quality standards are not achieved. Evaluate the adequacy of water quality criteria for assuring protection of beneficial uses. Recommend adjustments to water quality standards as appropriate."

Timber Harvest Best Management Practices:

- **T-2 Title:** Timber Harvest Unit Design
  Objective: To ensure that timber harvest unit design will create favorable conditions of water flow, water quality, and fish habitat.
- **T-3 Title:** Use of Erosion Potentials Assessment for Timber Harvest Design.
  Objective: To prevent downstream water quality degradation by the timely identification of areas with high erosion potential and adjustment of harvest unit design.
- **T-4 Title:** Use of Sale Area Maps for Designating Water Quality Protection Needs.
  Objective: To delineate location of protection areas and available water sources as a guide for both the Purchaser and the Sale Administration.
- **T-5 Title:** Limiting the Operating Period of Timber Sale Activities.
  Objective: To ensure that the purchaser conducts operations in a timely manner, within the time period specified in the Timber Sale Contract.
- **T-6 Title:** Protection of Unstable Lands
  Objective: To provide for identification and appropriate management prescription for unstable lands.
- **T-7 Title:** Streamside Management Unit Designation
  Objective: To designate a riparian area or zone along streams and wetlands where prescriptions are made that will minimize potential effects from logging and related land disturbance activities on water quality and beneficial uses.
- **T-8 Title:** Stream Course Protection
  Objectives: (1) To protect the natural flow of streams, (2) to provide unobstructed passage of streamflow and (3) to prevent sediment and pollutants from entering streams.
- **T-10 Title:** Log Landing Location.
  Objective: To located landings in such a way as to minimize creation of hazardous watershed condition.
- **T-12 Title:** Suspended Log Yarding in Timber Harvest.
  Objectives: 1. To protect soils from excessive disturbance, and 2. Maintain the integrity of the Riparian Reserve Areas and other sensitive areas.
- **T-13 Title:** Erosion Prevention and Control Measures During Timber Sale Operations.
  Objective: To ensure the Purchaser's operations shall be conducted to minimize soil erosion.
- **T-14 Title:** Revegetation of Areas Disturbed by Harvest Activities.
  Objective: To establish a vegetation cover on disturbed sites and to prevent erosion and sedimentation.
- **T-15 Title:** Log Landing Erosion Prevention and Control.
  Objective: To reduce the impacts of erosion and subsequent sedimentation, on log landings, by use of mitigation measures.
- **T-18 Title:** Erosion Control Structure Maintenance.
  Objective: To ensure that the constructed erosion control structures are stabilized and working.
- **T-19 Title**: Acceptance of Timber Sale Erosion Control measures Before Sale Closure.
  Objective: To assure the adequacy of required erosion control work on timber sales.
- **T-22 Title:** Modification of the Timber Sale Contract.
  Objective: To modify the Timber Sale Contract if new circumstances or conditions arise and indicate that the timber sale will irreversibly damage soil, water or watershed values.

Road System Best Management Practices:

- **R-1 Title:** Guidelines for the Location and Design of Roads.
  Objective: To located and design roads with minimal resource damage.
- **R-2 Title:** Erosion Control Plan

Objective: To limit and mitigate erosion and sedimentation through effective planning prior to initiation of road constructions activities and through effective contract administration during construction.

- **R-3 Title:** Timing of Construction Activities.
  Objection: To minimize erosion by conducting road construction operation during minimal runoff periods.
- **R-6 Title:** Dispersion of Subsurface Drainage Associated with Roads.
  Objective: To minimize the possibilities of roadbed and cut or fill slope failure and subsequent production of sediment:
- **R-9 Title:** Timely Erosion Control Measures on Incompleted Roads and Stream Crossing.
  Objective: To minimize erosion of and sedimentation from disturbed ground on incomplete projects.
- **R-13 Title:** Diversion of Flow Around Construction Sites
  Objective: (1) To ensure all stream diversion are carefully planned, (2) to minimize downstream sedimentation, (3) to restore stream channels to their natural grade, condition, and alignment as soon as possible.
- **R-14 Title:** Bridge and Culvert Installation and Protection of Fisheries.
  Objective: To minimize sedimentation and turbidity resulting from excavation for in-channel structures.
- **R-18 Title:** Maintance of Roads.
  Objective: To maintain roads in a manner which provides for water quality protection by controlling the placement of waste material, keeping drainage facilities open, and by repairing ruts and failures to reduce sedimentation and erosion.

Prescribe Fire Best Management Practices

- **F-2 Title**: Consideration of Water Quality in Formulating Prescribed Fire Prescriptions.
  Objective: To provide for water quality protection while achieving the management objectives through the use of prescribed fire.
- **F-3 Title:** Protection of Water Quality During Prescribed Fire Operations.
  Objectives: To maintain soil productivity.

Consistency

State and Local Laws

Implementation of all alternatives would be consistent with State and local laws, land use, and environmental policies.

National Environmental Policy Act (NEPA)

NEPA establishes the format and content requirements of environmental analysis and documentation. The entire process of preparing this environmental impact statement was undertaken to comply with NEPA.

National Forest Management Act (NFMA)

The Five Buttes project meets or exceeds standards given in the amended Deschutes Land and Resource Management Plan and the 2007 Davis LSRA. The design criteria common to all alternatives is to retain all existing snags greater than 9 inch in diameter except those that pose a hazard (FEIS, Resource Protection Measures and Project Design Criteria). The Five Buttes project seeks to manage snags and down wood habitat at various densities across the landscape utilizing a reference condition based on the historical range of variability as described in the FEIS (Chapter 3, Snags and Down Wood Habitat). Managing within the historical range would provide for those species that survived to the present with those densities meeting NFMA objectives. The best available science on dead wood relationships to wildlife habitat was used in the form of DecAID, and local data sets. Effectiveness monitoring is ongoing in terms of research and DecAID will be continually updated with the new science as it becomes available. As this information is updated management will adapt to the new information. This project demonstrates the Forest Service commitment to adaptive management to meet the needs of wildlife. NEPA requires a disclosure of effects of federal actions. The direct, indirect and cumulative effects of implementation of the alternatives on snag habitat are disclosed in Chapter 3 of the FEIS. The effects analysis is based on habitat needs determined by research.

National Historic Preservation Act

A cultural resource inventory has been completed for the project area. On June 09, 2006, the Deschutes National Forest completed the "Project Review for Heritage Resources under the Terms of the 2004 Programmatic Agreement" with the Oregon State Historic Preservation Officer (SHPO). The activities in the selected alternative have been designed to have No Effect or No Adverse Effect to cultural resource sites through both protection and avoidance.

Clean Water Act

Action alternatives follow State of Oregon requirements in accordance with the Clean Water Act for protection of waters. Application of Best Management Practices (BMPs) are selected and designed on site-specific conditions for waters potentially affected in the Five Buttes Project area. The interdisciplinary team has reviewed and incorporated applicable BMP water quality objectives in the design of alternatives and their mitigation measures. Standards and Guidelines for the Northwest Forest Plan (Aquatic Conservation Strategy) and the Inland Native Fish Strategy where developed (in part) to maintain and restore aquatic ecosystems for dependent species. These standards and guidelines afford the same or greater protection of stream courses as direction found in the 1988 USDA publication "General Water Quality – Best Management Practices." Protection of water quality is also provided by incorporation of BMPs in timber sale contract provisions, Oregon Department of Environmental Quality oversight for water quality monitoring in the East and West Davis potable water wells in the developed sites, and direction for road maintenance and reconstruction.

Clean Air Act

The selected alternative is designed to be consistent with the Clean Air Act. The Oregon Department of Environmental Quality (DEQ) is responsible for assuring compliance with the Clean Air Act. In 1994, the Forest Service, in cooperation with the DEQ, the Oregon Department of Forestry and the Bureau of Land Management, signed a Memorandum of Understanding (MOU) to establish a framework for implementing an air quality program in Northeast Oregon. All prescribed burning is coordinated with the DEQ through the State of Oregon smoke management program. All prescribed fire activites authorized by this Record of Decision would be conducted in compliance with the State of Oregon Smoke Management System and would meet smoke management objectives for total emissions.

Deschutes LRMP

Soils

Under Alternative B and C, the amount of disturbed soil associated with log landings and skid trails would be limited to the minimum necessary to achieve management objectives. Project design elements, management requirements, and Best Management Practices (BMPs) built into alternative are all designed to avoid or minimize potentially adverse impacts to the soil resource. Compliance with LRMP standard and guideline SL-5 (LRMP 4-70) is addressed by using advanced logging systems on slopes greater than 30 percent, restricting numbers of equipment passes, using existing harvest transportation systems, and seasonal restrictions on wet areas. 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 would be implemented during and following project activities to meet the stated objectives for protecting and maintaining soil productivity. The Ranger District and Forest has had success using these practices and is assured they can be implemented by contract provision.

Soil restoration treatments would be applied to rectify impacts by reducing the amount of detrimentally compacted soil dedicated to specific management areas of the proposed activity areas. Restoration treatments, such as subsoiling, are designed to promote maintenance or enhancement of soil quality. These conservation practices comply with LRMP interpretations of Forest-wide standards and guidelines SL-3 and SL-4 (Final Interpretations, Document 96-01, Soil Productivity, 1996), and Regional policy (FSM 2520, R-6 Supplement No. 2500-98-1) for planning and implementing management activities.

Under Alternative B, the percentages of detrimental soil conditions would increase above existing conditions by approximately 12 percent over all the activity areas. All activies would be consistent with Forest and Regional standards and guidelines for soil productivity. It is expected that enough fallen trees and other organic materials would be available after harvest activities to meet recommended guidelines for coarse woody debris retention in the short-term. Therefore, the proposed actions comply with Regional and LRMP standards and guidelines for maintaining soil productivity within all proposed activity areas.

Under Alternative C, the percentages of detrimental soil conditions would increase above existing conditions by approximately 3.2 percent over all activity areas. All activies would be consistent with Forest and Regional standards and guidelines for soil productivity. It is expected that enough fallen trees and other organic materials would be available after harvest activities to meet recommended guidelines for coarse woody debris retention in the short-term. Therefore, the proposed actions comply with Regional and LRMP standards and guidelines for maintaining soil productivity within all proposed activity areas.

Davis Lake Special Interest Area
The Deschutes Forest Plan designates 16,900 acres across the Forest as Special Interest Areas with the goal of preserving and providing interpretation of unique geological, biological, and cultural areas for education, scientific, and public enjoyment (LRMP page 4-90). The Davis Lake Special Interest Area (SIA) is approximately 4,276 acres and consists of the lake and surrounding shoreline. Davis Lake SIA is included in Group 1, where protecting the vegetation is an important goal (LRMP page 4-91). Within and adjacent to the SIA are several bald eagle nest sites. Three project units (35.4 acres) overlap the SIA.

Table A-1 Acres Within Davis Lake Special Interest Area by Alternative and Activity

Unit #	Alt. A	Alt. B	Alt. C
265	0	.7	.7
756	0	7.4	7.4
757	0	27.3	27.3
Total Acres*	0	35.4	35.4

*These figures do not include a reduction for 15-20% retention areas.

Applicable Forest Plan Standards and Guidelines include:
M1-4: “Special Interest Management Areas will provide the recreational activity, setting, and experience opportunities of the Recreational Opportunity Spectrum of Roaded Natural….”
M1-6: “Timber harvesting and vegetative management will be allowed in catastrophic situations and when necessary to meet objectives of the Special Interest Management Area” (LRMP page 4-90);
M1-9: “Manipulation of the game and fish habitat will be allowed as long as it maintains a natural appearance and does not conflict with the purpose and objectives of the area;
M1-10: “Emphasis will be on habitat improvement and watchable wildlife;
M1-18: “Fuels treatment methods should emphasize maintenance of the natural characteristics of the area. Fuel loadings should be low enough to eliminate the possibility of high intensity fires while maintaining the natural characteristics of the area” (LRMP 4-91); and
M1-20: “Follow Forest-wide Standards and Guidelines for Forest Health;
WL-1: “Seasonal restrictions as described in Table 2-1 will be applied to known northern bald eagle nests”

Most overstory ponderosa pine trees have dwarf mistletoe and/or *Elytroderma deformans*, which is a needle blight. The crowns show decreased vigor, with yellowish foliage, brooming, and dead limbs scattered throughout the crown canopy. Bark beetle activity is common in the infected trees, apparently being the final cause of death. Very few of the large ponderosa pine along the shoreline appear to have a healthy crown (ie. dark green foliage), little or no brooms, needles that persist for 3-4 years, and evidence of vigorous growth.

Needle blight results in needle loss and death of branch cambium. Severe infections, such as seen at Davis Lake, result in growth loss and potentially deformation of the entire tree canopy. The infection at these levels may weaken the trees, predisposing them to attack by bark beetles or may kill the tree outright (Goheen et al, 2006). *Elytroderma* is common in moist areas such as the shorelines of Davis Lake.

The understory at Davis Lake has experienced a shift in the understory species due to passive management and fire exclusion. Instead of more fire resistant species which is characteristic for the area, the understory comprises lodgepole pine and true fir. This situation limits the establishment and growth of ponderosa pine and Douglas-fir regeneration, which is needed to provide replacement trees suitable as nesting and roosting locations for the northern bald eagle. Following reconnaissance of the Davis Lake area, local experts in entomology and tree pathology estimated that approximately 1-2 large trees per year within the campground will succumb to insects and disease.

Active vegetative management in Alternatives B and C includes thinning of the understory trees to promote the growth and maintenance of the largest trees.

Within the Riparian Reserve, which also overlaps the SIA and the campground at Lava Flow, use of mechanized equipment would be restricted to hardened surfaces. Within the Riparian Reserve in units 265, 756 and 757, no off-road travel is allowed. Commercial harvest activities would utilize line to pull material to road 4600-850. Also, all logs would be decked on the road or in a designated area directly above the road on a hardened surface. No landings would be located within the reserve. All post-sale activities would be accomplished by handpiling and disposal of piles. Seasonal restrictions within the campground maintain the Recreational Opportunity Spectrum of Roaded Natural.

Activities are consistent with the SIA by maintaining the Recreational Opportunity Spectrum of Roaded Natural, and preserving future options for the primary benefiting use, which is developed and dispersed recreation. The largest trees characteristic of the area would remain. Vegetation manipulation of the area would benefit the bald eagle by reducing competition to the existing large trees, potentially keeping them alive and standing for a longer timeframe. Project Design Fetures include seasonal restrictions near bald eagle nests during periods of sensitivity.

M15: Old Growth (Deschutes LRMP, p 4-149)
The project area overlaps two Old Growth Management Areas (OGMAs). In unit 810, the prescription calls for a “light thin” maintaining the largest trees, with a goal to maintain uneven-aged condition where it exists on 144 acres. This has been identified as a strategic area for modifying fire behavior to reduce the risk to an adjacent northern spotted owl home range. The active management planned in this area would collectively reduce the risk of wildfire severely impacting the connected late-successional forested stands from above Odell Lake easterly along the southern flanks of Maklaks Mountain then running north parallel to the roadless area. Advanced harvest systems such as skyline or helicopter would be utilized. This area is within Management Strategy Areas K and J within the Davis Late-Successional Reserve where the emphasis species are spotted owls and eagles. The Deschutes Forest Plan designates this area for the pine marten and, based on a similar prescription on an adjacent harvest unit from the Royal timber sale (Seven Buttes EA, 1996), marten habitat capability would be retained. Although not a focal species for the MSAs, American marten benefit from habitat provided for the black-backed woodpecker, riparian associated species, and connectivity corridors for northern spotted owls, all of which are focal species in the two Management Strategy Areas.

Unit 690 has 10 acres that overlap a 970-acre Old Growth Management Area along Crescent Creek. It also has been identified as a strategic location for fire behavior modification. The prescriptions for this stand are for commercial thinning with a single story objective. Although a short segment of temporary road construction is proposed, it would be outside the Old Growth boundary. Ground based harvest systems would be utilized. A small portion of the unit is on 30% or greater slopes; these areas would either be avoided or activities on them would be implemented using low-impact methods described in the “Soils” section of Chapter 3. Goshawk is the focal species identified for this area. The FEIS discloses the effects of the Five Buttes project and removal of 8 percent of the potential nesting goshawk habitat. Proposed activities would likely have little long-term effect on goshawks. Nesting habitat would remain well distributed across the entire project area with the exception of the Davis Fire area. Nesting and foraging habitat is provided in this 970 acre OGMA and thinning as well as post-sale activities would not affect the ability of the OGMA to function as designated for goshawks.

Unit 692 is prescribed for “fuels only” activities that include small diameter thinning with an upper diameter limit of 6 inches on 85 acres. Utilization of wood products is also prescribed and the existing road system is adequate to facilitate this. Prescribed underburning would be utilized. The effects to the goshawk are as discussed for unit 690. All riparian resources would be avoided.

Planned activities are consistent with the Forest Plan (MA 15) by providing habitat because they do not detract from habitat for the species for which each OGMA was designated (i.e. American marten and northern goshawk). The activities represent landscape ecology by maintaining diversity and existing plant associations throughout and contributing to the biodiversity on the forest. The focus is to keep the largest trees on site. Vegetative removal intended to maintain or enhance old growth characteristics is appropriate in this MA (LRMP M15-4, p. 4-150). Prescribed fire (in ponderosa pine and mixed conifer stands) is an acceptable method of fuel reduction in this MA, and other methods may be considered (LRMP M15-19 and 15-20, p. 4-151).

Old growth management plans have been prepared and are available at the Crescent Ranger District.

Wildlife

<u>Goshawk</u>
There would be no timber harvest or burning conducted within known northern goshawk nest stands. Mitigation has been provided to prohibit disturbance to nesting pairs located in the project area. Nest stands would also be available in the 15 percent retention blocks and untreated stands across the Five Buttes project area. If new occupied nests are discovered during project implementation Forest Plan standards and guidelines would be met. The project is consistent with the Forest Plan.

<u>Osprey</u>
There would be no removal of existing nest trees. Thinning prescriptions would primarily remove trees less than 21 inches in diameter and maintain the largest trees in the stands as potential nesting habitat. Mitigation measures would protect active nest sites through seasonal restrictions. The project is consistent with the Forest Plan.

<u>Great Blue Heron</u>
There would be no removal of existing nest trees. The green tree thinning prescription would primarily remove trees less than 21 inches in diameter and maintain the largest in the stands as potential nesting habitat. Emphasis is placed on providing large ponderosa pine (WL-36). Mitigation measures would protect active rookeries through seasonal restrictions on disturbing activities; however, there is no activity proposed within ¼ mile of a known rookery. The project is consistent with the Forest Plan.

<u>Golden Eagle</u>
There are no known golded eagle nests in the project area. There would be no removal of existing nest trees since none are known to occur. The green tree thinning prescription would primarily remove trees less than 21 inches in diameter and maintain the largest in the stands as potential nesting habitat. Restrictions for disturbance are included in mitigation measures. The project is consistent with the Forest Plan.

Red-tailed Hawk
There would be no removal of existing nest trees. The green tree thinning prescription would primarily remove trees less than 21 inches in diameter and maintain the largest in the stands as potential nesting habitat. Active nest sites would be protected (WL-2, WL-3); restrictions on disturbance are included in mitigation measures. The project is consistent with the Forest Plan.

Sharp-shinned and Cooper's hawks
There would be no timber harvest or burning conducted within known or sharp-shinned or Cooper's hawk nest stands; the one known Cooper's hawk nests in the project area is located greater than one mile from the nearest proposed activity. Mitigation has been provided to prohibit disturbance to nesting pairs if located in the project area; activie nest sites would be protected (WL-33). The Five Buttes project would be consistent with the Deschutes LRMP.

Northwest Forest Plan Standards and Guidelines

Basis for the Review: Silviculture, risk reduction, and salvage treatments in LSRs are subject to REO review under the NWFP S&Gs (C-12-15). As required by the NWFP S&Gs (C-11), the Forest prepared a Late-Successional Reserve Assessment (LSRA). The Davis LSRA, which encompasses most of the Five Buttes Project, was recently revised, reviewed and found to be consistent under the NWFP S&Gs (C-11).

The Five Buttes project is consistent with the 2001 Record of Decision for the Amendment to the Protection Buffer and other Mitigation Measures, Standards and Guidelines (USDA and USDI 200, page 37) because:

Bats
The Five Buttes project is consistent with the standards and guidelines for the protection of bat species by:
- Conducting searches – There are no known caves, mines, or wooden bridges within the project area to search and buildings that may provide roosting habitat are scarce on the District. Non-destructive searches are not feasible for snags, rock outcroppings and pressure ridges. Therefore, measures and project design criteria for 15% retention within units, retention of snags, and avoidance of rock outcroppings and pressure ridges have been incorporated.
- Identifying likely bat use – existing condition and discussions in the consequences section identifies likely seasonal use and biological requirements.
- Identifying conditions which specific measures will be applied to project plans – see Resource Protection Measures in Chapter 2 of this EIS.
- Establishing conditions under which specific mitigation measures will be applied – seasonal restrictions on prescribed burning have been applied (see Resource Protection Measures in Chapter 2 of this EIS).
- Describing various no-harvest buffer widths to fit specific habitat conditions – rock outcroppings and lava pressure ridges are generally small and numerous within the project area. Directional felling and restrictions for mechanized equipment would protect these potential roosting and maternity areas. Large areas near the east side of Davis Lake associated with special habitat would have up to a tree length for protection, determined by the District biologist.

Great gray owl
Specific mitigation measures for the great gray owl include a no-harvest buffer of 300 feet around meadows and natural openings, and a ¼ mile protection zone around known nest sites.

Survey and Manage Species: Bryophytes, Fungi, Lichens and Vascular Plants
Only one site for a botanical Survey and Manage species, *Tritomaria exsectiformis,* is located in or near a proposed unit. This site is located in Unit 678 (Alternative C), where the species occurs on Class III and IV decayed wood in the perennial, low-flow channel of Dell Spring. A 100-foot buffer would be maintained between activities and the existing population to protect and maintain the microsite. Therefore, activities associated with the Five Buttes project would be consistent with the Northwest Forest Plan.

White-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl **(Northwest Forest Plan Implementation Strategy AND Deschutes National Forest Wildlife Tree and Log Strategy)**

The Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer and other Mitigation measures Standards and Guidelines (January 2001) on Standards and Guidelines page 34 states:

> "Snags over 20 inches dbh may be marked for cutting only after retaining the best available snags (considering size, longevity, etc.) in sufficient numbers to meet 100 percent of the potential population levels of these four species."

The 2001 amendment puts those levels for white-headed woodpeckers at 0.6 snags per acre at least 15 inch dbh, black-backed woodpecker at 0.12 snags per acre at least 17 inch dbh. Meeting standards for white-headed woodpecker was presumed in the amendment to provide for the pygmy nuthatch since they share the same habitat.

Flammulated owls utilize cavities occurring naturally or created by woodpeckers. The 2001 amendment assumed that standards and guidelines for snags and green-tree replacements for woodpeckers and other primary cavity nesting species in existing National Land and resource Management Plans would provide for flammulated owls. The 2001 amendment also states that provision must be additive, "provisions of snags for other cavity-nesting species, including primary cavity nesters, must be added to the requirements for these two woodpecker species (black-backed and white-headed woodpeckers)."
The Deschutes National Forest developed their Wildlife Tree and Log Implementation Strategy to provide for various levels of percent populations levels. It includes adding the various woodpeckers together by habitat types. These standards call for 3.87 snags/acre in ponderosa pine, and 4.05 snags per acre in mixed conifer (adding in black-backed from NWFP), with 0.6 snags/acre greater than 20 inches dbh.

The action alternatives do not remove any snags over 9 inches. Only those that pose a occupational hazard or public danger within units and along haul routes would be felled and retained for down wood material. Monitoring by harvest inspectors show approximately 1% of snags are lost through harvest. The project is consistent with the Deschutes National Forest Wildlife Tree and Log Strategy and NWFP implementation strategy.

Beneficial to development of late successional conditions (C-12)
The objective is to accelerate development of late successional conditions while making conifers in the future stand less susceptible to natural disturbances (C-12). Desired Future Condition for the Five Buttes area is to have habitat conditions where at least 60 percent of the remaining unburned area is moving toward a climatic-climax condition through time maintaining at least 25 percent in NRF habitat. This is a landscape-scale strategy to cycle in and out of NRF habitat while maintaining the large tree component throughout the cycle. The cycling from non-NRF to NRF across the landscape over time would reduce risk to large and contiguous blocks of habitat disturbance processes. The objective is to provide habitat for the spotted owl, which is relatively the most vulnerable to disturbance processes. The Davis LSRA also provides habitat management direction for other late-successional species such as white-headed and black-backed woodpeckers and flammulated owls.

Part of the landscape scale risk reduction strategy would be to incorporate single-story late-seral stands created in key locations. These would serve for the bald eagle and would function as dispersal spotted owl habitat for the foreseeable future. These activities would occur outside known spotted owl home ranges. Discussion of the effects of the alternatives on Threatened and Endangered species and their habitat begins on page 97 of this FEIS.

Treatments should be designed to provide effective fuel breaks wherever possible (C-13)
Alternatives B and C emphasize reducing the likelihood and size of another large fire event like the Davis Fire of 2003, and the protection of key assets such as spotted owl home ranges, bald eagle habitat, and late- and old-structured stands. Alternative C would strategically place fuels treatments on the landscape to coordinate with past treatments to create and maintain fuel modifications around identified habitats. These

"Fire Behavior Modification Areas" would be maintained through time. As a result of more effective protection, some important habitat for the Northern spotted owl, such as Nesting, Roosting and Foraging (NRF) and dispersal habitat is more likely to remain on the landscape with a lower risk of loss from a large scale disturbance processes. Management activities would take place on approximately 5,522 acres (Alt. B) or 7,797 acres (Alt. C) and would include:

- Thin to create or maintain single story stands and culture large trees;
- Thin to reduce stand competition but retain multi-story canopy and large trees;
- Thin to reduce stand competition, culture large trees and retain a combination of single story and multi-story canopy.

While risk-reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if:

(1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat, (C12,13)

The average burn probability decreased significantly from the no action alternative (A) over the entire analysis area under the treatment scenarios in B and C, with alternative C showing the most reduction (Figures 3-18 and 3-19). The highest burn probabilities were clustered in three major areas. Expected loss of owl habitat was substantially reduced by active management; the most reduction was seen in Alternative C. For pixels inside spotted owl habitat, the average burn probability for Alternative C was 40% less than alternative A. Thus, the risk was reduced by 40% for Alternative C over the no action alternative. Both action alternatives moved the spotted owl habitat areas with the highest burn probabilities to much lower burn probabilities.

In Alternative B, active management in strategic locations had an effect on minimum travel time and overall size of a fire, however, there was limited success in avoid the burning of multiple owl home ranges. In Alternative C, fires appear to have the least travel times and protect owl home ranges the best.

(2) the activities are clearly needed to reduce risks, and (C12,13)

The project area also includes the 21,000-acre Davis Fire of 2003; many thousands of acres of late-successional habitat and large trees were lost in this fire. Vegetation management activities are needed because vegetative conditions in the project area are such that risk of more large-scale loss of large trees and late-structure forest is extremely high. For instance, existing overstory ponderosa pine and Douglas-fir can not compete with true firs in overcrowded conditions. The trend in these forests is for the large-tree component to decline due to overcrowding from and competition with younger, smaller trees.

(3) the activities will not prevent the Late-Successional Reserves from playing an effective role in the objectives for which they were established. (C12,13)

In the past five years across the forest approximately 16,654 acres of NRF habitat has been lost mostly due to wildfires on the Crescent and Sisters Ranger District (Davis, B&B, and Link Fires).

Connectivity between LSRs is necessary to provide demographic viability and genetic diversity should stochastic events (e.g., fire, insect, disease, wind storms, inclement weather) significantly reduce the population in any individual LSR. The NFWP, in theory, provides for connectivity between each LSRs by utilizing Riparian Reserves, Administratively Withdrawn Areas, Wild and Scenic River corridors, 15 percent live tree retention areas, and 100-acre owl activity centers for those sites that are outside of the LSRs. This theory may be valid for westside conditions, but not for the dry eastside forests found on the Deschutes NF, where riparian areas are lacking or widely dispersed, and Wild and Scenic River corridors are limited. Generally, dispersal habitat across the Deschutes NF is fragmented by roads, timber harvest units, or by areas that have been burned or defoliated by insects or disease. The Davis Fire has caused further fragmentation to the Davis Late Successional Reserve and adjacent reserves.

A main goal within the LSR is to minimize the likelihood of an active crown fire event, or if such an event occurs, timber stands would not be in a condition that would sustain the event over large areas of the landscape. Fuels risk reduction activities are largely based upon spotted owl habitat suitability and a protection strategy as appropriate for the plant association group. For example, more thinning and prescribed burning may occur in ponderosa pine sites, where there is no Nesting, Roosting, Foraging (NRF) habitat. In mixed conifer sites, thinning and fuels treatments would vary dependent upon the importance of the stand for NRF and the strategic position on the landscape. If the NRF habitat is within an owl home range, then fuels treatments would be less intense or not done at all. If the NRF is outside a home range and within an area that falls within the protection strategy, the treatment intensity would correspond to the vegetation type and crown fire potential. Lodgepole pine would be allowed to continue natural disturbance processes in most areas. If stands are strategically located in an area that is important from a fuels reduction perspective, prescriptions would be used that would retain owl dispersal characteristics. In Management Strategy Areas (MSAs) where the emphasis species is dependent upon lodgepole pine snags and down wood, many of these stands would continue with natural succession. Very little high elevation mountain hemlock density management would be needed. More information on suppression strategy and fuels prescriptions can be found in Chapter 3.

Taking an active management approach now would accelerate development of the most limiting attributes, including large trees and NRF habitat. Proposed activities would not only reduce risk of large-scale disturbance, but would accelerate the ability of the Davis LSR to play a role for which late-successional reserves were established.

Aquatic Conservation Strategy

"The intent is to ensure that a decision maker must find that the proposed management activity is consistent with the Aquatic Conservation Strategy objectives. The decision maker will use the results of watershed analysis to support the finding. In order to make the finding that a project or management action 'meets' or 'does not prevent attainment' of the Aquatic Conservation Strategy objectives, the analysis must include a description of the existing condition, a description of the range of natural variability of the important physical and biological components of a given watershed, and how the proposed project or management action maintains the existing condition or moves it within the range of natural variability" (1994 ROD, Attachment B, p. B-10).

The existing condition discussion, including biological and physical components of the riparian condition, is found in soil quality, hydrology, and fisheries sections in Chapter 3 of this FEIS. These components are closely associated with the vegetative condition. Additional discussion on the transportation system, Best Management Practices, and effects on Riparian Reserves is also found in the FEIS (Chapter 3, Appendices A and B).

In summary, this active management would maintain the components of the nine objectives. The 1999 Odell Watershed Analysis specifies the objectives for Davis Lake as "Vegetative treatments should be designed to promote development of large tree dominated stands, late successional forest, and bald eagle habitat and may include prescribed fire and thinning" (page 157, Recommendations)." Retention of large trees on the landscape while reducing risk of wide-scale disturbance processes is the goal for this project. This condition would more closely follow the reference condition, or Historic Range of Variability as defined "…vegetation, disturbance regimes, and environmental conditions that are minimally altered by 20th century management activities, but may reflect patterns or conditions resulting from interactions of aboriginal peoples with their environments." The Watershed Analysis (page 31) identifies floodplain function and riparian health as in "excellent" condition over 99 percent of the watershed (Odell WA, 31). Active management under Alternatives B and C would not change that condition, including the portion of Odell Creek that burned in the Davis Fire. However, it identified the following trends in vegetative structure. The three primary areas of concern for the conifer vegetation are:

- Retention of large trees on the landscape.
- Development of replacement trees as large trees inevitably are lost from the landscape.
- Resilience of forest stands to disturbance agents (insects and fire).

Proposed activities within the Five Buttes Project were developed to address these trends.

The only activities associated with the Five Buttes Project that are within Riparian Reserves are: 1) understory commercial thinning, handpiling, and disposal of forest residue on 53 acres at Davis Lake; and

2) hauling and maintenance on up to 4.2 miles of road in Alternative B. None of these activities are within areas typically associated with riparian vegetation.

The project follows the Aquatic Conservation Strategy by meeting the nine objectives through an interdisciplinary process, as described in the section titled "Hydrology" in this FEIS.

Davis Late Successional Reserve Analysis and the Northwest Forest Plan

The Regional Ecosystem Office (REO) interagency Late-Successional Reserve (LSR) Work Group has reviewed the April 2007 revision of the Davis Late Successional Reserve Assessment (LSRA). The REO found the April 2007 Davis LSRA provides a sufficient framework and context for future projects and activities within the LSR. This LSRA replaces the 1996 Davis LSRA.

As a result of the Davis Fire and other wide-scale disturbance events in LSRs on the Forest, the Davis LSRA includes a strategy for altering fire behavior in key places on the landscape, using SPOTS (strategic placement of treatments). Where management activities are located on the landscape is more important than how much acreage is treated. Strategic placement of treatments allows northern spotted owl Nesting, Roosting, and Foraging habitat (which is very vulnerable on eastside forests), as well as other species habitat that depends on dense forest conditions, to be cycled and retained on the landscape over time. This strategy recognizes these conditions will shift around the landscape as some areas fade out due to disturbance events, and as other areas grow back into conditions that will support species that are dependent upon late-successional habitat.

The overall goal of the Five Buttes project is to promote and retain the largest trees on the landscape; the project achieves this by implementing the strategy identified in the LSRA. Some areas in the drier sites are better suited to be managed for species such as the white-headed woodpecker, which requires large ponderosa pine-dominated stands. These drier sites are the strategic areas that were selected to reduce risk on a landscape scale of a wildfire burning into multiple northern spotted owl home ranges.

The Five Buttes project would not appreciably change the current snag recruitment process or down logs, except in unit #370 where some salvage of down lodgepole pine would occur to reduce wildfire risk to Maklaks Mountain. Additional snags may be felled as necessary for occupational safety.

Also, based on the interagency REO LSR Work Group's review and recommendations, the REO concurs with the Deschutes National Forest's conclusion that vegetation management activities in the Five Buttes project area on the Crescent Ranger District are consistent with the Northwest Forest Plan. The basis for the review was: Silviculture, risk reduction, and salvage treatments in LSRs are subject to REO review under the NWFP S&Gs (C-12-15). As required by the NWFP S&Gs (C-11), the Forest prepared a Late-Successional Reserve Assessment (LSRA). The Davis LSRA, which encompasses much of the Five Buttes project, was recently revised, reviewed, and found to be consistent under the NWFP S&Gs (C-11).

Spotted Owl

Consistency with the Programmatic Biological Assessment

The Five Buttes project does not comply with all PDCs provided in the 2006-2009 Programmatic Biological Assessment for northern spotted owls. More specifically, project activities will remove, downgrade, or degrade primary constituent elements of northern spotted owl critical habitat including stands currently functioning as nesting, roosting, foraging and dispersal habitat (PDC Criteria B.1.(a), (b), (c), and (d). The project also does not maintain all existing NRF habitat for connectivity (PDC C.4). Because the project does not comply with all PDCs, formal consultation with the USFWS is required.

Consistency with Direction in Critical Habitat
Treatments planned in the Critical Habitat Unit (CHU OR-7) do not preclude options to provide dispersal habitat where capable. If it is dispersal habitat prior to active management, it will remain after implementation. All other effects in the CHU are displayed in Chapter 3.

Davis LSR Assessment and Odell Pilot Watershed Analysis

The Five Buttes project is consistent with the recommendations for Management Strategy Areas in the 2007 updated Davis Late-Successional Reserve Assessment and the Odell Pilot Watershed Analysis (update completed in 1999).

Regional Forester's Eastside Forest Plan Amendment #2 (Eastside Screens)

No timber sale activities are proposed east of the Northwest Forest Plan area; therefore the eastside screens do not apply.

FEIS for Managing Competing and Unwanted Vegetation and the Mediated Agreement

Analysis of the Five Buttes Vegetation Management Project follows the five-step process identified in the FEIS for Managing Competing and Unwanted Vegetation. This includes:

- Site specific analysis including existing condition and effects of project implementation (see Invasive Plant Report).
- Selection of a Strategy (with preference for the prevention strategy per the Mediated Agreement).
- Project Design incorporating measures applicable to the strategy selected.
- Implementation.
- Monitoring to ensure that planned accomplishments were completed and effective.

Exhibit A of the Mediated Agreement requires that the following six questions be addressed:

- What is the nature and the role of associated vegetation?
- Do conditions exist that favor the presence of competing and unwanted vegetation?
- If conditions exist that favor the presence of competing and unwanted vegetation, have past management actions exacerbated the situation?
- Do natural controls exist on the site?
- Can management actions be taken that either encourage natural controls or help avoid the conditions that favor the presence of competing and unwanted vegetation?
- Is it feasible to undertake the management actions, and if not, why? If undertaken, are impacts on other Forest Service objectives and goals acceptable?

Prevention Strategies and Prevention Strategy Evaluation

Prevention Strategies

The following prevention strategies and tactics apply to the Five Buttes Vegetation Management Project:

- Invasive plant management will be considered in NEPA planning activities where ground-disturbance is likely. Prevention will be addressed as part of the management constraints or requirements as well as being an evaluation criteria where appropriate (see section titled "Invasive Plants" in Chapter 3 of this FEIS).
- Where appropriate, NEPA analysis will consider the costs associated with preventing the occurrence or spread of invasive plants.
- Project level personnel should be able to recognize invasive plants occurring on or adjacent to their districts and should be able to recognize potential invaders.
- Project or contract maps will show currently inventoried high-priority invasive plant infestations as a means of aiding in avoidance or monitoring.

- Commensurate with anticipated risk of invasion or spread of invasive plants, ground-disturbing activities may need to include both a pre- and one or more post-project surveys to document pre-existing infestations and to evaluate the effects of the project on invasive plants. The intensity and frequency of surveys should vary according to the risk/probability of the project affecting or being affected by invasive plant infestations. This risk should be evaluated during initial or periodic project planning and should be coordinated with the District noxious weed coordinator. Where monitoring is needed, it should be planned to continue for at least five years on a scheduled basis (see section titled "Monitoring" in Chapter 2 of this FEIS).
- Where existing inventories or pre-project inventories indicate that an infestation occurs on or near a ground-disturbing project, the project will be designed, in coordination with the District invasive plant coordinator, to plan for the long-term management of the infestation and to prevent the spread of the infestation off site.
- Depending on an assessment of the potential risk for introduction or spread of invasive plants, this will often involve designing projects (including implementing contract, permits, etc.) so that the operator will not be working on high risk areas during the time when the invasive plants are capable of being spread by the operation.
- If an assessment of risk conducted by the Forest Officer in charge of a project, and in full coordination with the District noxious weed coordinator, indicates a high risk of introduction or spread of invasive plants through transport by logging, road construction or other ground disturbing equipment, and unless otherwise agreed to in writing, all equipment to be operated on a project area will be cleaned in a manner sufficient to prevent invasive plants from being carried on to the project area. This requirement does not apply to passenger vehicles or other equipment used exclusively on roads. Cleaning will be inspected and approved by authorized personnel working in conjunction with the specific project (see section titled "Mitigation Measures" in Chapter 2 of this FEIS).
- Where timber purchasers' log yards or other contractors' equipment yards are known or suspected to be infested by invasive plants, encourage their cleanup through working with the purchaser/contractor and the County Weed Board.

Prevention Strategy Evaluation
Exhibit A to the Mediated Agreement requires that six questions be addressed in the evaluation of the prevention strategy. These are:

1. What is the nature and role of associated vegetation?
   Relative to noxious weeds, the role of associated vegetation is to stabilize soil and utilize resources including nutrients, water, and space in order to deter invasion by opportunistic exotic plant species.

2. Do conditions exist that favor the presence of competing and unwanted vegetation?
   With implementation of the action alternatives conditions will exist that will increase the risk of the site to invasion by invasive plant propagules and will decrease the ability of site factors to deter invasive plant infestation.

3. If conditions exist that favor the presence of competing and unwanted vegetation, have past management actions exacerbated the situation?
   Past timber harvest, road management activities, and other ground-disturbing activities have provided environments for invasive plant species establishment, vectors for invasive plant propagule dispersal, and infestations to provide propagule source material.

   Documented invasive plant sites are located primarily along roads where disturbance has occurred. Vehicles are a vector for the spread of invasive plants. Past road building activity has allowed vehicles access into the area. The disturbed ground along roads provides a seed bed for invasive plants to become established. Invasive plants generally invade disturbed sites and will tend to interrupt the successional stages of site development.

4. Do natural controls exist on the site?
   Where undisturbed vegetation currently exists on the project site, there are some limited natural controls that exist. Through the utilization of resources including nutrients, water, and space existing vegetation would be expected to deter (although not entirely exclude) invasion by invasive plant species.

5. Can management actions be taken that either encourage natural controls or help avoid the conditions that favor the presence of competing and unwanted vegetation?
   There are many actions that may be taken that can both encourage natural controls or help avoid conditions that favor the invasion and establishment of invasive plants. The actions and measures, which have been determined to be feasible and effective are listed in the Project Design Features section of the Invasive Plant Report.

6. Is it feasible to undertake the management actions, and if not, why? If undertaken, are impacts on other Forest Service objectives and goals acceptable?
   The management actions proposed in the Five Buttes project have been determined to be feasible to undertake.

APPENDIX B - UNIT-SPECIFIC DESCRIPTION OF ALTERNATIVES AND IMPLEMENTATION MEASURES

Table B-1. Relationship of each unit to the Purpose and Need of the Five Buttes Project.

Alt. B Units	Alt. C Units	Units in both Alt. B and C	Strategically reduce fuel loadings and forest vegetation density so as to lessen the risk that disturbance events such as insect, disease, and wildfire will lead to large-scale loss of forest.	Contribute to the local and regional economies by providing timber and other wood fiber products.
	5		X	X
10			X	X
25			X	X
	65		X	X
	72		X	X
	74		X	X
		75	X	X
	76		X	X
		80	X	X
		85	X	X
105			X	X
		120	X	X
125			X	X
130			X	X
	135		X	X
	145		X	X
		155	X	X
		225	X	X
	226		X	X
	227		X	
		250	X	X
		265	X	X
290			X	X
		345	X	X
		370	X	X
	371		X	
		380	X	X
		385	X	X
		410	X	X
		415	X	X
		420	X	X
		430	X	X
435			X	X
440			X	X
		445	X	X
		460	X	X
		475	X	X
		505	X	X
		520	X	X
		525	X	X
		540	X	X
		550	X	X
		565	X	X
		570	X	X

Alt. B Units	Alt. C Units	Units in both Alt. B and C	Strategically reduce fuel loadings and forest vegetation density so as to lessen the risk that disturbance events such as insect, disease, and wildfire will lead to large-scale loss of forest.	Contribute to the local and regional economies by providing timber and other wood fiber products.
		605	X	X
		610	X	X
		620	X	X
		650	X	X
		670	X	X
	671		X	X
		675	X	X
	676		X	X
	677		X	X
	678		X	X
	679		X	X
		690	X	X
	691		X	
	692		X	
	693		X	
		695	X	X
740			X	X
		755	X	X
		756	X	X
		757	X	X
		765	X	X
		785	X	X
		790	X	X
795			X	X
800			X	X
805			X	X
		810	X	X
	811		X	
825			X	X

Table B-2. Proposed prescriptions and activities by unit.

	Alternative B							Alternative C						
UNIT	SILV Rx	LFR	UB	Util	GP	LS	ACRES	SILV Rx	LFR	UB	Util	GP	LS	ACRES
5									3"	Y	Y	Y	F	313
10	HTH9S	6"	N	Y	Y	G	138							
25	HTH9S	6"	Y	Y	Y	G	56							
65									3" 6"	Y	Y	Y	F	186
72									6"	Y	Y	Y	F	45
74									3" 6"	Y	Y	Y	F	308
75	HTH9Q	6"	Y	Y	Y	G	194	HTH9Q	6"	Y	Y	Y	G	194
76									6"	Y	Y	Y	F	47
80	HTH9Q	6"	Y	N	N	A	77	HTH9Q	6"	Y	Y	N	A	77
85	HTH9Q	6"	Y	N	N	G	175	HTH9Q	6"	Y	N	N	G	175
105	HTH9S	6"	Y	Y	Y	G	22							
120	HTH6S	6"	Y	Y	Y	G	130	HTH6S	6"	Y	Y	Y	G	130
125	HTH9S	6"	Y	Y	Y	G	111							
130	HTH9S	6"	Y	Y	Y	G	102							
135									3" 6"	Y	Y	Y	F	168
145									3" 6"	Y	Y	Y	F	6
155	HTH6C	6"	Y	Y	Y	G	459	HTH6C	6"	Y	Y	Y	G	459
225	HTH6M	6"	Y	Y	Y	G	40	HTH6M	6"	Y	Y	Y	G	40
226									3" 6"	Y	Y	Y	F	197
227									3" 6"	Y	N	Y	F	353
250	HTH6S	6"	Y	Y	Y	G	11	HTH6S	6"	Y	Y	Y	G	11
265	HTH9Q	6"	Y	Y	Y	G	81	HTH9Q	6"	Y	Y	Y	G	81
290	HTH9S	6"	Y	Y	Y	G	57							
345	HTH9M	6"	Y	N	N	A	366	HTH9M	6"	Y	N	N	A	366
370	HTH9S	6"	N	Y	Y	G	115	HTH9S	6"	N	Y	Y	G	115
371									3" 6"	Y	N	Y	F	76
380	HTH6M	6"	Y	N	N	G	70	HTH6M	6"	Y	N	N	G	70
385	HTH9M	6"	Y	N	N	A	8	HTH9M	6"	Y	N	N	A	8
410	HTH9M	6"	Y	N	N	A	36	HTH9M	6"	Y	N	N	A	36
415	HTH9M	6"	Y	N	N	A	23	HTH9M	6"	Y	N	N	A	23
420	HTH9M	6"	Y	Y	Y	G	60	HTH9M	6"	Y	Y	Y	G	60
430	HTH6M	6"	Y	Y	Y	G	177	HTH6M	6"	Y	Y	Y	G	177
435	HSL9M	6"	Y	Y	Y	G	368							
440	HSL9M	6"	N	N	N	G	55							
445	HSL9M	6"	Y	Y	Y	G	28	HSL9M	6"	Y	Y	Y	G	28
460	HTH6C	6"	Y	N	N	G	174	HTH6C	6"	Y	N	N	G	174
475	HSL9M	6"	Y	Y	Y	G	74	HSL9M	6"	Y	Y	Y	G	74
505	HSL9M	6"	Y	Y	Y	G	76	HSL9M	6"	Y	Y	Y	G	76
520	HSL9M	6"	Y	N	N	G	102	HSL9M	6"	Y	N	N	G	102
525	HSL9M	6"	Y	N	N	G	54	HSL9M	6"	Y	N	N	G	54
540	HSL9M	6"	N	Y	N	A	30	HSL9M	6"	N	Y	N	A	30
550	HTH9M	6"	Y	N	N	G	413	HTH9M	6"	Y	N	N	G	413
565	HSL9M	6"	N	N	N	G	27	HSL9M	6"	N	N	N	G	27
570	HSL9M	6"	N	N	N	G	47	HSL9M	6"	N	N	N	G	47
605	HSL9M	6"	N	N	N	G	17	HSL9M	6"	N	N	N	G	17
610	HSL9M	6"	Y	Y	Y	G	220	HSL9M	6"	Y	Y	Y	G	220
620	HSL9M	6"	Y	Y	Y	G	190	HSL9M	6"	Y	Y	Y	G	190

	Alternative B							Alternative C						
UNIT	**SILV Rx**	**LFR**	**UB**	**Util**	**GP**	**LS**	**ACRES**	**SILV Rx**	**LFR**	**UB**	**Util**	**GP**	**LS**	**ACRES**
650	HSL9M	6"	Y	Y	Y	G	88	HSL9M	6"	Y	Y	Y	G	88
670	HSL6M	6"	Y	Y	Y	G	37	HSL6M	6"	Y	Y	Y	G	37
671									3"	Y	Y	Y	F	81
675	HTH9M	6"	N	Y	Y	G	10	HTH9M	6"	N	Y	Y	G	10
676									6"	Y	Y	Y	F	82
677									3" 6"	Y	Y	Y	F	254
678									3" 6"	Y	Y	Y	F	453
679									3" 6"	Y	Y	Y	F	402
690	HTH6S	6"	Y	N	N	G	85	HTH6S	6"	Y	N	N	G	85
691									3" 6"	Y	N	N	F	225
692									3" 6"	Y	N	N	F	104
693									3" 6"	Y	N	N	F	50
695	HTH6S	6"	Y	N	N	A	49	HTH6S	6"	Y	N	N	A	49
740	HSL9M	6"	Y	Y	Y	G	41							
755	HTH6S	6"	Y	Y	Y	G	15	HTH6S	6"	Y	Y	Y	G	15
756	HTH6S	6"	Y	Y	Y	G	16	HTH6S	6"	Y	Y	Y	G	16
757	HTH6S	6"	Y	Y	Y	G	42	HTH6S	6"	Y	Y	Y	G	42
765	HTH6S	6"	Y	Y	Y	G	190	HTH6S	6"	Y	Y	Y	G	190
785	HTH6S	6"	Y	Y	Y	G	35	HTH6S	6"	Y	Y	Y	G	35
790	HSL9M	6"	N	N	N	A	49	HSL9M	6"	N	N	N	A	49
795	HTH6M	6"	Y	N	N	A	103							
800	HTH6M	6"	Y	N	N	A	102							
805	HSL6M	6"	Y	N	N	A	96							
810	HSL9M	6"	N	N	N	A	144	HSL9M	6"	N	N	N	A	144
811									6"	Y	N	Y	F	211
825	HSV	6"	N	Y	Y	G	34							
	TOTAL ACRES						**5522**	**TOTAL ACRES**						**7798**

ALL units would be pruned
ALL units would potentially be pile burned
ALL units would have handpiling when possible

Explanation of Silvicultural Prescriptions:

HSL	Individual tree selection, usually with uneven-aged management goals.	
HTH	Commercially thin with even-aged OR uneven-aged goals	
HSV	Utilization (salvage) of down dead commercial material as chips, firewood, etc.	
6*x*	Thin to 67% of UMZ. This is called the lower management zone (LMZ)	
9*x*	Thin to 90% of UMZ. This is for adequate treatment for insect resistance while maintaining as much of the stand structure as possible.	
Where *x*=	S	Single-storied objectives for treatment **for this entry.**
	M	Multi-storied objectives for treatment **for this entry.**
	C	A combination of the S and the M treatments, with 15% retention.
	Q	The same as C, but with 25% retention.

Logging System (LS) Codes:
G = Ground based

Fuels Trt. Codes:
LFR = thinning

F = Fuels only	UB = underburning
A = Advanced Logging Systems (Cable or helicopter)	Util = utilization (post/pole or firewood)
	GP = grapple piling

APPENDIX C - SNAG AND DOWN WOOD ANALYSIS

Determining a reference condition

The reference condition used for this analysis area was developed from DecAID and the Odell Pilot Watershed Analysis. DecAID synthesized data comes from established vegetations plots across all land ownerships in Oregon and Washington. Data from unharvested stands provides a reference condition in the various habitat types for distribution of snag and down wood size and densities across a large landscape. This data was used along with historical range of variability (HRV) information on structure stage from the Odell Pilot Watershed Analysis to develop the local HRV or reference condition of snag densities across a habitat type, with all structural stages lumped. The reference condition is compared to existing condition to determine how close existing conditions match with “historic”, then used as a comparison between the alternatives. It is assumed that managing within HRV will provide for those species that existed in the past and survived to the present with those historical snag densities. Fire ecosystems have been altered due to fire suppression over the years. Mellen et al. (2006) states dead wood levels may be above historical conditions due to fire suppression and increased mortality in some areas, and may be depleted below historical levels locally in other areas due to areas burned by intense fire or salvage and firewood cutting. The vegetation data is used for this analysis understanding that the information from unharvested plots may not accurately reflect “natural conditions.” They are comparable to recent research (Harrod et al. 1998, Agee 2002, Ohmann and Waddell 2002) regarding historic dead wood densities and until new information becomes accessible, DecAID vegetation data provides the most current, empirical data on natural conditions available for dead wood evaluations.

In determining reference condition, information from the watershed analysis on structure stages was taken and lumped into more manageable groupings similar to those structural condition classes found in DecAID. Table 14 is from Odell Pilot WA 1999 which displayed HRV by structural stage and plant association group (PAG).

Table C-1. Historic Range of Variability (HRV) by Plant Association Group (PAG).

Structural Stage	*PLANT ASSOCIATION GROUP* (Percent for Plant Association Groups (PAG) on the Crescent District)						
	MH	PPD PPW	LPD	LPW	MCD	MCW	LPHD
ES	NE	0-20	0-70	0-30	0-20	0-10	0-30
EM	NE	5-30	0-10	0-50	15-50	0-15	0-25
MO	NE	13-50	0-20	0-20	15-50	5-20	5-50
MC	NE	0-10	0-50	5-50	7-20	8-20	0-10
MM	NE	15-60	0-10	5-50	10-55	10-40	0-25
LM	NE	0-20	0-10	0-80	8-30	10-40	0-20
LS	NE	20-50	0-30	0-60	15-60	10-40	10-40

NOTE: NE = No HRV has been established for this PAG. Each structural stage could be 0-100.

The PAGS were lumped into habitat types that match the DecAID Habitat types.

Lumped PAGs by DecAID Habitat types

WA	DecAID
MH	MMC
PPD/PPW	PP/DF
LPD LPW LPHD	LP
MCD MCW	EMC

- Montane Mixed Conifer (MMC)
- Ponderosa Pine/Douglas-fir (PP/DF)
- Lodgepole Pine Forests and Woodlands (LP)
- Eastside Mixed Conifer Forest S Cascades/Blue Mnts (EMC)

Descriptions found at
http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf/QueryForm?OpenForm

The structural stages from the WA (Table 15 from Odell Pilot WA) was then matched up with the structural stages from DecAID.

Table C-2. A brief description of the codes used to define structural stages used for analyzing HRV and comparing existing conditions with historic conditions.

CODE	STRUCTURAL STAGE	DESCRIPTION
ES	Stand Initiation	One canopy stratum (may be broken or continuous), on dominant cohort of seedlings or saplings. Grass, forbs or shrubs may be present with seral trees.
EM	Understory Reinitiation	The overstory canopy is discontinuous. Two or more canopy layers are present. Overstory trees may be poles or of small or medium diameter. Understory trees are seedlings or poles.
MO	Stem Exclusion: Open Canopy	One discontinuous canopy stratum. One cohort of tree stems excluding competition. Trees may be poles of small or medium diameter. Understory shrubs, grasses, or forbs may be present.
MC	Stem Exclusion: Closed Canopy	Canopy layer is closed and continuous. One or more canopy strata may be present. Lower canopy strata, if present, is the same age as the upper stratum. Trees may be poles or small or medium diameter. Understory shrubs, grasses, or forbs may be present.
MM	Multi-stratum without Large Trees	The overstory canopy is discontinuous. Two or more canopy layers are present. Large trees are uncommon in the overstory. Horizontal and vertical stand structure and tree sizes are diverse. The stand may be a mix of seedlings, saplings, poles, or small or medium diameter trees.
LM	Multi-stratum with Large Trees	The overstory is broken or discontinuous. Two or more canopy layers 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.
LS	Single Stratum with Large Trees	The single dominant stratum consists of medium sized or large trees. One or more cohort 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.

Table C-3. DecAID structural Classes (Found in the Structural Conditions Descriptions portion of DecAID).

DecAID Structural Condition Class	**Definition - size class and tree stocking**[1]	WHR Structural Conditions, Wildlife-Habitat Relationships in Oregon and Washington (O'Neil et al. 2001).
Post-fire	stand replacing fire; stocking and trees size variable; high snag densities	N/A
Open Canopy	tree stocking <10% or tree stocking >=10% and QMD 1-9 inches (2.5-	1 Grass/Forb Open, 2 Grass/Forb Closed, 3 Shrub/seedling Open, 4 Shrub/seedling Closed, 5 Sapling/Pole Open, 6 Sapling/Pole Moderate, 7 Sapling/Pole Closed
Small/medium Trees	tree stocking >=10% and QMD 10-19 inches (25.0-49.9 cm)	8 Small tree single story open, 9 Small tree single story moderate, 10 Small tree single story closed, 11 Medium tree multi-story open, 12 Medium tree multi-story moderate, 13 Medium tree multi-story closed, 17 Small tree multi-story open, 18 Small tree multi-story moderate, 19 Small tree multi-story closed, 20 Medium tree multi-story open, 21 Medium tree multi-story moderate, 22 Medium tree multi-story closed,
Larger Trees	tree stocking >=10% and QMD >=20 inches (50.0 cm)	14 Large tree single story open, 15 Large tree single story moderate, 16 Large tree single story closed, 23 Large tree multi-story open, 24 Large tree multi-story moderate, 25 Large tree multi-story closed, 26 Giant tree multi-story

The two were combined as follows:

Watershed Analysis Code	DecAID equivalent
ES	Open Canopy
EM	
MO	Small/medium Trees
MC	
MM	
LM	Larger Trees
LS	

The HRV Table 14, from the Odell Pilot WA is converted to habitat types by grouping PAGs and structural stages. The range of variablility is determined by taking the lowest value and the highest value of the group. For example the lowest value for all of the PPD/PPW ES/EM or PP/DF habitat type, open stage is 0 the highest is 30, the range then would be 0-30 as shown in reference table.

	MMC	PP/DF	LP	MCD
Open	**0**	**0-30**	**0-70**	**0-50**
Small/medium	**0**	**0-60**	**0-50**	**7-55**
Larger	**0**	**0-50**	**0-30**	**8-60**

The maximum HRV value and the minimum HRV value of each structural group and each habitat type along with information from DecAID was used to develop a weighted range for the distribution of snags at various densities and two dbh categories across the landscape.

FOR EMC			Weighted Average of % of Landscape for snags 10"+ (24.5cm) dbh snag/acre (snags/ha)						
Assumption	Structure Class	HRV From Odell WA	0 (0)	0 - 6 (0-15)	6 - 12 (15-30)	12 - 24 (30-60)	24 - 36 (60-90)	36+ (90+)	Total
DecAID	O[1]	0-50	29	30	16	13	2	10	100
DecAID	S[2]	7-55	15	25	17	27	10	6	100
DecAID	L[3]	8-60	22	32	15	17	11	3	100
max O	O	50	14.5	15.0	8.0	6.5	1.0	5.0	50
max O	S	25	3.8	6.3	4.3	6.8	2.5	1.5	25
max O	L	25	5.5	8.0	3.8	4.3	2.8	0.8	25
max O	wt'd avg	100	23.8	29.3	16.0	17.5	6.3	7.3	100
max S	O	20	5.8	6.0	3.2	2.6	0.4	2.0	20
max S	S	55	8.3	13.8	9.4	14.9	5.5	3.3	55
max S	L	25	5.5	8.0	3.8	4.3	2.8	0.8	25
max S	wt'd avg	100	19.6	27.8	16.3	21.7	8.7	6.1	100
max L	O	15	4.4	4.5	2.4	2.0	0.3	1.5	15
max L	S	25	3.8	6.3	4.3	6.8	2.5	1.5	25
max L	L	60	13.2	19.2	9.0	10.2	6.6	1.8	60
max L	wt'd avg	100	21.3	30.0	15.7	18.9	9.4	4.8	100
min O	O	0	0.0	0.0	0.0	0.0	0.0	0.0	0
min O	S	55	8.3	13.8	9.4	14.9	5.5	3.3	55
min O	L	45	9.9	14.4	6.8	7.7	5.0	1.4	45
min O	wt'd avg	100	18.2	28.2	16.1	22.5	10.5	4.7	100
min S	O	33	9.6	9.9	5.3	4.3	0.7	3.3	33
min S	S	7	1.1	1.8	1.2	1.9	0.7	0.4	7
min S	L	60	13.2	19.2	9.0	10.2	6.6	1.8	60
min S	wt'd avg	100	23.8	30.9	15.5	16.4	8.0	5.5	100
min L	O	32	9.3	9.6	5.1	4.2	0.6	3.2	32
min L	S	60	9.0	15.0	10.2	16.2	6.0	3.6	60
min L	L	8	1.8	2.6	1.2	1.4	0.9	0.2	8
min L	wt'd avg	100	20.0	27.2	16.5	21.7	7.5	7.0	100
MAX % Landscape in dbh class			24	31	17	23	10	7	111
MIN % Landscape in dbh class			18	27	15	16	6	5	88
[1]Table EMC_ECB_O.Inv-14 unharvested plots for snags =10" (24.5cm) dbh			[2]Table EMC_ECB_S.Inv-14 unharvested plots for snags =10" (24.5cm) dbh			[3]Table EMC_ECB_L.Inv-14 unharvested plots for snags =10" (24.5cm) dbh			

FOR LP			Weighted Average of % of Landscape for snags 10"+ (24.5cm) dbh snag/acre (snags/ha)						
Assumption	Structure Class	HRV From Odell WA	0 (0)	0 - 6 (0-15)	6 - 12 (15-30)	12 - 24 (30-60)	24 - 36 (60-90)	36+ (90+)	Total
DecAID	O[1]	0-70	38	21	15	14	6	6	100
DecAID	S[2]	0-50	26	13	23	16	12	10	100
DecAID	L[3]	0-30	No Data						0
max O	O	70	26.6	14.7	10.5	9.8	4.2	4.2	70
max O	S	30	7.8	3.9	6.9	4.8	3.6	3.0	30
max O	L	0							
max O	wt'd avg	100	34.4	18.6	17.4	14.6	7.8	7.2	100
max S	O	50	19.0	10.5	7.5	7.0	3.0	3.0	50
max S	S	50	13.0	6.5	11.5	8.0	6.0	5.0	50
max S	L	0							
max S	wt'd avg	100	32.0	17.0	19.0	15.0	9.0	8.0	100
max L	O	20	7.6	4.2	3.0	2.8	1.2	1.2	20
max L	S	50	13.0	6.5	11.5	8.0	6.0	5.0	50
max L	L	30							
max L	wt'd avg	100	20.6	10.7	14.5	10.8	7.2	6.2	70
min O	O	20	7.6	4.2	3.0	2.8	1.2	1.2	20
min O	S	50	13.0	6.5	11.5	8.0	6.0	5.0	50
min O	L	30							
min O	wt'd avg	100	20.6	10.7	14.5	10.8	7.2	6.2	70
min S	O	70	26.6	14.7	10.5	9.8	4.2	4.2	70
min S	S	0	0.0	0.0	0.0	0.0	0.0	0.0	0
min S	L	30							
min S	wt'd avg	100	26.6	14.7	10.5	9.8	4.2	4.2	70
min L	O	35	13.3	7.4	5.3	4.9	2.1	2.1	35
min L	S	65	16.9	8.5	15.0	10.4	7.8	6.5	65
min L	L	0							
min L	wt'd avg	100	30.2	15.8	20.2	15.3	9.9	8.6	100
MAX % Landscape in dbh class			34	19	20	15	10	9	107
MIN % Landscape in dbh class			21	11	11	10	4	4	60
[1]Table LP_O.Inv-14 unharvested plots for snags =10" (24.5cm) dbh			[2]Table LP_S.Inv-14 unharvested plots for snags			[3]No Data On Large			

FOR MMC			Weighted Average of % of Landscape for snags 10"+ (24.5cm) dbh snag/acre (snags/ha)						
Assumption	Structure Class	Existing % (No HRV)	0 (0)	0 - 6 (0-15)	6 - 12 (15-30)	12 - 24 (30-60)	24 - 36 (60-90)	36+ (90+)	Total
DecAID	O[1]	2	5	14	19	31	16	15	100
DecAID	S[2]	92	54	30	13	2	1	0	100
DecAID	L[3]	6	1	17	28	37	11	6	100
Existing	O	2	0.1	0.3	0.4	0.6	0.3	0.3	2.0
Existing	S	92	49.7	27.6	12.0	1.8	0.9	0.0	92.0
Existing	L	6	0.1	1.0	1.7	2.2	0.7	0.4	6.0
Existing	wt'd avg	100	49.8	28.9	14.0	4.7	1.9	0.7	100.0
[1]Table MMC_O.Inv-14 unharvested plots for snags ≥10" (24.5cm) dbh			[2]Table MMC_S.Inv-14 unharvested plots for snags ≥10" (24.5cm) dbh			[3]Table MMC_L.Inv-14 unharvested plots for snags ≥10" (24.5cm) dbh			

FOR PPDF			Weighted Average of % of Landscape for snags 10"+ (24.5cm) dbh (snags/ha)										snag/acre	
Assumption	Structure Class	HRV % From Odell WA	0	0-4	4-8	8-12	12-16	16-20	20-24	24-28	28-32	32-36	39+	**Total**
DecAID	O[1]	0-30	68	13	10	1	3	2	1	1	0	0	1	100
DecAID	S[2]	0-60	54	30	10	3	1	0	1	1	0	0	0	100
DecAID	L[3]	0-50	54	24	7	10	3	0	1	0	0	1	0	100
max O	O	30	20.4	3.9	3.0	0.3	0.9	0.6	0.3	0.3	0.0	0.0	0.3	30
max O	S	40	21.6	12.0	4.0	1.2	0.4	0.0	0.4	0.4	0.0	0.0	0.0	40
max O	L	30	16.2	7.2	2.1	3.0	0.9	0.0	0.3	0.0	0.0	0.3	0.0	30
max O	wt'd avg	100	58.2	23.1	9.1	4.5	2.2	0.6	1.0	0.7	0.0	0.3	0.3	100
max S	O	15	10.2	2.0	1.5	0.2	0.5	0.3	0.2	0.2	0.0	0.0	0.2	15
max S	S	60	32.4	18.0	6.0	1.8	0.6	0.0	0.6	0.6	0.0	0.0	0.0	60
max S	L	25	13.5	6.0	1.8	2.5	0.8	0.0	0.3	0.0	0.0	0.3	0.0	25
max S	wt'd avg	100	56.1	26.0	9.3	4.5	1.8	0.3	1.0	0.8	0.0	0.3	0.2	100
max L	O	15	10.2	2.0	1.5	0.2	0.5	0.3	0.2	0.2	0.0	0.0	0.2	15
max L	S	35	18.9	10.5	3.5	1.1	0.4	0.0	0.4	0.4	0.0	0.0	0.0	35
max L	L	50	27.0	12.0	3.5	5.0	1.5	0.0	0.5	0.0	0.0	0.5	0.0	50
max L	wt'd avg	100	56.1	24.5	8.5	6.2	2.3	0.3	1.0	0.5	0.0	0.5	0.2	100
min O	O	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
min O	S	55	29.7	16.5	5.5	1.7	0.6	0.0	0.6	0.6	0.0	0.0	0.0	55
min O	L	45	24.3	10.8	3.2	4.5	1.4	0.0	0.5	0.0	0.0	0.5	0.0	45
min O	wt'd avg	100	54.0	27.3	8.7	6.2	1.9	0.0	1.0	0.6	0.0	0.5	0.0	100
min S	O	30	20.4	3.9	3.0	0.3	0.9	0.6	0.3	0.3	0.0	0.0	0.3	30
min S	S	20	10.8	6.0	2.0	0.6	0.2	0.0	0.2	0.2	0.0	0.0	0.0	20
min S	L	50	27.0	12.0	3.5	5.0	1.5	0.0	0.5	0.0	0.0	0.5	0.0	50
min S	wt'd avg	100	58.2	21.9	8.5	5.9	2.6	0.6	1.0	0.5	0.0	0.5	0.3	100
min L	O	30	20.4	3.9	3.0	0.3	0.9	0.6	0.3	0.3	0.0	0.0	0.3	30
min L	S	60	32.4	18.0	6.0	1.8	0.6	0.0	0.6	0.6	0.0	0.0	0.0	60
min L	L	10	5.4	2.4	0.7	1.0	0.3	0.0	0.1	0.0	0.0	0.1	0.0	10
min L	wt'd avg	100	58.2	24.3	9.7	3.1	1.8	0.6	1.0	0.9	0.0	0.1	0.3	100
MAX % Landscape in dbh class			58	27	10	6	3	1	1	1	0	1	0	107
MIN % Landscape in dbh class			54	22	9	3	2	0	1	1	0	0	0	91
[1]Table PP/DF_O.Inv-14 unharvested plots for snags =10" (24.5cm) dbh						[2]Table PP/DF_S.Inv-14 unharvested plots for snags =10" (24.5cm) dbh					[3]Table PPDF_L.Inv-14 unharvested plots for snags =10" (24.5cm) dbh			

The following summary of results was used in the analysis. Because there is no HRV for MMC existing structure was used. Ponderosa pine has a different split in categories for snags 10 inches and greater in diameter than the rest. This is due to the categories in DecAID.

Reference Range of Conditions	% of Landscape for snags ≥10" (24.5cm) dbh snag/acre (snags/ha)					
Habitat Type	0 (0)	0 - 6 (0-15)	6 - 12 (15-30)	12 - 24 (30-60)	24 - 36 (60-90)	36+ (90+)
EMC	18-24	27-31	15-17	16-23	6-10	5-7
LP	21-34	11-19	11-20	10-15	4-10	4-9
MMC	50	29	14	5	2	1
	0 (0)	0 - 4 (0-10)	4 - 12 (10-30)	12 - 24 (30-60)	24 - 36 (60-90)	36+ (90+)
PP/DF	54-58	22-27	12-16	3-5	0-1	0

Information from DecAID tables (unharvested plots for snags ≥10" (24.5cm) dbh) PP/DF_O.Inv-14, PP/DF_S.Inv-14, PP/DF_L.Inv-14, EMC_ECB_O.Inv-14., EMC_ECB_S.Inv-14, EMC_ECB_L.Inv-14, LP_O.Inv-14, LP_S.Inv-14, MMC_O.Inv-14, MMC_S.Inv-14, MMC_L.Inv-14 and modified with HRV information found in the Odell Pilot WA

The same process was used for those snags greater than or equal to 20 inches dbh, with the following results. Tables used from DecAID and the ranges used to construct this table follow.

Reference Range of Conditions	% of Landscape for snags ≥20" (50.5cm) dbh snag/acre (snags/ha)						
Habitat Type	0 (0)	0-2 (0-5)	2-4 (5-10)	4-6 (10-15)	6-10 (15-25)	10-18 (25-45)	18+ (45+)
EMC	31-42	12-19	14-18	9-13	10-15	5-7	1-2
LP	36-80	4-8	5-10	1-4	1-2	0-1	0
MMC	23	14	22	13	16	11	2
PP/DF	67-75	15-20	6-11	1-2	1	0-1	0
Information from DecAID tables (unharvested plots for snags ≥20" (50cm) dbh) PP/DF_O.Inv-15, PP/DF_S.Inv-15, PP/DF_L.Inv-15, EMC_ECB_O.Inv-15., EMC_ECB_S.Inv-15, EMC_ECB_L.Inv-15, LP_O.Inv-15, LP_S.Inv-15, MMC_O.Inv-15, MMC_S.Inv-15, MMC_L.Inv-15, and modified with HRV information found in the Odell Pilot WA							

The same process was used in determining a reference condition for down wood material. HRV from the Odell WA was taken to weight structural stages on the landscape. Tons/acre was calculated using conversions specific to the habitat type given in Table 1 of DecAID "Why percent cover?" section. These were calculated with for down wood 5 inches dbh and greater and 20 inches dbh and greater.

Reference Range of Conditions	Weighted Average of % of Landscape for dwd ≥5" (12.5cm) dbh % down wood cover *(ton/acre)*						
Habitat Type		0	0-4	4-8	8-10	10-16	>16
EMC	*(ton/acre)*	*(0)*	*(0-22)*	*22-44*	*44-54*	*>54*	
		22-30	53-54	13-19	2-3	1-3	
LP	*(ton/acre)*	*(0)*	*(0-13)*	*(13-26)*	*(26-40)*	*(40-53)*	*>(53)*
		4-14	37-55	14-23	4-7	4-8	0
MMC	*(ton/acre)*	*(0)*	*(0-22)*	*(22-45)*	*(45-56)*	*(56-90)*	*>(90)*
		9	48	25	8	7	3
PP/DF	(ton/acre)	*(0)*	*(0-21)*	*(21-42)*	*(42- 52)*	*>(52)*	
		36-43	55-61	3-4	0	0	
Information from DecAID tables (unharvested plots for down wood ≥5" (12.5cm) dbh) PP/DF_O.Inv-16, PP/DF_S.Inv-16, PP/DF_L.Inv-16, EMC_ECB_O.Inv-16., EMC_ECB_S.Inv-16, EMC_ECB_L.Inv-16, LP_O.Inv-16, LP_S.Inv-16, MMC_O.Inv-16, MMC_S.Inv-16, MMC_L.Inv-16 and modified with HRV information found in the Odell Pilot WA							

Reference Range of Conditions	Weighted Average of % of Landscape for dwd ≥20" (50cm) dbh % down wood cover *(ton/acre)*						
Habitat Type		0	0-4	4-8	8-10	10-16	>16
EMC	*(ton/acre)*	*(0)* 61-73	*(0-22)* 26-36	*22-44* 1-2	*44-54* 1-2	*>54* 0	
LP	*(ton/acre)*	*(0)* 39-85	*(0-13)* 8-15	*(13-26)* 1-2	*(26-40)* 0	*(40-53)* 0	*>(53)* 0
MMC	*(ton/acre)*	*(0)* 23	*(0-22)* 14	*(22-45)* 22	*(45-56)* 13	*(56-90)* 16	*>(90)* 11
PP/DF	(ton/acre)	*(0)* 72-79	*(0-21)* 20-28	*(21-42)* 0-1	*(42- 52)* 0	*>(52)* 0	
Information from DecAID tables (unharvested plots for down wood ≥5" (12.5cm) dbh) PP/DF_O.Inv-17, PP/DF_S.Inv-17, PP/DF_L.Inv-17, EMC_ECB_O.Inv-17, EMC_ECB_S.Inv-17, EMC_ECB_L.Inv-17, LP_O.Inv-17, LP_S.Inv-17, MMC_O.Inv-17, MMC_S.Inv-17, MMC_L.Inv-17 and modified with HRV information from Odell Pilot WA.							

The results of the weighted averages were used in various formats in the analysis.

APPENDIX D - RESPONSE TO COMMENTS

Content Analysis Process

The following is a summary of public comment received by the Crescent Ranger District regarding the Draft Environmental Impact Statement (DEIS) for the Five Buttes Project. The DEIS was 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).

Content analysis is a method for analyzing public comment. This process strives to identify all relevant issues represented by the public. The intent is to represent the public's viewpoints and concerns as fairly as possible, and to present those concerns in such a way as to assist the Interdisciplinary Team to effectively respond to them. It is important to recognize that the consideration of public comment is not a vote-counting process in which the outcome is determined by the majority opinion. Relative depth of feeling and interest among the public can serve to provide a general context for decision-making. However, it is the appropriateness, specificity, and factual accuracy of comment content that serves to provide the basis for modifications to planning documents and decisions.

Comments were received from eighteen different people (respondents) in seventeen letters. A total of 167 comments were contained in those letters. All but two respondents reside in Oregon and ten letters were received from various interested organizations. Of those, two are federal government agencies whose letters are contained in this document. All letters were received within the specified comment period which was from February 16, through April 2, 2007.

List of Respondents

Date Recvd.	Letter #	Name	Organization	City/State	Number of Comments
2/26/07	1	Lydia Garvey	Individual	Clinton, OK	1
3/12/07	2	Ben F. Sunderland V	Individual	Walterville, OR	3
3/07/07	3	Jim Larsen	Individual	Bend, OR	1
3/08/07	4	Preston Sleeger	DOI	Portland, OR	2
3/12/07	5	Laurie Solomon	Individual	Portland, OR	13
3/12/07	6	Karen Coulter	Blue Mt. Biodiverstiy	Fossil, OR	20
3/11/07	7	Charles H. Burley	AFRC	Bend, OR	23
2/23/07	8	Robert D. Irwin	Individual	White City, OR	4
2/19/07	9	Barbara Sachau	Individual	Florham Park, NJ	1
3/21/07	10	John Morgan	Ochoco Lumber	Prineville, OR	8
3/21/07	11	John Williams	Individual	Bend, OR	1
3/26/07	12	Josh Schlossberg	Native Forest Council	Eugene, OR	1
4/02/07	13	Asante Riverwind	Sierra Club	Bend, OR	15
4/02/07	14	A .Lewis / G. Fuller	Nature Conservancy	Portland, OR	6
4/02/07	15	Christine B. Reichgott	U.S. EPA	Seattle, WA	5
4/02/07	16	Karen Coulter	Blue Mt. Biodiversity	Fossil, OR	49
4/02/07	17	Daniel Kruse	Cascadia Wildlands	Eugene, OR	14

Comments and Responses

The following section contains the comments received from the public and the responses pertaining to them. The numbers in parentheses following each comment identify the letter number and the comment number within that letter.

Comment: ***[Re: DEIS p. 198] "Of those species in the habitat types listed above, disturbance is expected to be localized to activity units, if the actions take place during the nesting/denning season. Effects of disturbance could include nest abandonment, failure and/or destruction of nest. There potentially could be up to three seasons affected. The first would be during commercial harvest, another season for post-sale activities such as small diameter thinning, and the third for prescribed underburning. These activities would not take place in all activity units at once, and generally do not occur in the same location for consecutive years. Burning of piles is generally completed in the fall, outside of the denning/nesting season."***

Don't log during nesting / denning season for marten, flammulated owl, [and] woodpeckers. (#16 - 44)

Response: While winter timber harvest occasionally occurs on the Crescent Ranger District, the majority of the vegetation management activities are conducted from April through November. For this reason, the analysis disclosed the potential effects on this species group, assuming management actions could occur during the nesting or denning seasons (March through July). Page 194 of the DEIS states there are 108,000 acres of multi-story mid-, late and old forest in the project area where most of these species may occur. Within the 108,000 acres are 32,200 acres described as mixed conifer forest that provides habitat at varying levels. Table 3-61 (DEIS, page 197) displays the amount of eastside and montane mixed conifer (EMC and MMC) habitat proposed for commercial vegetative treatments (4,213 acres Alternative B and 3,205 acres Alternative C). Consequently, many thousands of acres of suitable habitat will not be affected by project activities and would not experience disturbance during the reproductive seasons for each species.

Comment: ***[Re: DEIS p. 214] "Alternative B Direct and Indirect Effects:***

Implementation of this alternative would result in silvicultural treatments prescribed to reduce stem density and overstocking within two OGMAs to perpetuate and enhance old growth characteristics. Unit #610 is located within the boundaries of the 252 acre Maklaks OGMA which has the American marten as a designated species under the Deschutes Forest Plan. Proposed activities would commercially thin 143 acres and maintain a multi-storied mixed conifer forest with fewer trees/acre to increase the likelihood of long-term retention of the largest trees on site."

Marten benefit from density. It's natural for mixed conifer to be dense. "Overstocking" is an artificial concept not relevant to natural processes within an OG stand. Drop unit 610. Logging up to 21" dbh can seriously impair the OG characteristics of an OGMA and reduce OG replacement trees. (#16 - 46)

Response: See response to comments #16-6 and #16-44. The Old Growth management areas were selected for active management to not only reduce risk to the old growth stands themselves, but also to collectively reduce the risk of wildfire severely impacting the connected late-successional forested stands from above Odell Lake easterly along the southern flanks of Maklaks Mountain then running north parallel to the Oregon Cascades Recreation Area (DEIS, page 214).

Based on a similar prescription on an adjacent harvest unit from the Royal timber sale (Seven Buttes EA, 1996) marten habitat capability would be retained in unit 810.

Comment: ***[Re: DEIS p. 215] "Because the same silvicultural prescription would be implemented on unit #810, the effects on the Maklaks OGMA would be the same as for Alternative B." [Alternative C]***

Drop unit 810 - Alt C - [for the] same reasons as for Alt. B. (#16 - 48)

Response: See responses to comments #16-6 and #16-46 above.

Comment: ***The DEIS fails to accurately assess and disclose adverse impacts on forest wildlife species, including neotropical migrant birds, species of concern, state listed species, and ESA listed species such as the spotted owl;*** (#13 - 8)

Response: Chapter 3 of the DEIS provides information on the effects of planned management actions on Endangered Species Act (ESA) wildlife species listed as threatened and endangered including the northern spotted owl (pages 91-122), those listed as federal candidate species pages 122-125), Region 6 Regional Forester Sensitive Species which includes state listed species (pages 125-134), and neotropical migrant birds (DEIS, pages 154-168).

Comment: ***[Re: DEIS p. 96] "Mychorrizal and epigeous fungi, in particular truffles, are an important food source for flying squirrels (Lemkuhl et al. 2004) but where winter snow levels are deeper, as seen in eastside habitats more often, other foods become important like lichens. Lemkuhl (2004) found that plant material was 22 percent of fall flying squirrel diets in the eastern Washington Cascades and diets were similar in diversity and species composition to squirrel diets in other parts of the Pacific Northwest. Lemkuhl et al. (2006) study of flying squirrels in the eastern Washington Cascades indicated low food availability (truffle and lichen biomass, understory plant richness) appeared to limit squirrel density, survival and recruitment in open pine forests as compared to mixed-conifer forests (Lehmkuhl et al. 2006). To compensate for low food productivity in pine forests, squirrels apparently forage over larger home ranges (Lehmkuhl et al. 2004)."***

Proposed logging and fuel reduction could reduce density of N. Flying squirrels, depleting N. spotted owl prey base. Similar results [could be] predictable for red-backed voles. (#16 - 31)

Response: There is no fungi harvesting allowed within the Davis LSR (Late Successional Reserve). Therefore, the northern spotted owl (NSO) and its forage prey base should not be affected by that activity. Snags would not be intentionally removed nor would dead and down woody material be appreciably changed which would provide continued prey base habitat for northern flying squirrels, woodrats, red-backed voles, and other small mammals (DEIS, pages 106 and 108).

DEIS page 103 discloses underburning operations would change the amount of small diameter wood less than or equal to 3 inches in diameter within activity units and may effect the shrub and small tree layers. Mitigation measures and Project Design Features were designed to avoid special features such as rock outcroppings in part to maintain habitat for NSO prey. Also, snags and large down wood would be retained with the exception of unit #370 where some salvage of down lodgepole is proposed to reduce wildfire risk to Maklaks Mountain and an occupied spotted owl territory; and as necessary for occupational safety, which is characterized as incidental (DEIS, page 198). Outside of NSO home ranges, prescribed burning would be accomplished in a mosaic pattern with unburned areas within the burn in addition to designated “leave” area (DEIS, page 23). No prescribed burning would occur inside the home ranges.

Comment: ***The impacts to the Threatened and Management Indicator Species also make the various alternatives all unacceptable, including the destruction of multi-layer canopy, which all current flora and fauna occupying this area depend upon for their survival. Protection Buffer species also are likely to suffer harm from the taking of their habitat including several bat species and various interior forest-dependent neo-tropical songbirds, along with Williamson’s Sapsucker and Lewis’ Woodpecker.*** (#5 - 7)

Response: See responses to comments #5-4, #6-7, #6-8, and #6-9, pertaining to Threatened and Endangered species and Deschutes National Forest Management Indicator Species.

Direct, indirect, and cumulative effects to bat species were disclosed on pages 147-150 of the DEIS. Direct, indirect, and cumulative effects to neotropical songbirds are disclosed on pages 154-168 under Birds of Conservation Concern and Landbird Focal Species for central Oregon, and impacts to Williamson’s sapsucker and Lewis’ woodpecker were discussed in the Snag and Down Wood portion of the wildlife analysis, DEIS pages 197, 200, 203-204, and 207.

Comment: ***Based on their habitat needs for old growth forest and large trees and their documented presence in the planning area (see Table 3-51, DEIS pp.179-180) and the Five Butte Project's planned commercial logging and removal of large and old growth trees, the following Survey and Manage Additional Protection species could be harmed by the Five Buttes Project sale: White-headed woodpecker, Black-backed woodpecker, pygmy Nuthatch; and Flammulated owl. Potential Great Gray owls in the Five Buttes area (eg. along Davis Lake and within the Odell and Crescent Creek drainages) could also be harmed due to the species' preference for mixed conifer forest with high canopy closure (60% or greater) and large old growth trees, broken-top snags and Lodgepole-Ponderosa sites. Protection Buffer species that could be harmed by planned logging include at least five bat species known or suspected to occur within the Five Buttes project area: California myotis, Western Small-footed myotis, Little Brown myotis, Long-eared myotis and Silver-haired bat. Birds of Conservation Concern that could be harmed by the Five Buttes sale include Lewis' woodpecker Williamson's sapsucker and various interior forest dependent Neo tropical songbirds.*** (#6 - 11)

Response: Direct, indirect, and cumulative effects to Survey and Manage Additional Protection and Protection Buffer wildlife species is discussed on pages 146-153 (Survey and Manage section) and/or pages 178-209 in the Snag and Down Wood section of the DEIS. Impacts to the Williamson sapsucker and Lewis' woodpecker are also discussed in the Snag and Down Wood section of the DEIS. (See response to comment #5-7 above)

Page 323 of the DEIS: The Five Buttes project is consistent with the standards and guidelines for the protection of bat species by:

- Conducting searches – There are no known caves, mines, or wooden bridges within the project area to search and buildings that may provide roosting habitat are scarce on the District. Non-destructive searches are not feasible for snags, rock outcroppings and pressure ridges. Therefore, measures and project design criteria for 15% retention within units, retention of snags, and avoidance of rock outcroppings and pressure ridges have been incorporated.

- Identifying likely bat use – existing condition and discussions in the consequences section identifies likely seasonal use and biological requirements.

- Identifying conditions which specific measures will be applied to project plans – see Resource Protection Measures in Chapter 2 of this EIS.

- Establishing conditions under which specific mitigation measures will be applied – seasonal restrictions on prescribed burning have been applied (see Resource Protection Measures in Chapter 2 of this DEIS).

- Describing various no-harvest buffer widths to fit specific habitat conditions – rock outcroppings and lava pressure ridges are generally small and numerous within the project area. Directional felling and restrictions for mechanized equipment would protect these potential roosting and maternity areas. Large areas near the east side of Davis Lake associated with special habitat would have up to a tree length for protection, determined by the District biologist.

When assessing effects to bats, the most important habitat features in the project area are lava pressure ridges and snags. Lava pressure ridges and rock outcroppings will be avoided (DEIS, page 323). Active management objectives are to maintain and enhance late and old structured forests, focusing on the retention of large diameter trees. These alternatives are the most likely to sustain large diameter trees on the landscape, which are important to future snag recruitment and bat roosting and maternity habitat.

Comment: ***The impacts of roads to wildlife affected by disturbance, hydrology, sedimentation of streams and, protection of native plants and ecological processes from exotic invasive plants are well known and well documented. The Forest Service acknowledges these impacts and the overly pervasive Forest Service road system (for which there are inadequate funds to maintain) by having an active road closure and decommissioning program. Therefore it is inconsistent and ill-advised to allow more road-building,***

including "temporary" roads, re-opening closed roads, and re-construction of little used and grown-over roads to allow for-more commercial logging. We ask that there be no road construction, re-opening or reconstruction of roads closed for wildlife or other resource protection or which are little used and unnecessary. (#16 - 12)

Response: See responses to comments #16-11 (above) and #17-6.

Comment: ***. . . the federal candidates for listing and Regional Forester Sensitive-listed Pacific fisher and Oregon Spotted frog could be threatened by loss of complex forest structure in mixed conifer forest and disturbance to any resident or dispersing fisher and by degradation to pond or marsh habitat where Oregon Spotted frogs may occur (Odell Creek, Ranger Creek, and potentially in the Davis Lake marsh, which is adjacent to planned sale units. Oregon Spotted frogs were confirmed in Odell Creek in 2004. Carnivore surveys are dated in the area (most recent in 1998) but a radio-collared male was known to have traveled into the Crescent Ranger District from the Rogue River National Forest in 1999 and suitable fisher habitat exists in the Five Buttes Interface planning area and sale units.*** (#6 - 3)

Response: Page 122 of the DEIS states there are no silvicultural or fuels treatments planned within the wetland area of any riparian reserve of the three alternatives analyzed. Consequently, there will be no direct, indirect, or cumulative effects to the Oregon spotted frog.

See response to comment #17-8. The Five Buttes project is a landscape-scale strategy to cycle in and out of Nesting, Roosting, and Foraging (NRF) habitat while maintaining the large tree component throughout the cycle. The cycling from non-NRF, to NRF across the landscape over time would reduce risk to large and contiguous blocks from habitat disturbance processes. The objective is to provide habitat for the spotted owl, which is relatively the most vulnerable to disturbance processes. While commercial thinning would occur, the primary emphasis would be removing some of the competing trees to reduce ladder fuels and stand density competition. The largest diameter trees would be retained to maintain late and old-structured forests. In addition, no snags or dead and down wood would be removed with the exception of unit #370 where some salvage of down lodgepole is proposed to reduce wildfire risk to Maklaks Mountain and an occupied spotted owl territory; and as necessary for occupational safety, which is characterized as incidental (DEIS, page 198). Complex forest structure for fishers would be maintained because dead and down wood, snags, or shrub removal is not proposed with the exception previously mentioned. Prey base habitat for fishers would be retained as well as denning and resting sites. The DEIS pages 124 and 125 disclose habitat capability would be maintained for the fisher, although there may be local displacement when activities are occurring. It would not inhibit animals to re-colonize into the project area and surrounding lands.

Comment: ***Regional Forester Sensitive-listed species that could be negatively affected by loss of habitat include California wolverine, Gray Flycatcher birds, Bufflehead ducks (from timber sale loss of large nesting snags near Davis Lake and Wickiup Reservoir) and the Crater Lake Tightcoil snail, which is also listed as a Survey and Manage species. Of these, wolverines could be harmed by disturbance to foraging or dispersing individuals or alteration of preferred habitat (mature and intermediate-aged forest in late fall and early winter); Gray flycatchers could be disturbed during nesting season with loss of reproductive success and unidentified populations of Crater Like Tightcoil snail could be harmed by activities in riparian zones that compact soils, reduce litter and / or plant cover or impact potential food sources.*** (#6 - 4)

Response: The DEIS pages 125-134 and 153-154 disclosed direct, indirect, and cumulative effects to this group of Regional Forester sensitive species. While some effects were projected to occur from project implementation, none of the actions led to a determination of contributing to a trend for federal listing or would cause a loss of viability to the population or species. Because of the limited proximity of activities to aquatic resources and mitigation, page 153 of the DEIS discloses there would be **"No Impact"** on the Crater Lake Tightcoil snail.

Comment: ***The Northern goshawk would lose 3,301 acres (alternative B) to 4,499 acres (alt. C) of potential nesting habitat to commercial thinning (including the removal of large potential nest trees over***

21 dbh). Cooper's hawk would lose 1,536 acres (alt. B) to 3,665 acres (alt. C) of potential nesting habitat and Sharp-shinned hawk would lose 1,438 acres (alt. B) to (unreadable refer to letter) acres (alt. C) of potential nesting habitat. It's important to consider the effects of these losses of potential nesting habitat on the viability of these species' viability cumulatively, due to many other losses of their nesting habitat from past and planned timber sales and past and future wild fires, yet the DEIS fails to adequately analyze potential losses to populations or possible extirpations of species locally and regionally with these continued threats. (#6 - 5)

Response: Direct, indirect, and cumulative effects to the northern goshawk are disclosed on pages 135-139 of the DEIS and on pages 143-146 for the sharp-shinned and Cooper's hawks. The analysis concluded there would be a loss of nesting habitat for each species. However, research publications cited in the analysis indicate all three species use a variety of foraging habitat types. Wisdom et al. (2000) stated the long-term maintenance of goshawk foraging areas is as important for successful reproduction as protection of the immediate nest stand. Wisdom also recommended that a variety of cover types and structural stages be included in the home range of each active nest (DEIS, page 137). The cumulative effects section for each species acknowledged the loss of nesting habitat on the Crescent Ranger District and Deschutes National Forest from past commercial timber harvest and wildfires. Breeding bird survey data indicate there was insufficient data to determine goshawk population trends within any state or physiographic province in the Interior Columbia Basin (Wisdom e t al,. 2000) and sharp-shinned and Cooper's hawks are considered S4, apparently secure (Natureserve, 2004). However, it is expected that populations of these three species have declined as a result of wildfires on the Deschutes National Forest over the last 6 years. In consideration of habitat loss from recent fires, the Five Buttes project would maintain a well distributed network of nesting habitat within unthinned portions of each treatment unit and within suitable lands not scheduled for treatments. In addition, the silvicultural and fuels treatments planned have been designed to reduce the risk of large-scale loss of mature forest which will help maintain habitat for this group of species.

Comment: ***This project fails to address cumulative loss of owl habitat, population trends that fail to meet Northwest Forest Plan goals, and harmful logging in spotted owl LSR areas in violation of the NEPA, ESA, and NFMA.*** (#13 - 3)

Response: There is a discussion on the cumulative loss of owl habitat on pages 110-113 of the DEIS.

Comment: ***The DEIS owl analysis fails to adequately address and incorporate new information (spotted owl new information, including: barred owl competition, West Nile Virus, Sudden Oak Death syndrome, wildfire effects, climate change, overly aggressive fuel treatments, and the 9th Circuit opinion about the important role of critical habitat in spotted owl recovery (not just avoiding jeopardy)). While the DEIS refereed to some of the new information about the owl, the DEIS analysis and alternatives fall short of the thorough programmatic NEPA required analysis that this significant new information warrants. The Forest Service plans fail to acknowledge the obvious: that all remaining suitable owl habitat is clearly far more important than realized in 1994 and must be protected and conserved to achieve spotted owl recovery goals and Northwest Forest Plan (NWFP) objectives.*** (#13 - 4)

Response: The Davis Fire, recent findings regarding loss of NSO habitat in dry forests, and comments from some conservation groups and federal regulatory agencies prompted the Forest Service to take action as it was apparent that the remaining spotted owl habitat on the Deschutes National Forest was at an elevated risk to another wide-scale disturbance. The 1992 and 2007 draft recovery plans identified threats to the northern spotted owl:

Barred owl: Although barred owls have been documented to occur on the Crescent Ranger District, there are no known pairs. There is also no evidence that spotted owls have been displaced from their territories by barred owls (DEIS, page 100). Implementation of the action alternatives would not result in habitat fragmentation that could contribute to an increase in barred owl occupancy in the project area.

West Nile virus: One captive spotted owl in Ontario, Canada contracted west Nile virus and died, but there are no documented cases of the virus in wild populations (Draft Recovery Plan, USFWS, 2007). Health officials expect west Nile Virus will eventually spread throughout the range of the spotted owl (Blakesley et al, 2004 in USFWS Draft Recovery Plan, 2007), but it is unknown how the virus will ultimately affect spotted owl populations. This factor is beyond the scope of the Five Buttes analysis.

Sudden Oak Death Syndrome: Sudden oak death syndrome has no host species located in the project area that would facilitate its establishment and spread.

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 project area. Some of the species in the project area, such as the pines, are well adapted to warm dry growing seasons, while other species do well in cool wet conditions. Hence, regardless of the climatic changes, a full suite of species remaining on the project area ensures adaptability for a wide range of climatic conditions (DEIS, page 67).

Additional discussion on the effects of West Nile Virus, Sudden Oak Death, climate change, and barred owl competition on northern spotted owls has been added to the FEIS.

Comment: ***[Re: DEIS p. 100] "Barred owls have been documented in the project area for at least 10 years including individual responses while conducting northern spotted owl surveys, unsolicited while conducting other avian species surveys, and from random observations. As of late-summer 2006 there were no known barred owl pair territories in the project area or entire Crescent Ranger District."***

Logging spotted owl NRF habitat could be expected to increase competition from more fragmentation tolerant Barred owls yet this combined impact is not analyzed. (#16 - 33)

Response: See response to comment #13-4 above regarding the barred owl and other threats to the northern spotted owl.

A discussion on fragmentation is provided on pages 211-213 of the DEIS. It states there is no regeneration timber harvest proposed in the Five Buttes Project, or within actions listed in Table 3-1 (cumulative effects) on page 35, that would result in forest fragmentation. All Forest Service managed lands in the project area would remain as forested habitats because no lands are being converted to non-forest uses with the exception of the short-term temporary road construction. At the completion of management activities, the temporary roads would be subsoiled and allowed to revegetate.

Comment: ***Alternative C provides better protection for late successional forests and occurrences of the northern spotted owl and other sensitive species habitat conditions through the reduction in threat from unnaturally severe fires, as well as through proposed commercial thinning. There is less impact to nesting, roosting, and foraging habitat, and would improve foraging accessibility to the forest floor for prey capture.*** (#14 - 4)

Response: No response necessary.

Comment: ***Alternative B & C are both unacceptable - Destroying this (precious & unique Wild area with critical habitat to many threatened & endangered species with extreme logging of ancient forests is highly inappropriate.*** (#1 - 1)

Response: No response necessary.

Comment: ***We [Blue Mt. Biodiversity] believe that, in general, the action alternatives would violate the Endangered Species Act and the Northwest Forest Plan regarding needed habitat protection for Northern Spotted owls.*** (#16 - 20)

Response: Vegetative management actions planned with the Five Buttes project are consistent with existing direction for the Deschutes National Forest Land and Resource Management Plan as amended by the Northwest Forest Plan and also comply with the Endangered Species Act. Formal consultation with the U.S. Fish and Wildlife Service has occurred based on projected effects to federally listed wildlife species and designated critical habitat. A Biological Opinion on the Five Buttes project was received from the U.S. Fish and Wildlife Service that concurred with the effects determinations and that no jeopardy would occur to listed species.

Comment: ***. . . all suitable Spotted owl NRF habitat should be dropped from logging because it is identified and designated NRF habitat for a listed species in decline in the project area.*** (#16 - 17)

Response: See responses to comments #17-8 and #16-20 above.

Comment: ***You are violating the objective of "development, maintenance and enhancement of wildlife habitat conditiions appropriate for management in areas specified in the Northwest Forest Plan" by eliminated identified and designated Northern Spotted owl nesting, roosting, and foraging habitat.*** (#16 - 15)

Response: See responses to comments #16-7, #16-20 above, and #17-8 regarding the strategy to cycle NRF around the landscape. The vegetation management actions planned with the Five Buttes project are consistent with the Northwest Forest Plan and the Davis Late-Successional Reserve Assessment. Consistency with the Northwest Forest Plan is disclosed on page 320 of the DEIS.

Comment: ***It was unreasonable and arbitrary not to consider and analyze in depth the "alternatives considered but eliminated from detailed study": deferring all active management from Northern Spotted owl NRF habitat . . .***

Regarding the deferment of Spotted owl NRF habitat from logging eliminated alternative, where's the proof that long-term risks from natural disturbance agents are at "uncharacteristically severe levels"? This does not take into account the greater moisture retention in mixed conifer forests from greater shading and deeper, longer-lasting snows at higher elevations, or the greater natural density, longer fire return intervals, and natural susceptibility to stand replacement fire of these forest types. . . .

There is inadequate reason given not to consider this as an alternative; fire risk reduction should not override all other considerations, including Endangered Species Act (ESA) requirements. Elimination of existing suitable habitat is still an impact to existing and future owls. The Northern Spotted owl is not in a good position to wait for logged-off suitable habitat to recover into suitable habitat again 20-50 years later (generations of Spotted owls from now.) (#16 - 22)

Response: See response to comment #16-1 regarding the selection of alternatives considered but not fully analyzed. Current vegetative trends in the project area are discussed on DEIS, pages 64-66. This includes discussion and a table (Table 3-13, page 65) on plant associations, resilience to disturbance events, and a time period of relevance, all of which show that long-term risks from natural disturbances are at "uncharacteristically severe levels" (also see responses to comments #16-4 and #16-24). Pages 27-28 of the DEIS disclose that deferring all active management from spotted owl habitat was an alternative considered but eliminated from detailed study. Supporting information for that decision is provided on DEIS, page 28.

Comment: ***[Re: DEIS p. 103] " . . . Underburning objectives . . . Small rodents including woodrats that build surface nests are more vulnerable to fire-caused mortality."***

The cummulative effect to spotted owl prey base [is] not analyzed . . . [there is] direct mortality from underburning to spotted owl prey base. (#16 - 34)

Response: Page 103 of the DEIS discloses underburning operations would change the amount of small diameter wood less than or equal to 3 inches in diameter within activity units and may effect the shrub and small tree layers. Mitigation measures and project design features were designed to avoid special features such as rock outcroppings in part to maintain habitat for NSO prey. Also, snags and large down wood would be retained with the exception of unit #370 where some salvage of down lodgepole is proposed to reduce wildfire risk to Maklaks Mountain and an occupied spotted owl territory; and as necessary for occupational safety, which is characterized as incidental (DEIS, page 198). Outside of NSO home ranges, prescribed burning would be accomplished in a mosaic pattern with unburned areas within the burn in addition to designated leave area (page 23) No prescribed burning would occur inside the home ranges.

Comment: ***[Re: DEIS p. 105] "Regular commercial thinnings and underburning activity would be used on an as needed basis to maintain the desired habitat components for bald eagles. This would be an expected long-term conversion of spotted owl NRF habitat to mostly single-storied late-seral habitat for nesting bald eagles. Pockets of multi-storied late-seral stands however would be maintained for eagle winter roosting habitat within the 15 percent retention areas and those stands not selected for commercial thinning as part of this project analysis. The single-story late-seral stands would function as dispersal spotted owl habitat for the foreseeable future. At the present time there are no known spotted owl activity centers on the north side of Davis Mountain so this would not impact known owl pairs or territorial single birds."***

This could impact known owl pairs or single birds by removing potential habitat and lessening the total amount of suitable NRF habitat available, preventing the strengthening and expansion of the species population intended by the ESA for moving toward de-listing. This loss of NRF could lead over time to exptirpation and up-listing to Endangered. (#16 - 35)

Response: The bald eagle is currently listed as a federally threatened species although a decision to delist is expected in July, 2007. Regardless of the outcome, bald eagle habitat management direction is also provided by the Deschutes LRMP.

One of the strategies for Alternative C was to retain additional NRF acreage on the north side of Davis Mountain. This would allow for immediate occupancy by a new pair of owls.

The Five Buttes project follows a larger plan which is the Davis Late-Successional Reserve Assessment (available on file at the Crescent Ranger District). It specifies a strategy for cycling habitat around the landscape. With the recent loss of over 5,000 acres of NRF habitat and two owl territories, the strategy for the LSR has changed to a more strategic active management scenario. The desired condition is to manage at least 60 percent of the remaining unburned area toward a climatic-climax condition through time maintaining at least 25 percent in NRF habitat. This requires a landscape-scale strategy to cycle in and out of NRF habitat while maintaining the large tree component throughout the cycle. The cycling from non-NRF to near NRF to NRF across the landscape over time would reduce risk to large and contiguous blocks of habitat to disturbance processes. Part of this strategy is to incorporate the drier and more strategic sites for risk reduction in an open condition benefiting bald eagles and white-headed woodpeckers. This strategy would maintain NRF habitat for northern spotted owls over time while reducing threats from wide-scale disturbance processes.

Single-story late-seral stands created in key locations for the bald eagle would function as dispersal spotted owl habitat for the foreseeable future. These activities would occur outside known spotted owl home ranges. See page 91 of the DEIS for a discussion on the effects to Threatened and Endangered species.

Comment: ***Another failure to disclose relevant information and example of inadequate analysis is the neglecting to mention that the Davis Fire just opened up a very large area to re-seeding by Ponderosa pine and Douglas fir and that these species are being re-planted there, eliminating any need to open up naturally mixed conifer forest to single story Ponderosa pine and Douglas fir, as is proposed for within Bald Eagle Management Areas.*** (#16 - 19)

Response: See response to comment #16-35 above regarding the strategy for cycling northern spotted owl habitat and incorporating single story stands (bald eagle habitat) in strategic places.

Comment: ***The DEIS also admits to planning to convert existing multiple canopy Spotted owl NRF habitat to single story Ponderosa pine and Douglas fir "bald eagle nesting habitat" even though Bald eagles are far less threatened with extinction at this point than Northern Spotted owls. Alternative B would eliminate 2,822 acres of Northern Spotted owl NRF habitat and Alt. C would eliminate 2,106 acres of NRF habitat through commercial logging and alt. C would eliminate a further 1,148 acres pf NRF habitat through fuel reduction. Neither alternative is acceptable. (See Tables 3-29 and 3-30, DEIS p. 105). Spotted owl dispersal habitat would also be degraded in both action alternatives. Both action alternatives "would change spotted owl constituent habitat elements (nesting, roosting, foraging and dispersal) in the short-term (sic: 20-50 years!). . . Therefore the determination is that implementation of Alternative B or C would result in a "May Effect, Likely to Adversely Affect" (sic) determination due to loss of critical habitat unit viability. (DEIS pp. 112-113).*** (#6 - 9)

Response: See response to comment #16-35 above. Management direction for bald eagle habitat is provided by the Deschutes Land and Resource Management Plan through the designation of Bald Eagle Management Areas (BEMAs). In addition, site-specific management plans have been prepared for the BEMAs. Habitat objectives within BEMAs include maintaining a mix of late and old structured (LOS) ponderosa pine and Douglas-fir of single-story and multi-storied stands. While both single- and multi-story LOS stands can provide nesting habitat, there is less risk of large tree loss to fire or stand density competition in single-story stands. For that reason a mix is preferred to include single-story for nesting purposes and some multi-storied stands to serve as eagle roosting habitat.

The discussion of acres of NRF habitat treated by commercial thinning and acres of fuels only treatment of NRF within matrix lands, the Davis LSR, and Critical Habitat Unit CHU OR-7 is disclosed on pages 104-113 of the DEIS. The effects also describe how actively treated stands would be used by spotted owls (foraging or dispersal habitat) and how long it will take to return to a NRF habitat condition. Fuels treatments within NRF stands planned in Alternative C are described on pages 107 and 108. Fuels treatments within NRF habitat will still function as NRF habitat when completed. The U.S. Fish and Wildlife Service is supportive of this project, has concurred with the spotted owl effects determination, and no jeopardy would result as stated in the Biological Opinion for the Five Buttes project. Only the USFWS can make a jeopardy determination.

Comment: ***The DEIS also admits to planning to convert existing multiple canopy Spotted Owl NRF habitat to single story Ponderosa Pine and Douglas Fir "bald eagle nesting habitat", even though bald eagles are far less threatened with extinction at this point than Northern Spotted Owls.*** (#5 - 5)

Response: See responses to comments #16-35 and #6-9 above.

Comment: ***[Re: DEIS p. 107, Alternative C, NRF] "The selection of alternative C would result in the commercial thinning of 2,106 acres (11 percent) and the pre-commercial thinning only (<3" dbh) of 1,148 acres (6%) of the NRF habitat within the project area. "***

We [Blue Mt. Biodiversity] request no commercial thinning of NRF habitat, no conversion to single story stands in the BEMAs that are also spotted owl NRF habitat - Alt. C PCT [Pre-commercial thinning] is acceptable. (#16 - 38)

Response: See response to comment #16-35 above and the strategy to cycle NRF around the landscape over time (response to comment #17-8).

Comment: ***[Re; DEIS p. 107] "Unit #370 is proposed to have a single story commercial thin prescription to remove some of the overstory lodgepole pine. This stand would be defined as dispersal habitat and should remain dispersal post-harvest though at the 30 percent canopy cover level.***

None of the commercial thinning or salvage proposed should have a negative short- or long-term impact on either spotted owl pair because the current habitat capability would still remain after the completion of completion of harvest activities. "

But 30% canopy closure and less than high density canopy does not meet standard definitions of suitable NRF and would represent degraded dispersal habitat - spotted owls could be subject to overhead predation by larger raptors. (#16 - 37)

Response: Active management in unit #370 is very important to the overall landscape strategy to reduce the risk to the adjacent home range upslope. Further reconnaissance has determined this stand does not currently provide dispersal habitat; this information has been added to the FEIS and acre estimates have been adjusted accordingly. Proposed activities would accelerate attainment of dispersal habitat by allowing the understory to grow free of competition. It is estimated it would be 30 years before the stand would provide the necessary canopy structure. Without active management, this timeframe could be much longer.

Comment: ***[Re; DEIS p. 107] "Activity unit #440 (55 acres) is near the outer edge of the Hamner Butte home range and is currently described as foraging and dispersal habitat. . . . Unit #370 is proposed to have a single story commercial thin prescription to remove some of the overstory lodgepole pine."***

Drop Alternative B units 440 and 370 in Hamner and Maklaks home ranges. (#16 - 36)

Response: See response to comment #16 – 37 above regarding proposed management activities in unit #370.

Comment: ***[Re: DEIS p. 110.] "Mushrooms are an important forage base for the northern flying squirrel and the squirrel is the primary prey for the northern spotted owl. "***

Control and monitor mushroom gathering for sustainability. (#16 - 39)

Response: There is no fungi harvesting allowed within the Davis LSR. The discussion on page 295 of the DEIS is for areas outside the LSR; therefore the northern spotted owl and its forage base should not be affected. Fungi collection is monitored through the permit process and on the ground contact.

Comment: ***The DEIS has inadequate analysis in many areas, including its failure to analyze the impacts of proposed logging--particularly to Spotted owl viability and the viability of other listed species, failure to consider the difference between theoretical speculative risk of fires (or insects, disease, the usual litany of natural disturbance "threats" to the forest) versus the actual impacts of proposed logging to the forest, wildlife, soils, etc. For instance, there is suitable N. Spotted owl habitat there now that Spotted owls have used that would be eliminated as NRF habitat available for use through logging, based on the speculative risk of fire removing it later. Further, there is no guarantee that the logging proposed would protect the habitat from fire, though it is certain that the logging will eliminate its usefulness as NRF habitat for Spotted owls.*** (#16 - 7)

Response: See response to comment #17-8 regarding the strategy to cycle NRF on the landscape. A full disclosure of direct, indirect, and cumulative effects to federally listed and federal candidates for listing wildlife species is provided on pages 91-125 of the DEIS. This includes discussion on the spotted owl and its habitat within the project area. A Biological Assessment was also written and submitted to the U.S. Fish and Wildlife Service for formal consultation. A Biological Opinion from the U.S. Fish and Wildlife Service concurred with the effects determinations and concluded that project actions would result in no jeopardy to the northern spotted owl or critical habitat.

The Fire and Fuels section of the DEIS shows the potential effectiveness of silvicultural and fuels treatments in reducing loss of late successional habitats to a large severe wildfire. Models provided a way to quantify potential habitat loss from natural disturbances such as wildfire. This allowed a quantitative comparison of the risk of habitat loss by the different management alternatives. Fire modeling results show less impact to spotted owl home ranges as a result of planned management actions in Alternatives B and C as compared to the no-action Alternative A. The 21,000 acre Davis Fire of 2003 provided conclusive evidence that a catastrophic loss of wildlife habitat could occur in the project area. The Davis Fire resulted in the loss of over 5,000 acres of spotted owl NRF habitat including one entire owl home range and impacting several others.

Comment: ***According to the DEIS, all alternatives including the No Action Alternative "May Affect, and are Likely to Adversely Affect" the northern spotted owl and designated critical habitat. (DEIS p. 91). It seems incredibly ridiculous (and illegal) that the no-action alternative will "likely adversely effect" spotted owls. According to the DEIS, this determination was made because "the lack of risk reduction work may result in large tree loss at some point in the future whether to wildfires or beetle outbreaks relates to drought or tree density competition." (DEIS p.102). The Forest Service cannot base a "likely to adversely effect" determination solely on the hypothetical occurrence of a natural event. This characterization of the no-action alternative is misleading and illegal.***

What is know[n] is that the project area currently functions as spotted owl habitat, and that the proposed activities will degrade the habitat for upwards of fifty years. "Heavier thins.. .could return to NRF conditions in an estimated 3-5 decades depending on the amount of understory trees left and their growth response to the thinning. Lighter thinning in NRF stands allows the treated stand to recover to a NRF condition in a shorter time frame, perhaps in 2-3 decades depending on site conditions and the ability of the understory to respond to thinning with increased tree height and crown diameter." (DEIS p.102). (#17 - 12)

Response: Alternatives B and C were determined to have adverse effects to the northern spotted owl and critical habitat as a result of conducting active management (commercial thinning) on nesting, roosting, and foraging (NRF) habitat. The May Effect, Likely to Adversely Affect determination for Alternative A (no action) is not illegal. The selection of the no action alternative would not change the current level of risk to wide-scale loss of late and old-structured forest to a disturbance process, as evidenced by the Davis Fire. Insect outbreaks in the Santiam Pass area and other places on the Deschutes National Forest, in addition to numerous recent wildfires (Davis, B&B, Cache Mountain, Eyerly, Link) are not hypothetical occurrences of wildlife habitat loss. Although modeling cannot accurately predict when the next wide-scale disturbance from wildfire will occur on the Crescent Ranger District and the Deschutes National Forest, given the past history and condition of the forest, it is likely in the future. Risk reduction activities planned for the Five Buttes project are designed to lessen that risk and ultimately lessen the severity to the remaining wildlife habitat.

Comment: ***Although the Five Buttes Project proposes to manipulate forest stands that currently provide suitable habitat for the spotted owl, we believe that the Preferred Alternative of this project could provide long-term benefits to spotted owl habitat at a landscape level. Since the Five Buttes Project may affect the spotted owl, consultation pursuant to section 7 of the Endangered Species Act is needed. The Department [DOI] supports the efforts of the Deschutes National Forest to reduce the risk. Of further loss of late-seral forests while accelerating the development of early and mid-seral forest that may support the spotted owl in the future.*** (#4 - 2)

Response: No response necessary.

Comment: ***There have been an inadequate range of alternatives offered for this project. I believe that the alternatives given are all unacceptable for this planning project, for the following reasons:***

There have been inadequate considerations given in any of these proposed alternatives to the impact on federally listed endangered species. For instance, a 20-50 year recovery period is given for the spotted owl habitat that will be destroyed with this sale, for any of the alternatives offered. There are numerous other endangered and threatened species within and around this sale area, and the admitted taking of the habitat of all of these flora and fauna species is also unacceptable. There are many rare and sensitive and survey and manage species in this area as well that will be negatively impacted by the proposals with any proposed alternative, and the habitat on which they depend should not be destroyed. (#5 - 1)

Response: See response to comment #5-2 regarding the range of alternatives. Effects to federally listed species is disclosed on page 91 of the DEIS. The Davis Fire significantly removed habitat for several federally-listed species, therefore this landscape-scale strategy is to cycle in and out of habitat while maintaining the large tree component throughout the cycle. The cycling from non-NRF to NRF across the landscape over time would reduce risk to large and contiguous blocks of habitat disturbance processes. In addition, effects to Survey and Manage species are disclosed on page 146 of the DEIS.

Comment: ***. . . it is stated in the DEIS that the Deschutes National Forest Management Indicator species most likely to be harmed by the Five Buttes Project include the Northern Spotted Owl, Northern Bald Eagle, American Marten, Northern goshawk, Cooper's hawk, Sharp shinned hawk, elk and mule deer. The amount of land each species would lose is obviously unacceptable, and the situation regarding the Spotted Owl is most egregious; this taking alone makes this sale horrific, accentuated by the prediction that this vital habitat won't soon (within 30-50 years for one alternative, 2-3 decades for another) be returning to the current Nesting Roosting and Foraging (NFR) conditions that are known to be necessary to sustain communities of Northern Spotted Owl.*** (#5 - 4)

Response: The direct, indirect, and cumulative effects to this group of Deschutes National Forest Management Indicator Species has been disclosed in Chapter 3 of the DEIS under the following wildlife section: Page 91 Threatened and Endangered Species section (spotted owl and bald eagle); page 134 Management Indicator Species section (goshawk, Cooper's hawk, and sharp-shinned hawk); page 168 Big Game (deer and elk), and page 178 Snags and Down Wood (American marten).

Comment: ***Northern Spotted owl and American marten would both be threatened by loss of old growth habitat and denser, complex forest structure. Northern Bald eagles risk loosing large potential nesting and roosting trees through logging of the Wickiup and Davis Bald eagle Management Areas (345 to 475 acres under the two action alternatives) with no diameter limit specified for logging.*** (#6 - 6)

Response: See responses to comments #6-8, (below), #16-7, and #16-20 pertaining to the northern spotted owl. Management direction for bald eagles is provided in the Deschutes National Forest Land and Resource Management and site-specific BEMA plans (see response to comment #6-9). Responses to comments #6-13 and #16-9 provide rationale when live trees greater than 21 inches in diameter may need to be removed and under what circumstances.

Implementation of the Five Buttes project will not result in the loss of any old growth habitat although commercial thinning will occur in late and old-structured (old growth) forests. The primary emphasis is removing some of the understory trees which will lessen the risk of a problem wildfire and/or lessen the risk of high levels of mortality from bark beetle attacks to the overstory trees. With the exception of unit #370, there is no proposal to remove dead and down wood and snags are not proposed for removal except those deemed to be an occupational safety issue (such snag removal has been characterized as incidental). Also see response to comment #16-44 pertaining to marten habitat.

Comment: ***Elk and deer would both lose thousands of acres of thermal and hiding cover under both action alternatives (see Table 3-49 on pages 172-173 DEIS.) Alternative C would also reduce both thermal and hiding cover in the Maklaks Key Elk Area (Table 3-50, p. 173.)*** (#6 - 7)

Response: None of the Subwatersheds would fall below the 30 percent hiding cover levels recommended in the Deschutes LRMP, page 176. Active management would provide a balanced habitat condition for deer and elk on their summer range. There are no silvicultural or fuels treatments planned for the Davis KEA (Key Elk Area) in either action alternative. There is one proposed fuels treatment unit in Alternative C that would enter the Maklaks KEA. Approximately 25 acres of small tree thinning less than 6 inches in diameter would occur in the very northwest tip of the Maklaks KEA. Because leave tree spacing may range from 15-20 feet, the hiding and thermal cover capability would be removed and the stand would function more as a foraging area for big game post-harvest. This may result in the long-term loss of hiding and thermal cover if repeated entries are made in this same piece of ground to keep a reduced fire risk along the Odell Creek drainage. Even though 25 acres are converted to foraging habitat, hiding and thermal cover acreages in the KEA still greatly exceed the minimum levels specified in the LRMP. There would be no long-term negative impact on elk with this proposal. There are no treatments planned in Alternative B for the Maklaks KEA (DEIS, page 176).

Actions designed in Alternatives B and C would have a net benefit to deer habitat. Because the project purpose and need is to reduce the risk of large-scale forest loss to insects, tree diseases, and wildfire, the proposed activities would be consistent with managing big game habitats for the long-term. Maintaining a well distributed mix of forage and cover blocks for the long-term in each subwatershed is a desired objective, as is reducing risk of losing these habitat components in a large event similar to the Davis Fire. For example, the Davis fire created over 16,000 acres of early-seral habitats mostly in one consolidated block extending from south of Davis Lake northeast to the south side of Wickiup Reservoir (page 175, DEIS).

Comment: ***Given the rapid continued decline of Northern Spotted owls in the Northwest and their declining presence in the Five Buttes sale area, with past and ongoing cumulative habitat fragmentation and degradation from past and future commercial logging and wildfires (most recently the Davis Fire), this looks suspiciously like a Spotted owl extirpation plan for the Five Buttes area in violation of the Endangered Species Act. The DEIS admits that planned "(h)eavier thins . . . Could return to NRF conditions in an estimated 3-5 decades" and "lighter thinning in NRF stands allows the treated (sic) stands to recover to a NRF condition . . . Perhaps in 2-3 decades". It is our opinion, based on the evidence of Spotted owl decline and habitat loss in the Five Buttes area that the Spotted owls can't wait 20-50 years to get their lost nesting, roosting and. foraging habitat back.*** (#6 - 8)

Response: The Davis Fire, recent findings regarding loss of NSO habitat in dry forests, and comments from some conservation groups and federal regulatory agencies prompted the Forest Service to take action as it was apparent that the remaining spotted owl habitat on the Deschutes National Forest was at an elevated risk to another wide-scale disturbance. See the response to comment #17-8 regarding the strategy for cycling NRF on the landscape. The commercial thinning intensities planned for NRF habitat in the project area are all designed to retain the largest diameter trees and typically the more fire resistant species within the stands because they take the longest time to regenerate. Based on modeling, the return to NRF conditions will take 2-5 decades depending on the thinning intensity prescribed and how quickly canopy cover re-establishes to meet a NRF habitat definition. There is no commercial thinning of NRF habitat proposed within an occupied spotted owl home range; all other thinning within these areas would be small-diameter (3 inches and less) and stands would remain in NRF condition following activities. While NRF stands will be converted to foraging or dispersal habitat for several decades it does have the capability to return to NRF habitat and could serve as future NRF replacement habitat if a fire or disease event results in high mortality to an existing or multiple spotted owl home ranges. We believe this strategy provides a reasonable approach to maintaining NRF habitat across the project area for the short- and long-term.

Comment: ***On page 15, the DEIS says that some important habitat for the Northern Spotted Owl proposed for active management in Alternative B is deferred for the foreseeable future. Instead, Alternative C places non-commercial fuel treatments around these areas. AFRC points out this was the failed strategy on the Sisters Ranger District that led to the loss of several known owl sites in the Cache Mountain Fire. It was also the same strategy for the Nesting-Roosting-Forage (NRF) habitat around Round Lake, also on the Sisters Ranger District that led to the total loss of that habitat to fire (the B&B Complex).*** (#7 - 4)

Response: No response is necessary.

Comment: ***The Forest Service still does not have a new snag habitat method to replace the discredited potential population method. The Forest Service must follow NEPA and NFMA procedures in considering alternatives and adopting new standards for snag habitat. The Forest Service cannot rely on the 2001 S&M ROD that eliminated the requirement to retain snags over 21" dbh for white-headed woodpecker, black-backed woodpecker, and flammulated owl, and pygmy nuthatch, because this change was made on an erroneous assumption that the potential population method is scientifically valid, which it is not.*** (#13 - 13)

Response: The Five Buttes project meets or exceeds standards given in the amended LRMP and the 2007 Davis LSRA. The design criteria common to all alternatives is to leave all existing snags greater than 9 inches in diameter except those that pose a hazard (DEIS, page 22). The Five Buttes project seeks to manage snags and down wood habitat at various densities across the landscape utilizing a reference condition based on the historical range of variability as described in the DEIS on page 182. Managing within the historical range would provide for those species that survived to the present with those densities meeting NFMA objectives. The best available data on dead wood relationships to wildlife habitat was used in the form of DecAID, and local data sets. Effectiveness monitoring is ongoing in terms of research and DecAID will be continually updated with the new science as it becomes available. As this information is updated, management will adapt to the new information. This project demonstrates the Forest Service commitment to adaptive management to meet the needs of wildlife. NEPA requires a disclosure of effects of federal actions. The direct and indirect effects of implementation of the alternatives on snag habitat are disclosed in Chapter 3 of the DEIS on pages 196–206. The cumulative effects follow on pages 206-209. The effects analysis is based on habitat needs determined by the best available science.

Comment: ***[Re: DEIS p. 181] "Tolerance level (t.l.) is the percent of a population that would use a density of snags or down wood cover percentage. For example, the following table [Table 3-52, DEIS page 181] shows the tolerance levels for white-headed woodpeckers. For a population of 100 individual white-headed woodpeckers, at the 80% t.l., 80 of them would use habitat with at least 3.7 snags per acre greater than or equal to10 inches dbh.***

Tolerance intervals were used to determine habitat levels in the planning area. A tolerance interval includes the range of snag density between tolerance levels. Using the example below, the 30-50% tolerance interval would be habitat with at least 0.3 snags per acre and less than 1.7 snags per acre. "

DecAid tolerance levels were not intended to indicate or guarantee species viability and are speculative, not based on real world empirical data. Also a theoretical 30-50% tl may not be enough to ensure species viability in the area. (#16 - 41)

Response: DecAID tolerance levels are based on real world scientific peer-reviewed data. It is a statistically valid compilation of the best, most current (to Jan. 2006) available science on dead wood relationships to wildlife habitat. The website that fully describes what is in DecAID (DEIS, page 182) and how the information was developed is found at: **www.fs.fed.us/wildecology/decaid/decaid_background/decaid_home.htm.** Caution of using DecAID information gained from a single study is discussed (DEIS, page 181). "Tolerance levels do not equate to population potential, nor imply viability, but they are assumed to provide habitat at varying snag densities." (DEIS, page 181) Table 3-52 (DEIS, page 181) is, as the document states, an example of a table from DecAID to explain tolerance levels, not as a measure of management. Habitat was not managed at the 30-50% ti. The analysis process (DEIS, pages 179-182) describes how DecAID and tolerance levels in conjunction with other information was used in the analysis. Tolerance levels were not used in the Five Buttes project analysis as a measure of species viability. It was used in determining habitat levels in a quantitative manner and a factor that could be modeled over time. Additional habitat factors needed for species viability were taken into account in a more qualitative manner. Used the same for all alternatives it is a means for comparing alternatives. Snag habitat is not proposed to be managed at any given tolerance level but as varying densities across the landscape moving toward the reference condition (DEIS, page 182). No snags greater than 9" dbh are to be removed except for safety during logging operations. Those felled for safety reasons would be left for down wood (DEIS, page 22). See also responses to comments #13-13, #16-14, and #16-42 which follows.

Comment: ***[Re: DEIS p. 186 Table 3-54]***
Dearth of snags over 20" dbh across 81% of the landscape indicates a need to retain more live trees >21" dbh to replace missing snags across the landscape, not log more trees over 21"dbh as planned. (#16 - 42)

Response: Table 3-54 (DEIS, page 186) displays 81 percent of the PP/DF habitat type does not have snags. Figure 3-21 (DEIS, page 184) also shows that 81 percent of the PP/DF habitat type has no snags and is outside the reference condition (67-75 percent of the landscape) by 6 percent. It also shows that the higher densities in this habitat type, 6 snags per acre and greater, are above reference conditions by 12 percent. So, for PP/DF habitat, while more ground has no snags, there are greater densities where snags exist. The analysis also shows (DEIS, Table 3-62, page 202) over time the density and distribution of snags greater than 21 inches in diameter increase and the percent of area absent of snags this size will decrease. While the effects of removing live trees over 21" dbh have been covered in the analysis (DEIS, pages 102, 117, 160), the design criteria were not included in the DEIS, but have been added to the FEIS. The design criteria added to the FEIS includes the following:

"Areas with an excess of basal area in large trees (generally over 21 inches in diameter) may need to have some of those trees removed to meet biological objectives. If so, trees to remove should be selected in such a way that:

- They don't have the crown or the physiological characteristics to be useful to wildlife or to be able to respond to thinning.
- They have numerous other larger suitable trees nearby that can remain to meet long-term objectives.
- They do not appear on the verge of imminent mortality so as to contribute to snag densities in the short term (this is a consideration in areas where snag numbers are low).
- Trees of high value to wildlife should remain on site. Examples include, but are not limited to, true fir with conks that would indicate a future hollow log, non-lodgepole trees with multiple tops, trees with very large limbs, etc."

See also responses to comments #13-13 and #16-41 (above) and #16-14.

Comment: ***[Re: DEIS p. 178] "Stand structure often influences species that utilize snags. Frenzel (2002) noted snag density may be less important for white-headed woodpeckers than other woodpeckers since they forage mostly in live trees. He found the mean snag densities at nest sites to be 1.5 trees per acre. Nesting success was greatly influenced by the number of large green trees available at the nest site; specifically there was greatest success in stands where there were 12 ponderosa pines per acre greater than 21 inches diameter. Development of dense understories due to fire suppression is one cause of reduced white-headed woodpecker habitat (Frenzel 2002). "***

Whiteheaded woodpeckers need more OG [Old-growth] PP[Ponderosa pine] more than 21" dbh per acre [which is a] reason not to log over 21". (#16 - 40)

Response: White-headed woodpeckers do need more OG PP habitat. Five Buttes project proposes to convert multi-storied habitat to the single storied open OG PP habitat that white-headed woodpeckers prefer (551 acres Alt B, 330 acres Alt C DEIS, page 200). High tree densities stress large ponderosa pine making them vulnerable to insects and disease or problem fire (DEIS, pages 66, 67-74). Reducing tree densities enhances the survival of the remaining ponderosa pine. Harvesting trees >21" dbh in very specific cases is part of the density control needed. While the effects of removing trees >21" dbh have been covered in the analysis (DEIS, pages 102, 117, 160), the design criteria were not included in the DEIS, but have been added to the FEIS. Harvest would not reduce the number of PP greater than 21" dbh below 12 per acre. Fuels and fire treatments and maintenance post-harvest would reduce understory densities and maintain open white-headed woodpecker habitat. See example Figure 3-9 on DEIS page 74.

Comment: ***[Re: DEIS p. 187] "There was approximately 61,800 acres of mixed conifer habitat across the project area. This habitat type varies greatly across the planning area from drier, less productive sites that tend toward ponderosa pine-dominated stands, to wetter more productive sites with multiple fir species present in higher densities."***

This difference should be recognized and wetter sites not thinned. (#16 - 43)

Response: See response to comment #17-8. The 21,000-acre Davis Fire experienced stand replacement in approximately 80 percent of the fire area and it was composed mostly of the mixed conifer plant association group. The Five Buttes project is consistent with the Davis LSRA in which the desired condition is to manage at least 60 percent of the remaining unburned area toward a climatic-climax condition through time maintaining at least 25 percent in NRF habitat. This is a landscape-scale strategy to cycle in and out of NRF habitat while maintaining the large tree component throughout the cycle. The cycling from non-NRF to NRF across the landscape over time would reduce risk to large and contiguous blocks of habitat to disturbance processes. The objective is to provide habitat for the spotted owl, which is relatively the most vulnerable to disturbance processes.

Comment: ***Lynx habitat and dispersal habitat for Canada Lynx should also be protected, and the habitat recognized as where they are likely to occur should return to the previous definition which included Grand fir/Lodgepole pine associations as well as Subalpine fir/Lodgepole associations. The proximity of this sale to the Diamond Peak Wilderness Area makes this a likely dispersal habitat area for Lynx. The Five Butte Project could therefore threaten lynx viability.*** (#5 - 6)

Response: In a letter to all District Wildlife Biologists on the Deschutes an Ochoco National Forest[s] and the Crooked River National Grassland (File code 2670; June 18, 2003) from Shane Jeffries and Dave Zalunardo, Forest Wildlife Biologists for the Deschutes and Ochoco National Forest (respectively) and referred to on page 75 of the EA, a determination was made that no lynx habitat or self-maintaining populations are present on these three administrative units. The rationale included using the best available science and guidance, that was often more recent than the literature referred to in the comment, and field surveys conducted on these units in 1999, 2000, and 2001. The authors of the letter relied upon the Lynx Biology Team's definitions of habitat and definitions that are part of the Lynx Conservation Assessment and Strategy. The US Fish and Wildlife Service was an integral part of both the Biology Team and the Conservation Assessment and Strategy. The letter with the rationale and literature cited can be found in the project files.

A discussion on the Canada lynx is provided in the DEIS, pages 120-122. The Lynx Biology Team reported that all investigations into lynx habitat in the southern part of its range show an association between lynx and lodgepole pine cover types within the subalpine fir series. The best available scientific information suggests that subalpine fir plant associations capable of supporting a minimum density of snowshoe hares is a reasonable surrogate for describing lynx habitat conditions to support survival. The Lynx Conservation Assessment and Strategy (Reudiger et al 2000) identified the need for 10 square miles of primary vegetation to support lynx survival and reproduction and constitute a lynx analysis unit. On the Deschutes National Forest these plant associations are limited and only comprise 3,650 acres of which 3,500 acres do not support snowshoe hare populations. Consequently, there is an inadequate amount of primary habitat to support lynx on the Deschutes National Forest.

Further, on November 8, 2006 the USFWS issued a news release announcing that critical habitat for the Canada lynx has been designated and includes approximately 1,841 square miles within the states of Minnesota, Montana, and Washington. There is no critical habitat designated in Oregon. The final rule for designation of critical habitat in the Federal Register Notice (Vol. 71, No. 217, November 9, 2006) concluded that not all occupied habitat is essential to the conservation of the lynx.

At the present time there is no information to suggest lynx are present on the Deschutes National Forest. If, in the future lynx are confirmed on the Deschutes National Forest they will receive full protection under the Endangered Species Act and consultation with the U.S. Fish and Wildlife Service will commence immediately if necessary. Also, if new information becomes available on vegetation that constitutes lynx habitat, analysis will occur to identify any lynx habitat on the Deschutes National Forest.

Comment: ***. . . there have been confirmed positive sightings of lynx as recently as 1987 in eastern/central Oregon and Blue Mountains Biodiversity staff and volunteers have had three positive sightings of lynx in eastern and central Oregon (near Crater Lake on highway 66 in the mid-90's, in the Deep sale area in the Ochocos in 2005 and just south of the Umatilla National Forest in 2006 with the 2005 and 2006 sightings in full daylight.) The Forest Service's definition of suitable lynx habitat suddenly shifted from including Grand fir/Lodgepole associations (such as an identified Lynx Analysis unit that used to exist in the Deep sale) to a much narrower Subalpine fir/Lodgepole association that conveniently eliminated most previously identified Lynx Analysis Units in eastern and central Oregon. The Five Buttes Project area often receives heavy snow and is near large expanses of Lodgepole pine habitat in the Diamond Peak Wilderness Area. We feel there is potential for dispersing Canada lynx to occur in the Five Buttes planning area and that under the Endangered Species Act, their dispersal***

habitat should be protected. There is also the potential that dispersing individuals could establish themselves and expand their range southwards, especially since they are not limited to Snowshoe hares as prey and could occupy less than ideal habitat. The Five Buttes Project could thus threaten lynx viability. (#6 - 10)

Response: See response to comment #5-6 above. Discussion provided on the Canada lynx on pages 120-122 of the DEIS describes only 12 verified lynx records in all of Oregon since 1897. Only one of these records is from the Deschutes National Forest in 1916. Most of the verified records of lynx in Oregon coincide with population peaks of lynx in Alaska and Canada. Self–maintaining populations of lynx in Oregon have not existed historically, and lynx occurrence here is likely the result of dispersal from occupied areas with declining prey populations (Verts and Caraway 1998; McKelvey and Aubrey 2001). At the present time there is no information to suggest lynx are present on the Deschutes National Forest.

Comment: ***[Re: DEIS p. 214 / 215] "Silvicultural treatments are also proposed in the 970 acre Crescent Creek OGMA. Ten acres of proposed unit #690 is within the boundaries of this OGMA. " [Alternative B]***

"Within the Crescent Creek OGMA, a total of 97 acres are proposed for silvicultural and fuels treatment. The same 10 acres of unit #690 would be scheduled similar to Alternative B." [Alternative C]

Goshawk depend on higher density, as do their prey. Drop the 10 acres of unit 690 within the Crescent Creek OGMA. (#16 - 47)

Response: See response to comment #16-6. Page 137 of the DEIS states "The removal of 8 percent of the potential nesting habitat would likely have little long-term effect on goshawks. Nesting habitat would still be well distributed across the entire project area with the exception of the Davis Fire area." Page 214 of the DEIS states "Nesting and foraging habitat is provided in this 970 acre OGMA and thinning as well as post-sale activities would not affect the ability of the OGMA to function as designated for goshawks."

Comment: ***[Re: DEIS p. 203] "Mixed Conifer Habitat Northern Flying Squirrel, Southern Red-backed Vole, Bushy-tailed Woodrat, Williamson Sapsucker, Pileated Woodpecker***
Alternative B would commercially thin 4,163 acres within this habitat type. Habitat capability would remain on all but 343 acres, where the prescription (HTH6C, HTH6S) calls for more single-story and open conditions in ponderosa pine-dominated habitat. In this circumstance, the canopy cover may be reduced below species needs. A reduction of canopy cover below 55 percent would result in a corresponding reduction of habitat for pileated woodpecker, and lower densities of flying squirrels (Lehmkuhl et al. 2006)."

Drop the 343 acres logging into more siingle story and open conditions in PP-dominated mixed conifer re: pileated, N. Flying squirrel and N. Spotted owl needs. (#16 - 45)

Response: To maintain large and old growth ponderosa pine for the short- and long-term as bald eagle nesting habitat, a single story prescription would apply within some ponderosa pine dominated stands totaling 343 acres. This would occur mostly within bald eagle management areas (BEMAs). The DEIS stated this would result in a reduction of habitat for pileated woodpeckers and bushy-tailed woodrats and a reduction in flying squirrel densities where this prescription would be applied. The management actions are consistent with bald eagle habitat management direction provided in the Deschutes National Forest Land and Resource Management Plan and site-specific BEMA plans.

Comment: ***[Re: DEIS p. 215] "Cumulative Effects to all Action Alternatives***
Activities in Table 3-1 were reviewed for their potential for cumulative effects on OGMAs. There are no additive effects identified with the implementation of the action alternatives and past, present, and reasonably foreseeable actions, therefore no additive cumulative effects are anticipated."

Insufficient cumulative effects analysis - commercial logging in these OGMAs would change the character of the stand and degrade marten and goshawk habitat quality and hiding cover. (#16 - 49)

Response: See response to comment #16-6. Pages 214 of the DEIS stated unit #610 is within the boundary of the Maklaks Old-Growth Management Area (OGMA) when it should have read unit #810. This will be corrected for the FEIS. The analysis concluded that habitat capability would be maintained post-harvest for marten in the Maklaks OGMA. The analysis also concluded that project implementation would not affect the ability of the Crescent Creek OGMA to function as designated for goshawks. The cumulative effects discussion stated there would be no cumulative effects because there are no future projects identified that would impact either OGMA. The last sentence on page 215 also states that vegetation manipulation has been designed to enhance and perpetuate old growth characteristics; therefore, both action alternatives are consistent with M15-4 of the Deschutes Land Resource Management Plan.

Comment: ***LOS connectivity corridors:***
"Implementation of either alternative would result in no active management within or adjacent to identified connectivity corridors." (p. 210)

"Alternative C would implement 210 acres of fuels treatments . . .in an identified connectivity corridor located east of Cascade Lakes Highway and southwest of Hamner Butte." (p. 211)

These two statements are contradictory. (#7 - 20)

Response: The contradiction is not apparent. Page 210 of the DEIS refers to Alternatives A and B and states there are no treatments within connectivity corridors. Page 211 of the DEIS refers to Alternative C where there is a proposed 210 acre activity unit with an upper diameter limit of 6 inches for removal. All medium to large trees and overstory canopy cover would be maintained and the corridor would function properly. Guidelines for snag retention and down woody debris, plus unthinned clumps (collectively) would provide habitat continuity for woodpeckers, songbirds, and other mammals.

Comment: ***The wildlife and birds are dying out. It is because sites where they should be able to live in peace are constantly being sprayed, burned, logged all by a Forest Service that is in fact destroying the natural forest. . .***

Logging kills birds and wildlife, who are made homeless. These animals depend on having homes. They are unsheltered when the forests are cut. This destruction has to stop. This plan needs to be changed to protect forests, not destroy them. (#9 - 1)

Response: There is no herbicide use proposed in this federal action. The impacts of the proposed action and the alternatives have been discussed in the Wildlife section of the DEIS (page 91).

Comment: ***The DEIS just says that disturbance of habitat for species like brown creeper that prefer dense forests will cause those species to move to adjacent habitat. The DEIS fails to account for the fact that adjacent habitat may be destroyed by the Davis Fire and/or the adjacent habitat may be already occupied by the same or other species that compete with or prey upon them.*** (#13 - 14)

Response: The DEIS acknowledges vegetation activities conducted during the nesting season may result in brown creeper displacement. The DEIS also noted there has been a reduction in habitat for the brown creeper due to wildfires across the Deschutes National Forest (DEIS, pages 161-162). The activities proposed in the Five Buttes project area have been designed to reduce the risk of additional loss of late and old structured mixed conifer stands and maintain this habitat type over the long-term for late-successional associated species including the brown creeper. This is consistent with the recommendations Wisdom et al. (2000) noted in the Interior Columbia Basin Ecosystem Management project.

Comment: ***We support the use of pre-scribed fire as a tool to lower fuel load levels. Mechanical treatments and fire, in the right balance, are good management tools.*** (#10 - 7)

Response: No response necessary.

Comment: ***This alternative [Alternative C] . . . promotes the restoration of fire at a scale that will better mimic historic patterns due to the larger size of treatment units (treatment units are on average 40% larger in Alternative C).*** (#14 - 3)

Response: No response necessary.

Comment: ***Logging is not restoration or mimicking a natural process and may impair the resiliency of the ecosystem to respond to natural disturbances if too much canopy, large structure, healthy trees, or topsoil is removed.*** (#16 - 9)

Response: Thinning (with small trees and/or larger trees of commercial value) is an attempt to mimic the vegetative structure resulting from natural disturbance fire events with density control and minimization of ladder fuels as would be found in frequent fire conditions of the past.

As noted in the proposed action, page 4 of the DEIS, "The proposed action includes the following activities:

- Thin to create or maintain single story stands and culture large trees (1,175 acres);
- Thin to reduce stand competition but retain multi-story canopy and large trees (3,153 acres);
- Thin to reduce stand competition, culture large trees and retain a combination of single story and multi-story canopy (1,160 acres);"

Concerning the comments on removal of too much canopy, large structure, healthy trees, or topsoil being removed, these subjects are addressed in the project design criteria as follows:

Thinning of conifer vegetation: The Five Buttes project incorporates the following priorities from the Odell Pilot Watershed Assessment and the Davis Late Successional Reserve Assessment:

- Retain large trees on the landscape.
- Retain conifer species diversity.
- Retain structural diversity for a variety of wildlife species.
- Strategically locate areas on the landscape where fire is frequently applied in ways that reduce problem fire extent on the landscape.

Using these priorities and assumptions, the following specific Project Design Criteria are incorporated into the action alternatives:

Thinning: Thinning of conifer trees of all sizes is to be done in such a way that:

- The diversity of species on the site is retained, though the proportion of one species over another may change considerably. Generally, the preference, from highest to lowest for conifer species to leave is, Douglas-fir, sugar pine, western white pine, Shasta red fir, mountain hemlock, ponderosa pine, white fir/grand fir, and lodgepole pine. These preferences may vary on specific sites depending on the abundance of a given species, presence of pathogens, vegetative potential, and/or site specific objectives.
- NOTE: It is assumed that fully stocked stands will provide adequate levels of future snag recruitment opportunities resulting from natural and prescribed fire and endemic insect and disease activities.
- The largest of the large trees remain on the site.
- Structural diversity will be clearly maintained on the landscape, but may not be very diverse in a given activity unit. This means some individual areas may be single-storied, others two-storied, and still others with more canopy layers.
- Areas with an excess of basal area in large trees (generally over 21 inches in diameter) may need to have some of those trees removed to meet treatment and long-term objectives. If so, trees to remove should be selected in such a way that:
    1. They don't have the crown or the physiological characteristics to be useful to wildlife or to be able to respond to thinning.
    2. They have numerous other larger suitable trees nearby that can remain to meet long-term objectives.

3. They do not appear on the verge of imminent mortality so as to contribute to snag densities in the short term.
4. Trees of high value to wildlife should remain on site. Examples include, but are not limited to, true fir with conks that would indicate a future hollow log, non-lodgepole trees with multiple tops, trees with very large limbs, etc.

<u>Commercial Harvest</u>: Since the commercial market fluctuates widely, a precise division between small tree and commercial products is not defined with this document. So, essentially, implementation of this project will utilize the smallest materials the commercial market will bear at the time of implementation. Commercial material will be thinned and removed using logging methods that will ensure minimal displacement of topsoil and minimal damage to residual trees.

Comment: ***Mixed conifer forests had some of the highest levels of snag and down wood (See Figure 3 James K. Agee. 2002. Fire as a Coarse Filter for Snags and Logs. USDA Forest Service PSW-GTR-181 (2002) http://www.fs.fed.us/psw/publications/documents/gtr-181/029_Agee.pdf), but the logging proposed here will usurp natural disturbance and "capture mortality," diverting it to the timber industry, when it is still highly valued and under-represented in the forest. Abundant green tree replacements are especially needed because there is a future snag deficit expected in this area due to the Davis Fire (and the ecologically ill-advised post-fire logging). The Forest Service must consider how these stands contribute to filling the future snag gap caused by fire and salvage logging.*** (#13 - 12)

Response: In the discussion on waterfowl, under direct and indirect effects of the action alternatives, DEIS page 142, it states: "The largest green trees, primarily ponderosa pine, would be retained and capable of becoming future snag habitat." On page 150, under the effects of the action alternatives to bat species, it says, "Active management objectives are to maintain and enhance late and old structured forests, focusing on the retention of large diameter trees. These alternatives are the most likely to sustain large diameter trees on the landscape, which are important to future snag recruitment… This short-term effect would be offset by snags created by prescribed burning and ongoing snag recruitment from natural successional process on adjacent areas." On page 206 of the DEIS, in a discussion on effects in mixed conifer stands in this area it says, "Montane and Complex habitats – Flammulated owl, American marten, Northern flicker, Three-toed woodpecker, Hairy woodpecker. Both Alternatives B and C propose approximately 50 acres of commercial thinning to 90% UMZ with a multi-storied condition. This prescription maintains high densities of trees of various diameters and would not reduce existing snag and down wood levels beyond those felled for occupational safety, nor appreciably affect future snag level as mortality would continue at endemic levels." For all activities, snag recruitment over time and across the landscape is similar compared to Alternative A, no action (Figures 3-29 and 3-30, DEIS page 201). Changes in snag densities over time are very similar (DEIS, page 198). Habitat capability would be maintained for the flammulated owl, American marten, northern flicker, three-toed woodpecker and the hairy woodpecker." (Table 3-67, DEIS page 206). On page 199, under the discussion of hazard trees, the 3rd paragraph under Effects Common to all Alternatives, it says, "In general, hazards felled along roads are retained on site for down wood." The Activities and Snag Recruitment discussion that begins on page 199 includes the following: "Occasionally, fuels reduction activities are outside prescriptive parameters and some down wood is lost. This is a result of weather changes during a burn or when small test fires are ignited to gauge fuel conditions. When this circumstance occurs, burning is suspended until conditions are favorable. This happens on average, less than one percent of the total burn acreage on the district (Boucher, 2006, personal communication). In areas where this happens, there is a trade-off with additional snags falling down and new ones being created. There is generally an increase in deadwood for the short term, a corresponding reduction in live tree density, which affects snag recruitment over the long-term." It concludes on page 200-201 with, "In both action alternatives, activities produce a mosaic of conditions. There would be lower numbers of snags developing in stands maintained with a fire regime. Diversity of live tree and snag densities are maintained through prescriptions for variable densities. Diversity is also maintained with Project Design Elements, areas where no active management occurs within activity units (15 percent), and in stands that remain at high risk to a disturbance process. The short-term reduction of habitat for some species at the stand level is offset by a much greater benefit from a reduction of risk for a large scale disturbance (Lehmkuhl 2004, Rapp 2005, Lehmkuhl et al 2006, Thompson 2006)." In addition, the project design criteria for thinning will state that the fully stocked stands left after thinning is completed are assumed to have adequate snag and down wood recruitment opportunities (see responses to comments #16-42 and #16-9 above).

Comment: ***It is not true that neither Alt. B or C would not affect snag recruitment over time and across the landscape, as claimed on p. iv. Logging larger trees (there is no size limit for cutting and the DEIS admits that trees over 21" dbh as well as other mature, larger trees would be logged) inevitably decreases large snag recruitment over time and alters its distribution across the landscape. Larger snags are the primary issue for snag-dependent and cavity-nesting species, not just the total number of smaller snags available.*** (#16 - 10)

Response: See response to comment #13-12 (above) and Project Design Features for when trees over 21 inches in diameter are to be removed.

Comment: ***[Re: DEIS p. 68] "Application of vegetative treatments that favor pines and Douglas-fir to reflect historic resiliency to disturbance events would not be met with this alternative. Stands currently dominated by pines and Douglas-fir in the overstory would continue to see development of true fir and lodgepole pine in the understories contributing to competition and mortality of the overstory trees."***

Where were PP and DF dominant? Where would they now be favored? Only stands currently dominated by PP and DF should be managed to favor them and not by logging WP, SP, MH, or SRF. (#16 - 29)

Response: On DEIS page 3, paragraph 5, it states, "Stands that historically were dominated by large pines and Douglas-fir (greater than 21" in diameter) are now dominated by smaller, less desirable tree species such as the true firs, which are less resistant to disturbance. Existing overstory ponderosa pine and Douglas-fir cannot compete with true firs in overcrowded conditions. In a dense stand condition, replacements for the large overstory trees are not able to seed in and grow. The trend in these forests is for the large-tree component to decline due to overcrowding from and competition with younger, smaller trees. These conditions have caused a shift in species composition in the understory (mostly to true fir and lodgepole pine) leaving a few overstory ponderosa, sugar pine, white pine, and Douglas-fir. Not enough trees of the desired species exist in the understory to adequately replace the larger trees that are being lost to density-related mortality."

The ponderosa pine plant association groups (PAGs) and almost all of the mixed conifer dry PAGs are characterized in untreated areas by ponderosa pine and, in some areas Douglas-fir, as the dominant and oldest overstory species. These generally are 200+ years old, with intermediate and understory true firs and lodgepole pine mostly 120 years old and less.

Also refer to the response to comment #16-9 for further discussion of species preferences in thinning units.

Comment: ***The presence of, and intention to log, the tree species that are known to be rare in eastern and central Oregon, Shasta Red Fir, Mountain Hemlock, and the present, but not mentioned, White Pine, also makes this sale unacceptable.*** (#5 - 10)

Response: All of these species are common within the analysis area where conditions are suitable for their survival and growth. Most of the species mentioned are most common above 5,500 feet in elevation, so they are usually located on higher slopes and butte tops near the upper limits of the proposed treatments with this analysis. In the discussion on page 103 of the DEIS under Effects Common to Both Action Alternatives, it says, "Generally, the understory tree removal will focus on cutting white fir and lodgepole pine but minor amounts of ponderosa pine, Douglas-fir, Shasta red fir, mountain hemlock, and sugar pine may also be removed." As noted in the response to comment #16-9, preferences for species to retain will include these species in the project design criteria being added to the Final EIS. Ranking of preferences is due, in part, to such things as discussed on DEIS page 65, the 6th paragraph under vegetative conditions common to all plant association groups that says, "Conifer diseases are endemic on the landscape and include dwarf mistletoes, root rots, and rusts. These do not currently pose significant threats of epidemic (broad scale) problems with the exception of the white pine blister rust (*Cronartium ribicola*) which has significantly affected the five-needled pines throughout the western states. The five needled pines in this project area include western white pine, sugar pine, and some white bark pine at higher elevations."

In the discussions on landforms on the sides of buttes and areas above 6,000 foot elevation, (Table 3-12, DEIS page 61), it says, "Shasta fir, mountain hemlock, and western white pine dominate the overstories of these stands … Lodgepole pine, mountain hemlock, and western white pine dominate these understories." and "Subalpine fir may also be present in some areas, especially near timberline."

In summary, even though some of these species may be removed, they are recognized as important to maintain at sufficient levels on the landscape to be able to meet long-term vegetative objectives associated with the purpose and need of this project. Biodiversity would be maintained, even in thinned areas, by ensuring the species present on a thinned area remain on the thinned area after thinning, though perhaps at a different level of presence (see response to comment #16-9).

Comment: ***Impacts to Rare Tree Species and Plants: There are relatively rare tree species in the Five Buttes, area, including old growth large Shasta Red fir (at the far edge of its range), Sugar Pine and White pine. None of these should: be cut: along with Mountain Hemlock, to protect irreplaceable: native tree diversity that should not be reduced to more homogenous and single story stands of Douglas fir and Ponderosa Pine as planned for some areas. The buttes are higher elevation, naturally mixed conifer, denser areas that should not be commercially logged as they are naturally subject to longer interval, more intense fire disturbance and rich in biodiversity. The District admits that they plan to log "minor amounts" of Shasta Red fir, Mountain hemlock and Sugar pine even though they are all rare species in eastern and central Oregon. White pine is not mentioned but could also be logged.*** (#6 - 12)

Response: See response to comment #5-10 above.

Comment: ***Favor pines and Douglas-fir to reflect historic resiliency with vegetative treatments: Alternative B: "This alternative has the most acres of comprehensive vegetative and fuels treatments (5,522 acres), so it ranks second among all alternatives for meeting this purpose." (p. 68) Alternative C: "This alternative has the second most acres of comprehensive vegetative and fuels treatments (4,234 acres), hence it ranks second among all alternatives for meeting this purpose." (p. 69)***

Two concerns: (1) which is indeed the second; and (2) the vegetative treatments here include "vegetative and fuels treatments" and the acres are 5,522 and 4,234 for B and respectively. But in the discussion about maintaining LOS, the same vegetative and fuels treatments are 5,522 acres and 7,798 acres respectively. Which is it? (#7 - 18)

Response: B is the alternative that ranks first in this measure. This is corrected in the FEIS.

Comment: ***At a minimum, it would take suitable owl habitat twenty to thirty years to recover from the thinning activities. In heavier thins, this recover period could stretch to fifty years. This is contrasted with the maximum of twenty years it take for fuels to re-accumulate to prethinning levels.***

Vegetation and fuels begin to reaccumulate as soon as fuel reduction treatments are completed (Kauffman, 2004; Graham et ai., 2004). Although this varies with site factors that affect vegetative regrowth, it is unlikely that reduced fuel levels persist for longer than 20 years (Martinson et ai., 2003; Graham et ai., 2004). In some areas, it is considerably more fleeting. In a study of fuel treatments in the Sierra Nevada, van Wagtendonk and Sydoriak (1987) estimated that fuels returned to pre-treatment levels within 11 years. Therefore, there is a high degree of certainty that the effectiveness of fuel reduction by MFT declines over time and becomes non-existent after about 20 years or less (Kauffman, 2004; Graham et ai., 2004; Agee and Skinner, 2005; Rhodes and Baker, in review).

Thus, in order to effectively reduce fuels through logging, entries would have to be made at least once every twenty years. The DEIS states that burning would need to occur every 8-12 years. (DEIS p. 15). If it takes twenty to fifty years for a thinned forest to regain its late-successional characteristics, and thinning has to occur at least once every twenty years for fuel levels to stay at the desired rate, the Late-

Successional Reserves will never have the opportunity to "play an effective role in the objectives for which they were established." (#17 - 9)

Response: Under discussion of Status and Trends in Demography of Northern Spotted Owls, 1985-2003, page 21 of the Davis LSRA, it says, "The relevance of the report to the LSRA is the information on the overall decline of the spotted owl population, and the support for the idea that there is a need for careful consideration of any management across the landscape in potential habitat. As did other reports, this information highlights the need to provide habitat over time for this species where we can." This project, as noted on page 28 of the DEIS, 2nd paragraph, says, "The Five Buttes project follows the Davis LSRA strategy for potential spotted owl occupation over time." Hence, a variety of vegetative structures and conditions will remain on the landscape, but it is anticipated that specific locations of a given vegetative structure will move around the landscape. An area being maintained for fire strategy with this entry might be looked at for letting the vegetation grow back in, not maintain it with fire, and let the densities increase to where it becomes suitable owl habitat again, based on its context in the landscape.

Comment: ***The Forest Service further admits that "occasionally" trees over 21 inches in diameter (dbh) would be cut "to meet basal area objectives, spacing needs or diseased tree removal." (DEIS p. 102). This is outrageous and is not necessary to reduce fire risk. The Interior Columbia Basin Ecosystem Management Plan stressed that trees above 21" dbh are far below historic levels in eastern Oregon and are in need of protection. The density in these forests is not from trees over 21" dbh! The average diameter for the densest trees in these stands ranges from 3" to 10 or 11" dbh. This is a grab for old growth trees disguised as fuel reduction to protect old growth from wildfire and should be rejected as such.*** (#6 - 13)

Response: Although the removal of a large tree would help in reducing the canopy bulk density (see DEIS pages 28 and 29), another concern is reducing the density of the stand to the point at which it is considered resistant to high levels of mortality from bark beetles in the overstory. On page 69 of the DEIS, under the Summary of All Alternatives discussion, it says:

- "Areas with commercial thinning and follow-up activities would be thinned to densities that are deemed to be resistant to large-scale loss of large trees to insects and disease. Hence, the more acres thinned, the more resistant areas on the landscape.
- Areas with only fuels treatments and/or small tree thinning/removal would remain at densities that are susceptible to large scale loss of large trees to insects and disease. Hence, the increase in fuels treatments is expected to change the risk of loss to wildfire, but the risk of loss to insects and disease remains unchanged with these treatments.
- Unlike predicting fire risk, severity of the large-scale loss of large trees is impossible to predict for insects in overstocked stands. Infestations are very stochastic in nature with a wide variety of climatic and other environmental conditions that can alter the intensity of the insect outbreaks.
- There is no strategic landscape-level effectiveness to minimize spread of insect activity. Even isolated stands of susceptible densities can be severely impacted by beetles because of their mobility. Hence, only acres where densities are considered below Upper Management Zone are considered to be resistant to large scale loss to insect activity.

Therefore, in stands where the level of thinning of smaller trees, especially those stands with a multi-storied objective, some of the larger trees may need to be removed in order to attain resistance to insect mortality. This is more likely in multi-storied stands because of the objective of keeping trees from all size ranges; this causes a greater need to "make room" for smaller trees, so larger trees may need to be removed, even though these are not the largest of the large trees that are removed.

Refer also to the Project Design Features responding to comment #16-9.

Comment: ***Maintain and enhance existing late and old structured stands using silvicultural treatments. Alternative B: would enhance the second most acres directly . . . Second in maintenance of existing conditions. (p.68)***

Alternative C: would enhance the most acres directly . . . Maintenance of exisitng conditions is highest with this alternative. By not thinning and treating some of the key NFR that was included in Alternative B, this alternative leaves more large trees at risk to insect attack than Alternative B. (p. 69)

1) if more total acres (thinning and fuels treatments) is better, combine the fuels treatments from C to the commercial activities in B; (2) intuitive conclusions are questionable; (3) it's clear from the last statement under Alt. C that the lack of management in NRF poses serious risks long-term as were demonstrated in the Round Lake NRF habitat on the Sisters Ranger District. (#7 - 17)

Response: See responses to comments #7-8 and #17-8. The key to the project is that, as guided by the Davis LSRA, there needs to be a mix of conditions on this landscape to provide current and future habitat structures for a variety of wildlife species. Thus, by the design of the project, there will be areas on the landscape that remain at risk. See the Davis Late-Successional Reserve Assessment for further discussion (on file at the Crescent Ranger District).

Comment: ***For both action alternatives, we recommend that the U.S. Forest Service expand and clarify what monitoring will be done to examine the effectiveness of treatments in meeting the Project Purpose and Need. Reductions in fuel loadings and forest vegetation density can be modeled, but should be ground-truthed before and after treatments to test for predicted accuracy. Monitoring is critical to an effective adaptive management program. In addition, monitoring will help the Deschutes National Forest articulate the results of the Five Buttes Project and build support for future public investments in similar management actions.*** (#14 - 6)

Response: The Forest Service agrees with this recommendation. Additional implementation monitoring would occur such as inspection of the timber sale contract to ensure compliance, review of prescribed burning for compliance with the burn plan objectives, and interdisciplinary District post-sale reviews which also serve as a forum for the district specialists to view and discuss the efficacy of vegetative prescriptions.

Comment: ***It's time to move beyond managing for ponderosa pine and Douglas fir in stands that also have old growth Grand fir, and in this case, Shasta Red fir, Mountain Hemlock, White pine, Sugar pine, etc. The bias toward Ponderosa pine and Douglas fir, even where these may not be the naturally dominant trees or the only historically present dominant trees, is a timber industry bias, not ecologically sound science. Who determines which are the "less desirable" tree species? Apparently not the public but the timber industry and Forest Service. Why is there no concern about retaining the more rare mature and old growth Shasta Red fir, Sugar Pine, White pine and old growth, historically present Grand fir? There should be no logging of Shasta Red fir, Sugar pine or White pine and no logging of old growth trees of any species.*** (#16 - 16)

Response: See responses to comments #16-9, #13-12, #16-10, #5-10, and #6-12.

Comment: ***There is a noticeable lack of empirical evidence to support commercial thinning to reduce fire risk. The risk modeling procedures used are computer simulations with no real on-the-ground data input. This makes them highly questionable, easily biased with artificial data assumption inputs (the "garbage in--garbage out" syndrome) to produce desired results. . . . the Five Buttes DEIS incorporates inaccurate and unprofessional science, as well as failures to disclose relevant information.*** (#16 - 18)

Response: Stand exams, which are sampled on-the-ground data, were used to calibrate the model to simulate a problem fire scenario which actually occurred within the project area (i.e. Davis Fire). The model is then adjusted to match what is known and relevant research and with local experience. Alternatives can then be compared using consistency in perspective and assumptions. Modeling included prediction of flame lengths and rates of spread using a mathematical equation developed by Rothermel. This equation was developed in 1972 and has been the basis for surface fire behavior predictions throughout the global fire community. The equation has been tested for 35 years and still holds up to on the ground observations. See page 85 in the DEIS for a discussion on the modeling used for this analysis.

Comment: ***[Re: DEIS p. 85]. "The approach to modeling risk involved:***

a) simulating major fire travel pathways (Minimum Travel Time or MTT) under severe burning conditions in order to affirm efficacy of active management in strategic locations using FlamMap 3;
b) simulating landscape fuel treatment scenarios using the FVS and FFE;
c) simulating random ignitions under severe burning conditions commonly found in the analysis area to compute burn probabilities for late successional habitat using FlamMap; and
d) developing and applying stand-specific loss functions to determine the resultant simulated fire effect on LOS stands (FVS-FFE and FlamMap). "

Key input data was simulated, not real, making conclusions very susceptible to biased assumptions. (#16 - 30)

Response: See response to comment #16-18 above.

Comment: ***. . . we [Blue Mt. Biodiversity] feel this is a questionable purpose and need for the project units located up on the buttes and Davis Mountain . . . The forest on the buttes and Davis Mt. appears green, healthy and thriving in most areas, not in danger of imminent loss to insects or disease (though it does seem under imminent threat of loss to logging, thanks to this project) and the huge fuel break caused by the recent Davis Fire around it is conveniently ignored throughout the DEIS, as far as fire risk goes.*** (#16 - 4)

Response: Analysis has shown that the vegetative structure is constantly changing and cannot be sustained in any one place on the landscape for the long-term. Page 61 of the DEIS discloses the existing condition for the area. However, the mixed conifer and ponderosa pine PAGs have reached conditions well outside of their historic fire condition class where we expect they will continue to see increasing uncharacteristic losses of the large tree components. For insects and disease, stands may appear live and healthy, but experience a large-scale disturbance in a relatively short period of time (pesrsonal communication with Andy Eglitis, Deschutes National Forest, Zone Entomologist, 2007). Conditions across the landscape in Five Buttes are very similar (i.e. overly dense and a shift in species) to those conditions that were found prior to, and that fueled the Davis Fire event.

Regarding the “fire break” created by the Davis Fire and the lack of acknowledgement in the DEIS, the Davis Fire and its effects are discussed in the document over 200 times. Within the core of the Davis Fire, the potential for a problem fire is reduced. Fire under the current conditions would spread though the core as a low intensity burn to the perimeter. However, it is not a fire break, but it does modify fire behavior by reducing the chance of a problem fire in that location.

The perimeter of the fire is a different situation where mixed severity has occurred and the problem fire potential exists. The Five Buttes project identified a need for strategic reduction of fuel loadings and forest vegetation density so as to lessen the risk that disturbance events such as insect, disease, and wildfire will lead to large-scale loss of forest (DEIS, page 15). As used here, the term “strategic” means to locate a mix of management actions in specific places on the landscape where they will reduce the risks between desired habitats, specifically late and old-structured stands and large trees.

Comment: ***The DEIS should not have rejected the proposed alternative that would remove mostly trees less than 12-15 inches dbh and reintroduce fire. This alternative is scientifically and ecologically more sound than the logging "alternatives" presented. Omission of this alternative violates NEPA’s reasonable, expert, and credible science clauses, and deprives the public of the scientifically sound information necessary to meaningfully participate in this NEPA project.*** (#13 - 6)

Response: Trees with an upper diameter limit of 8 and 12 inches were eliminated from detailed study because modeling of fire behavior and vegetation indicated that small diameter thinning "only" would not considerably change expected fire behavior on a landscape scale (DEIS, page 28). Removal of trees with an upper diameter limit of 15 inches did not demonstrably change the outcomes modeled for 12 inches because there are not many trees in the 12-15 inch size class to affect crown bulk density or basal area.

Reintroduction of fire in most stands where only small diameter thinning has occurred is not feasible in most circumstances. It would cause an undesired level of mortality to the overstory trees.

Comment: ***It was unreasonable and arbitrary not to consider and analyze in depth the "alternatives considered but eliminated from detailed study": . . . Limiting thinning to small diameter (8-12" dbh). . . .***

Re: the elimination of the alternative of limiting thinning to small diameter (8-12" dbh) , there is a preponderance of science supporting the thinning of small diameter trees in this size range as the most useful approach for reducing fire risk and tree stress from over-crowding. There is a notable lack of evidence to support logging larger trees to achieve these objectives. . . . computer simulation modeling of fire behavior and vegetation is inherently flawed without empirical evidence or data supporting its fundamental assumptions. There is no empirical or outside scientific evidence presented to demonstrate that the speculative model's conclusion is correct that small tree thinning would not move the project area toward the desired condition and would not meet the purpose and need. Instead the science of the outside world (outside this DEIS) suggests that small diameter thinning would achieve these objectives. Field-surveying, aptly called "Ground Truthing", reveals the same thing: that the greatest density of trees, as well as the most flammable trees are within the 3-8"dbh range in the vast majority of proposed sale units. Where the mean density is greater, it is still not above 10-12" dbh. (#16 - 23)

Response: See response to comment #13-6 above. Modeling of fire behavior and vegetation indicated that small diameter thinning only would not considerably change expected fire behavior on a landscape scale (Page 28 of the DEIS).

Comment: ***There have been an inadequate range of alternatives offered for this project. I believe that the alternatives given are all unacceptable for this planning project, for the following reasons: . . .***

. . . Having no diameter limit for the logging in this area is especially horrific, and provides further reasons that this sale must have alternatives that include preserving the mixed conifer multi-layer canopy habitat by including strict limits to diameters of less than 21 inches in diameter (dbh) for trees to be logged. (#5 - 3)

Response: See response to comment #13-6 above and Project Design Criteria for when larger trees may be removed in response to comment #16-9, and Alternatives Considered but Eliminated from Detailed Study, page 27 of the DEIS.

Comment: ***Both action alternatives for the Five Buttes "Project" (aka timber sale) include substantial commercial logging with no diameter limit for cutting over thousands of acres.*** (#6 - 2)

Response: See response to comment #13-6 above and Project Design Criteria for when larger trees may be removed in response to comment #16-9, and Alternatives Considered but Eliminated from Detailed Study, page 27 of the DEIS.

Comment: ***You need some harvest level in these areas for fire breaks, veg. type breaks, wildlife enhancement. Need more edge effect.*** (#8 - 4)

Response: No response necessary.

Comment: ***Another point AFRC wishes to make is from Table 2-4 on page 32. In the table under Alternative B it states, "Fire behavior would be modified on a landscape scale, though not as effectively as in Alt. C. This alternative would reduce imminent susceptibility of stands to insect and disease by 5,522 acres." Under Alternative C, Table 2-4 states, "This alternative affords the most effective landscape scale fire behavior modification, as well as reducing imminent susceptibility of stands to insect and disease by 4,325 acres."***

The two distinctions here are a qualitative assessment of the effectiveness at the landscape scale and a quantitative assessment of the reduction in acres imminently susceptible to insect and disease. The hard

numbers show Alternative B meets the Purpose and Need better than Alternative C. The qualitative assessment of landscape effectiveness shows the opposite. But the latter is more speculative.

AFRC would argue that if Alternative B included more of the fuel treatments not on commercial units as are in Alternative C, the landscape effectiveness would be higher. (#7 - 12)

Response: As is common with environmental analyses, there are often resource trade-offs that would be necessary when choosing between alternatives. The trade-off noted here is that one alternative provides a level of landscape effectiveness that emphasizes or favors insects and disease resistance, while the other alternative provides a higher short term level of owl habitat. As can be seen in Table 2-5, DEIS page 33, even the evaluation of just owl habitat effects shows the trade-offs in that thinning can promote large tree retention, a key component for the owls to nest in, as thinning also reduces the vegetative structural components to where it stops providing some of the other key components for NRF.

Comment: ***Basal Area:***
"proposed basal areas after harvest will have commercially thinned stands at low risk of large scale insect attack. The exceptions noted for Alternative C will still be at risk." (p. 69) The DEIS clearly points out here that because of the lower commercial activities, Alternative C will result in more owl habitat at risk after implementation. (#7 - 19)

Response: See response to comment #7-12 above.

Comment: ***Forested Vegetation:***
Risk of large scale loss of forests, especially the large tree components as measured by acres thinned and with fuel reduction activities. Alternative B has the second lowest (p.68) and Alternative C has the lowest (p. 69).

This subjective assessment clearly favors non-commercial activity given the two alternatives. (#7 - 15)

Response: See response to comment #7-12 above. There are several factors a Deciding Official must weigh. All alternatives were presented as equal and measuring factors were utilized to facilitate an informed decision. There is no "favoring" of any alternative.

Comment: ***Commercial thinning is less advisable for mid-.and higher-elevation sites (such as the buttes and mountains) which naturally have denser stands of mixed conifer with greater natural moisture retention and longer fire return intervals with normally higher fire severity. In such sites, even stand replacement fire may have a restorative effect. Five Buttes Project sale units up the sides of the buttes and mountains are typical of such mid- to high elevation, naturally denser mixed conifer sites where higher severity, less frequent fire is natural.*** (#5 - 12)

Response: See response to comment #16-35. The purpose and need (in part) for the Five Buttes project is to strategically reduce fuel loadings and forest vegetation density so as to lessen the risk that disturbance events such as insect, disease, and wildfire will lead to large-scale loss of forest. As used here, the term “strategically” means to locate a mix of management actions in specific places on the landscape where they will reduce the risks to desired habitats, specifically late and old-structured stands and large trees.

Comment: ***Commercial thinning is less advisable for mid-.and higher-elevation sites (such as the buttes and mountains) which naturally have denser mixed conifer with greater natural moisture retention and longer fire return intervals with normally higher fire severity. In such sites, even stand replacement fire may have a restorative effect. Five Buttes Project sale units up the sides of the buttes and mountains are typical of such mid- to high elevation, naturally denser mixed conifer sites where higher severity, less frequent fire is natural.*** (#6 - 19)

Response: See response to comment #5-12.

Comment: ***There is . . . No justification given for the claim that insects and disease are at "uncharacteristically severe levels"; a claim that is conspicuously absent from the rest of the DEIS and not discussed or analyzed anywhere in the DEIS.*** (#16 - 24)

Response: Most bark beetles attack trees that are larger than 6" dbh and more than 80 years old, especially in dense stands. "…occasionally, beetle populations become so large that an epidemic results. This is especially common in large areas of mature trees in overdense stands. By controlling tree density, trees and stands become less susceptible to beetle attack". Historic outbreaks of bark beetles have killed lodgepole and ponderosa pine on hundreds of thousands of acres such as in central and southern Oregon in the 1980s. For several forest management objectives, bark beetle outbreaks should be prevented (Emmingham et al, 2005).

As stated in the first paragraph on DEIS page 28, "Also, long-term risk from disturbance agents such as insect and disease would remain at uncharacteristically severe levels, with recovery of many elements of the ecosystem taking centuries to achieve." The key here is that risk of uncharacteristically severe, or epidemic levels, of insect caused mortality remains high in the over dense stands. Currently, the only significant insect mortality event in the past few decades in the project area is the mountain pine beetle mortality mentioned above during the 1980s.

Comment: ***Forested Vegetation:***
Acres thinned resulting in large trees retained on the sites that are more resistant to insect attack. Alternative B has the highest (p. 68) and Alternative C has the second highest (p. 69).

In an attempt to make C look better, on page 69, it states, "Dropping some of the areas with NRF that were proposed for commercial entry proposed in Alt. B potential[ly] affects the ability to retain large trees on those sites in the event of bark beetle activity, even though the strategic placement of fuels treatments would reduce the risk of loss to fire from adjacent areas." This statement forgot one other important potential disturbance - fire that starts inside the NRF units (as opposed to one from 'adjacent areas'). (#7 - 16)

Response: On pages 86-89 of the DEIS, maps and discussion of landscape fire dynamics under a problem fire scenario show the intentional use of owl home ranges (the circles) as part of what is being considered. On page 3 it states, "Across the landscape within the mixed conifer dry plant association group, the true-fir component has increased dramatically in recent times. This condition is found largely within the stands classified as suitable for spotted owl nesting, roosting and foraging in the project area. Because of the dry site conditions and a stand structure that provides ladder fuels from the ground to the crown, these stands are at the highest risk of being lost to a large-scale fire event or insect or disease attack. Some of the most desired characteristics of these stands (such as fire resistant large ponderosa pine and Douglas-fir) are placed at risk because the increasing true fir component creates a structure that allows ground fires to reach the crowns of the larger trees."

As stated on DEIS, page 80, the main fuel modification objectives include the need to:

- reduce the risk that fires that start outside of late and old forest (LOS) areas will burn into the LOS, become crown fires, and eliminate important characteristics of the LOS habitat;
- reduce the risk that fires that start inside of LOS will burn into adjacent areas;

So, it is recognized that NRF is a condition highly susceptible to stand replacement fires.

Comment: ***Commercial harvest should be given a high priority along with pre-commercial thinning to achieve your desired stand density. This would help improve overall forest health conditions and would decrease the risk of catastrophic wildfires. Furthermore, all age classes and all diameter classes should be considered in selecting the trees to be harvested.*** (#10 - 3)

Response: No response necessary.

Comment: ***We don't feel that the proposed Alternative B activities will adversely impact wildlife habitat or wildlife populations. In addition, we don't feel that the proposed activities actually go far enough to provide the landscape with enough results that adequately defend the forest from insects, diseases, and risk from future catastrophic wildfires. However, Alternative B is a starting point. Project activities should target more thinning acres than planned. While going through the lengthy and expensive NEPA process, get as much accomplished as possible.*** (#10 - 6)

Response: No response necessary.

Comment: ***Any harvest plan I would be glad to comment on especially special forest products and timber harvest increase to reduce the bark beetle and moth attacks . . .[I am] Especially interested in extraction and retrieval of high value PP [Ponderosa Pine] salvage of dead and dying in forest reserves where [there is a target of] no cut of old growth PP. This is criminal as far as many professional Foresters are concerned and will one day be proved as major lawsuit.*** (#8 - 3)

Response: No response necessary.

Comment: ***The DEIS fails to adequately and accurately address and disclose the risks of the proposed project, including the risk that logging mixed-conifer stands on relatively productive sites will make fire hazard worse instead of better because, (a) logging will move hazardous small fuels from the canopy to the ground where they are relatively more available for combustion and thus more hazardous, and in spite of best intentions such logging slash is never fully treated; (b) logging will open the canopy and make the fire microclimate hotter, dryer, and windier; and (c) logging will make available more light, nutrients, and expose mineral soil thus stimulating the growth of future ladder fuels.*** (#13 - 9)

Response: Activity-generated slash would be treated to meet the Deschutes National Forest Plan Standards and Guidelines. Canopy removal alone may increase fire risk but activity units that will remove canopy are also removing ladder fuels and ground fuels. This multiple treatment strategy will reduce fire spread and flame length by breaking up fuel continuity, reducing the chance of an active crown fire event. Page 15 of the DEIS also specifies a maintenance schedule for the areas identified as strategic for fire behavior modification.

Comment: ***By using the SPOTS concept to strategically place fuel treatment activities across the project landscape, Alternative C does a better job of improving suppression effectiveness in the entire 160,000-acre project area. As a result, Alternative C better meets the landscape portion of the Purpose and Need by lessening the risk that disturbance events such as wildfire, will lead to large-scale loss of forest. Approximately 7,502 acres (as compared to 4,998 in Alternative B) would be available for burning in a natural return interval under Alternative C.*** (#14 - 2)

Response: No response necessary.

Comment: ***The DEIS itself offers little reassurance that the proposed logging activities will effectively reduce the threat of fire. According to the Rhodes [2007] study, "any potential benefits of reduced fire severity by [mechanized fuel treatments (MFTs)] clearly come at an ecological price. " Therefore, examining the potential effectiveness of MFT is a crucial step in assessing net impacts to aquatic systems from wildfire versus treatments to alter its behavior. This requires consideration of several key contexts:***

1. "Alternative B would not be effective in protecting late and old structure forest if a fire originates outside of activity units." (DEIS p.83).

2. "Alternative B would not be effective in protecting late and old structure forest if a fire originates outside of activity units." (DEIS p.83). "Alternative B does not alter fuels profiles on large enough blocks to reduce fire travel pathways on the landscape, and therefore does not provide strategic protection of LOS stands or other landscape features." (DEIS p.83). "From a landscape perspective, [Alternative B] does very little to reduce the chance of a problem fire if an ignition occurs anywhere

adjacent to an activity unit. This affords very little change form the effects discussed in Alternative A - for instance, one or more owl home ranges would be vulnerable to a stand replacement event. If a wildfire buns into an activity unit and is not contained, predicted fire effects would be similar to those experience in the Davis Fire. Although there may be a slight reduction in fire behavior immediately after the wildfire passes through the unit (called the "shading effect"), it would return to an uncontrollable condition very soon after." (DEIS p.83). According to the models that were run, Alternative B will have "limited success in avoid[ing] the burning of multiple owl home ranges." (DEIS p.86). (#17 - 5)

Response: See responses to comments #17-4 and #5-11. The Five Buttes project purpose and need (in part) was to strategically reduce fuel loadings and forest vegetation density to lessen the risk that disturbance events such as insect, disease, and wildfire will lead to large-scale loss of forest. (DEIS, page 4). It was not to reduce the threat of wildfire.

Alternative B would reduce the fire behavior in activity units by changing the fuel model, raising the canopy base height, and reducing crown bulk density. These activities in turn will lower the Fire Regime Condition Class (DEIS page 84, Table 3-21). Activities proposed in Alternative B would reduce the severity of fire behavior within the activity units, and also may lower the fire behavior in another 5%-15% of the area downwind of activity units (DEIS page 84, Table 3-22). Alternative B would not be as effective in protecting late and old structure forest as Alternative C.

Because the risk of crown fire would be reduced in Alternative B units, the chance of large trees inside and outside activity units surviving a wildfire would increase. Risk of wildfire spreading from Alternative B units to adjacent stands would be reduced because altered fuel profiles would slow fire spread and allow firefighters additional time to implement a successful initial attack. Alternative B alters the fuels profiles on large enough blocks to reduce fire travel pathways on the landscape, but not as well as alternative C. From a landscape perspective, this alternative does more than alternative A but less than Alternative C in reducing the extent of a problem fire.

Common to all action alternatives, fire behavior within the activity units is expected to be reduced. If an ignition outside an activity unit in either action alternative occurs and is not contained within an adjacent treated unit, predicted fire effects would be similar to those experienced in the Davis Fire. Although there may be a slight reduction in fire behavior immediately after the wildfire passes through the unit (called the "shading effect"), it would return to an uncontrollable condition very soon after.

Comment: ***The available science does not back the claims made in the DEIS that justify cutting trees over 21" dbh. In general it is a fallacy to assume that commercial thinning reduces fire risk. In fact, there is considerable evidence available to conclude that commercial thinning may actually create hotter, drier forest floor conditions, and increase fire risk and severity by reducing shade and moisture retention from live tree canopy and potential down wood, and increasing wind speed through openings, defeating most of the purpose and need for this project. Logging also potentially leaves greater accumulations of highly flammable slash and fine fuels at ground level. (*** (#5 - 11)

Response: See response to comment #16-3. Activity units that remove canopy are also reducing ladder fuels and ground fuels as an integrated process. This multiple treatment strategy would reduce fire spread and flame length by reducing ground fuels and breaking up ground fuel continuity, decreasing the potential for an active crown fire event.

Comment: ***The draft EIS indicates that the Dell Springs Wood Post Treatment site is within the project area and that cleanup of pentachlorophenol and dioxin/furan contaminants there was scheduled to be complete by the end of 2006. Planned activities under the Preferred Alternative action (Alternative C) include small tree thinning and disposal in management Unit 678, which surrounds the cleanup site. Although these activities are scheduled to be implemented in 2007, we recommend cautious use of the site and surrounding areas until monitoring activities confirm that conditions at the site pose no further threats to human health and the environment. Dioxins and furans are toxic chemicals, highly persistent in the environment, and are associated with adverse health effects such as cancer.*** (#15 - 4)

Response: The Forest Service agrees with these recommendations. On September 6, 2006, "CES Natural Solutions for Water", issued a final report on the removal of contaminated soil from Dell Springs. This report states that the area is no longer a threat to wildlife or humans. As an extra precaution the area has been signed "No Camping" and motor vehicle access to the site will be blocked. Planned activities in Alternative C is in an area that is isolated from access to the site. The final report is on file at the Crescent Ranger District.

Comment: ***Because the Preferred Alternative includes a proposal to conduct prescribed fire and the project area is near the communities of Bend, Chemult, Crescent, and La Pine that may include sensitive populations, it will be important to monitor air quality and take corrective action if air quality standards are not met. Such monitoring should be tailored to local conditions because localized air quality impacts can be substantial, even though area-wide and/or long term monitoring may show the project's compliance with air quality standards.*** (#15 - 3)

Response: The Forest Service voluntarily follows the Oregon Smoke Management Plan (OAR 629-043-0043) when conducting fire management operations. The Oregon Smoke Management Plan also has a website: (**http://www.odf.state.or.us/Divisions/protection/Fire_protection?DAILY/Smi.asp**) that produces daily reports, burn day conditions, how many acres or tons are available to burn in the local area, and the distance downwind from designated areas (i.e. Bend) and smoke receptors such as the communities of Chemult, Crescent, and La Pine. Cumulative monitoring is built into the program.

Comment: ***We are skeptical of your science modeling supporting your conclusions regarding fire risk and behavior. Please see our handwritten comments copied from the pages of the DEIS (incorporated by reference as part of our comments) for more detail on this and other issues discussed. These handwritten comments contextualize our concerns by appearing next to parts of the DEIS with which we take issue or that support our concerns, as noted.*** (#16 - 25)

Response: Identified as the largest and most destructive fire in the area in recent times, the 2003 Davis Fire was used to represent the "problem fire" scenario and modeling was calibrated to mimic the Davis Fire effects and behavior. Conditions within the Five Buttes area are similar to pre-fire conditions for the Davis Fire.

The Davis Fire spread eight miles in five hours. There are four nationally-designated communities at risk and numerous subdivisions within or in close proximity to the Five Buttes analysis area. All are within 7 miles: Crescent Lake Junction, La Pine, Crescent and Gilchrist.

> Comment: Regarding Page 85, DEIS: Define acceptable risk. This would make all naturally occurring stand replacement fires "problem fires". Yet there are many parts of the landscape naturally prone to stand replacement disturbance. These are not "problems".
>
> Response: There is no acceptable risk for human safety. This will be corrected in the FEIS.
>
> Comment: Regarding Page 77, DEIS: Some of the "fuel models" are simply natural for the site…artificially imposed to try and get them all to less flammable models.
>
> Response: Fuel models are standardized descriptions of fuels availability to a fire, based on amount, distribution, and continuity of vegetation and wood.

Comment: ***. . . The mid-to higher elevation mixed conifer (including the spotted owl NRF habitat) is naturally subject to more intense fires due to the nature of the forest composition and longer fire return intervals. Nowhere does the DEIS substantiate Forest Service implications that this is not the case. The Forest Service should not be trying to alter natural fire regimes, nor. treat forest structure in longer fire return intervals that is naturally subject to stand replacement fire as if it is the same as lower elevation, more frequent fire interval, low fire intensity Ponderosa pine.*** (#16 - 5)

Response: Historic fire return intervals may not be desired in some areas, such as where the objective is to retain northern spotted owl NRF habitat over the short-term. Large-scale disturbance events such as the Davis Fire have made this habitat even more important to retain. In all other areas following commercial and fuel reduction-related activities, prescribed fire is planned for most areas where it is appropriate (DEIS, page 15).

Comment: ***Too much canopy removal and removal of larger, more fire-resistant trees may increase fire risk through hotter, drier microclimate conditions, higher wind speeds and removal of more fire-resistant trees.*** (#16 - 3)

Response: Alteration of fire behavior on a landscape scale is a product of essentially three aspects of the fuel profile: 1) ground fuels 2) ladder fuels 3) crown bulk density. Small diameter thinning (only) can alter the first two, but it is necessary to incorporate all three (except in areas desired to remain NRF habitat) in order to be effective on a landscape scale. Page 27 of the DEIS explains this concept.

Comment: ***Re: pp. 2-3 [DEIS]: You don't "promote, enhance and retain" large trees on the landscape by logging them and logging the mature trees that would replace them, as planned. I am aware that you say you will only remove about 5% of the volume in trees over 2l"dbh, but this is not guaranteed in the DEIS and there is no justification for removing any trees over 21"dbh or for removing trees much over 10-12" dbh to achieve your ecological objectives. The greatest density of trees in the proposed sale units is only 3-8" dbh in the majority of cases. It is this size range of trees that poses the greatest fire risk in terms of flammability and that can most be attributed to any fire suppression.*** (#16 - 14)

Response: See response to comment #16-3 above. It is acknowledged that the greatest density of trees that will be removed is in the smaller size classes, contributing to the greatest risk reduction. However, reduction of the smaller size classes, in general, does not contribute to reduction of crown bulk density. See page 28 of the DEIS for further discussion of small tree thinning effectiveness.

Comment: ***The FEIS needs to accurately disclose the environmental costs of logging to reduce fuels, as well as any benefits that such activities might have. . . . We [Cascadia Wildlands] want to know how long it will take after logging for fuels to re-accumulate to current loads, and the likelihood that a fire will even burn in the project area during that time. We want to know the likelihood of a fire igniting within one of the units, the probability that the proposed activities will do anything to alleviate the risk of high intensity fire, and whether the proposed logging activities could increase those risks.*** (#17 - 3)

Response: Modeling is described on DEIS page 84. It is most accurate to model using a landscape-scale approach. The Davis Fire and similar "problem fires" on the Deschutes National Forest present an opportunity to accurately model these events using similar vegetative and environmental conditions. Effects are described as risk (probability of a randomly-generated ignition) on a landscape scale, and what would happen should a fire start under a problem fire scenario. Starting on page 83 of the DEIS, it discloses what would happen within an activity unit, should an ignition occur. It does not assign a timeframe because of variable parameters associated with lightning and human-caused ignitions (DEIS, page 80). However, knowing that patterns of human-caused ignitions adjacent to developed recreation sites and road corridors is useful in determining the placement of areas to modify fire behavior. These areas are then maintained through time (DEIS, page 15) so the fuels are never allowed to accumulate to existing levels.

Comment: ***B affords more protection to private lands from fire.*** (#7 - 23)

Response: Commercial activity units that were dropped from Alternative B in Alternative C did not considerably affect fire behavior on a landscape scale. Alternative C dropped units in essentially three areas: north side of Davis Mountain, north side of Odell Butte, and south side of Cryder Butte.

> **North Davis:** As a result of the Davis Fire, this area has become an isolated island of fuels. The Davis Fire perimeter is parallel to FS road 6240 and extends north along Wickiup Reservoir. This creates an area of modified fire behavior along the southern, eastern, and northern extent. Davis

Lake and associated lava flows create a barrier to the west. If a fire were to start in this area, it would be very limited to its spread potential in any direction outside of the "island". The worst case scenario would be a wildfire from the most probable source of ignition - campers in sites along Wickiup Reservoir. This type of fire would potentially cause heavy mortality as it spreads uphill. Alternative C places some "fuels only" units to block up larger areas to respond to this potential, affording initial attack forces more strategic and tactical options for successful suppression upslope from the camping areas and Highway 46.

North Odell: Similar to the North Davis area, the worst case scenario would be if a fire originated down slope near Crescent Creek – where most recreation occurs. Previous activities on the upper third of the butte would impede fire spread. Alternative C also places some "fuels only" units to block up larger areas to respond to this potential, affording initial attack forces more strategic and tactical options for successful suppression.

Southern Cryder Butte: These activity units were on the eastern edge of the project area and adjacent to private timber lands. This is the area referenced on page 86, where the DEIS states Alternative C does not afford the same amount of protection to private lands as Alternative B. This is due to one commercial unit that was dropped along the eastern edge. The burn probability and minimum travel time figures show a slightly elevated risk in Alternative C as compared to Alternative B (starting on page 87 of the DEIS). Although modeling has shown this effect, the adjacent private timber lands have effectively managed their stands to a condition that would not likely support an active crown fire based mainly on the current low crown bulk density on private lands. Should a wildfire occur on federal lands under a problem fire scenario, in combination with past and planned fuels reduction activities, a successful initial attack would be probable.

Comment: ***Sensitive Soils:***
Alternative B: Activity on 493 acres of sensitive soils (p.51)
Alternative C: Activity on 782 acres of sensitive soils (p.56)
Alternative C has greater impacts; under Cumulative Effects (p. 59) it states, "In summary, 667 acres in Alternative B and 769 acres in Alternative C are the total of soils that remain in detrimental state after soil restoration measures have been applied." It's questionable how 667 acres would remain such under Alternative B when just 493 acres have activity. (#7 - 14)

Response: Sensitive soils and detrimental soil conditions are not the same thing. The calculation of existing detrimental soil conditions is based on the amount and type of past activity in each activity unit; estimated increase in detrimental soil conditions is determined by the amount and type of activities that are proposed in each activity unit. Sensitive soils are areas in which the soil is particularly sensitive to disturbance; steep slopes, high water tables and frost rifts are examples of places where sensitive soils occur. Sensitive soils are delineated on gross landtype acres and only portions of those landtypes are actually on sensitive soils. Disturbance to sensitive soils is minimized by use of advanced harvest systems; temporary roads, landings and skid trails are not placed on sensitive soils. Elements of ground-based logging systems are located on non-sensitive soils where mitigation measures can be applied to reduce the net increase in detrimental soil conditions. Estimates of increase in detrimental soil conditions are irrelevant to the amount of sensitive soil in each harvest unit.

Comment: ***The soil disturbance that is described will exceed Forest Plan Standards in many sale units. Planned sub-soiling mitigation may not be 100% effective or even implemented based on past sales where these goals have been laid out but never met.*** (#5 - 8)

Response: The DEIS acknowledges that the LRMP standard of 20 percent as an allowable threshold for detrimental disturbance of the soil resource has been, or would temporarily be, exceeded in some proposed activity units as a result of active management. The DEIS estimates that detrimental impacts in the form of compaction exceeding the 20 percent Standard and Guideline (SL-3) would temporarily occur in some units as a result of proposed activities prior to subsoiling mitigations (Table 3-8 starting on page 52 of the DEIS). Compacted areas within units exceeding the 20 percent Standard for detrimental compaction would be subsoiled following the implementation of harvest and fuels treatments (Table 3-6, starting on page 50 of the DEIS). The soils disturbance that is described in Alternatives B and C will meet Forest Plan Standards and Guidelines and Regional Policy in all units. The following Standards and Guidelines can be found on page 41 paragraphs 1 & 2.

Management Direction
The Deschutes Land and Resource Management Plan (LRMP) specifies that management activities be prescribed to promote maintenance or enhancement of soil productivity by leaving a minimum of 80 percent of an activity area in a condition of acceptable productivity potential following land management activities (Forest Plan page 4-70, SL-1 and SL-3). This is accomplished by following Forest-wide standards and guidelines to ensure that soils are managed to provide sustained yields of managed vegetation without impairment of the productivity of the land. Applicable Standards and Guidelines include:

- **SL-4**, which directs the use of rehabilitation measures when the cumulative effects of management activities are expected to cause damage exceeding soil quality standards and guidelines on more than 20 percent of an activity area.

The Forest Service Region 6 Supplement also includes policy direction for designing and implementing management practices which maintain or improve soil and water quality. An emphasis is placed on protection over restoration. Specifically, under 2520.3 – Policy, the narrative reads:
"When initiating new activities:
- Design new activities that do not exceed detrimental soil conditions on more than 20 percent of an activity area. (This includes the permanent transportation system).
- In areas where less than 20 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 20 percent.
- In 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 toward a net improvement in soil quality."

The following Standards and Guidelines can be found on page 45, paragraphs 4, and page 46, 1 & 2 of the DEIS:

Soil restoration has been implemented with good success due to the absence of rock fragments on the surface and within soil profiles. Although rock fragments can limit subsoiling opportunities on some landtypes, hydraulic tripping mechanisms on this specialized equipment help reduce the amount of subsurface rock that could potentially be brought to the surface by other tillage methods. Most surface organic matter remains in place because the equipment is designed to allow adequate clearance between the tool bar and the ground, thereby allowing smaller slash materials to pass through without building up. Mixing of soil and organic matter does not cause detrimental soil displacement because these materials are not removed off site. Restoration treatments likely improve subsurface habitat by restoring the soil's ability to supply nutrients, moisture, and air that support soil microorganisms. Since the winged subsoiler produces nearly complete loosening of compacted soil layers without causing substantial displacement, subsoiled areas are expected to reach full recovery within the short-term (less than 5 years) through natural recovery processes.

Monitoring has shown the winged subsoiling equipment used on the Deschutes National Forest lifts and fractures compacted sub-surface soil layers in greater than 90 percent of the compacted zone with one equipment pass (Craigg, 2000). Subsoiling directly fractures compacted soil particles and increases macro pore space within the soil profile, both of which contribute to increased water infiltration and enhanced vegetative root development. Although subsoiling does not completely return these areas to pre-impact conditions, it does significantly rectify physical properties to a condition where other soil processes can recover on site. Subsoiling is very effective in reducing soil strengths incurred by the compression and vibration effects of machine traffic. Soil probes taken before and after subsoiling operations show reductions in compaction below pre-disturbance levels after a single pass of the implement. Following subsoiling, soils can be very fluffed but return to natural bulk density levels after a year or two of physical settling and moisture percolation through the soil profile (Deschutes Soil Monitoring, 1995).

Comment: ***Other concerns include soil disturbance planned to exceed Forest Plan standards in many sale units. Planned sub-soiling mitigation may not be 100% effective or even implemented.*** (#6 - 16)

Response: See response to comment #5-8 above.

Comment: ***Cumulative soil damage in the area is significant. The DEIS does not adequately account for the impacts of multiple entries to accomplish biomass extraction, nor does it accurately describe the inadequacy of soil mitigation techniques.*** (#13 - 5)

Response: Cumulative effects to the soil resource are disclosed on page 59 of the DEIS. See response to comment #5-8 above regarding the efficacy of soil restoration techniques. Table 3-8, page 52 in the DEIS, accounts for existing condition and all potential ground disturbing activities.

Quantitative analyses and professional judgment were used to evaluate the proposed activities by comparing existing conditions to the anticipated conditions that would result from implementing the action alternatives (DEIS, page 42). GIS analysis utilized the soil resource inventory and past harvest data to determine the location and extent of soil effects and existing conditions. Proposed activity units for each alternative in the current project were then overlaid to identify areas of potential effects. Aerial photos, scale 1:12000, were used to refine the location of overlap between past and proposed treatment units. Research by Froelick and Garland, aerial photos, and field visits were used to estimate soil quality. Communication with District Sale Administrators was used to validate this research and insure site-specific conditions were considered. Other district personnel that had information about historical and current logging activities were also consulted. Monitoring and field reconnaissance was used to insure assumptions made were within acceptable limits. This analysis also considered the effectiveness and probable success of implementing the management requirements, mitigation measures, and Best Management Practices (BMPs) which are designed to avoid, minimize or reduce potentially adverse effects to soil productivity.

Comment: ***[Re: DEIS p. 56: Sensitive Soils.]***
Drop units on sensitive soils or eliminate impacts that would raise soil impacts above 20%. [Table 3-11, DEIS pages 56 & 57] (#16 - 27)

Response: See response to comments #5-8 above and #7-14.

Comment: ***To implement the proposed action the Forest Service will, according to the DEIS, need to open 34 miles of closed roads, conduct road maintenance on 130 miles of roads, and build 6.4 miles of new roads. We [Cascadia Wildlands] would like to stress how severe the impacts of roads are, not only on soils but on riparian areas and aquatic ecosystems as well. "Roads have been consistently singled out as a primary cause of the reduced range and abundance of many aquatic species, not only in the West but also across the continent (CWWR, 1996; USFS and USBLM, 1997a; Trombulak and Frissell, 2000; Kessler et aI., 2001; Angermeier et aI., 2004)." (Rhodes, p.7).***

The construction of new roads will add to the total percentage of degraded soils within the project area for a very long time, even if the roads are later decommissioned. Moreover, the sediment delivery from the simple use of roads is enormous:

The USFS' s summary of scientific information on roads (Gucinski et aI., 2001) concluded that 'rates of sediment delivery from unpaved roads are…closely correlated to traffic volume.' Reid et ai. (1981) documented that roads used by more than four logging trucks per day generated more than seven times the sediment generated from roads with less use and more than 100 times the sediment from abandoned roads. Even with a road surface of crushed rock aggregate, which is often used with the intent of reducing sediment production on road surfaces, Foltz (1996) documented that elevated truck traffic increased sediment production by 2 to 25 times that on unused roads in western Oregon. "

(Rhodes, p.19).

Studies throughout the West corroborate that elevated erosion from roads triggered by MFT -associated road use will increase sediment delivery and subsequent negative effects on aquatic resources. A large number of studies and reviews have repeatedly documented significant increases in sedimentation, sediment yield, turbidity, and suspended sediment in response to the existence, construction, reconstruction, and use of roads (e.g., reviews and results in: Geppert et aI., 1984; Eaglin and Hubert, 1993; Meehan, 1991; MacDonald and Ritland, 1989; Rhodes et aI., 1994; Kattleman, 1996; Espinosa et aI., 1997; USFS et aI., 1997a; USFS 2000; McIntosh et aI., 2000)."
(Rhodes, p.25). (#17 - 6)

Response: There are two road/stream crossings and both will be on improved road systems with hardened surfaces prior to haul. The topography is flat at the majority of road crossings and riparian areas, limiting the water that is available to the ditch to that which is directly adjacent to the stream channel. Soils in these areas are outwash plains of a thick layer of coarse pumice that exhibits high infiltration rates (SRI, 1976). As a result, flows rarely occur in roadside ditches. Many roads in the project area are closed during winter months due to heavy snow.

Potential sedimentation from the upslope areas, Odell Butte, Hamner Butte, Odell Butte, Malaks Mountain, and Davis Mountain, can be analyzed by looking at current ground cover and past vegetation or fuels management activities that may have reduced it. With the exception of the Davis Fire area, ground cover in the upslope areas is within standards and guidelines in the LRMP (SL-6).

The Davis fire area was monitored for over-land surface flows in May 2004, June 2005, and May 2006. Monitoring showed very little movement of surface soils in the upslope area. Small, short areas of soil movement were observed in road prisms. In the majority of cases, rills traveled short distances, moved off the roadway at water bars, and finally traveled down hill (less than 50 feet) to be reabsorbed into the soils. No movement of surface soil was observed entering stream channel or wet area (Davis Fire monitoring reports are on file at the Crescent Ranger District).

Due to the high infiltration rate and depth of the pumice soil, stream density on Hamner Butte, Maklaks Mountain, Odell Butte and Davis Mountain is considered low. Water moves downslope subsurface until it encounters the water table adjacent to Odell Creek or Davis Lake (DEIS, page 239).

There is a new bridge over Odell Creek on Forest Service Road 4660. Both of the approaches to the bridge will be paved before haul begins. There is a new open bottom arch that will be constructed over Maklaks Creek that has a hardened surface of rock or pavement. There is one other crossing over Moore Creek on the FS Road 4660. Moore Creek in an intermittent stream that flows for only two to three weeks a year.

Comment: ***In evaluating the costs and benefits of this project, road construction and road use is a major weight on the side of no-action. The FEIS needs to discuss the full impacts that roads and road use will have on soils, streams, and aquatic species. These impacts must be part of the comparison between the overall benefits of the project and the overall detriments of the project, particularly with regard to the activities in Late Successional Reserves.*** (#17 - 7)

Response: See response to comment #17-6 above.

Comment: ***The draft EIS states that Total Maximum Daily Loads (TMDLs) for 303(d) listed waters within the project area are not yet available and that the FS has been working cooperatively with Oregon Department of Environmental Quality (ODEQ) to meet State and Federal water quality rules and regulations (p. 234). While we support this collaboration between FS and ODEQ, we also recommend that the FS continue to coordinate with ODEQ as water quality restoration plans including TMDLs are developed and implemented to address 303(d) listed waters, and the antidegradation provisions of the Clean Water Act for water bodies where water quality standards are currently being met.*** (#15 - 2)

Response: The Forest Service will continue to cooperate with the ODEQ regarding TMDLs.

Comment: ***The FEIS needs to accurately disclose the environmental costs of logging to reduce fuels, as well as any benefits that such activities might have. We [Cascadia Wildlands] want to know if reduced fuels are worth the added erosion, sedimentation, etc..*** (#17 - 2)

Response: See response to comment #17-4 regarding cycling the most vulnerable habitat (NRF) around the landscape. It is worth trying to lessen the risk of another disturbance event with the scale of the Davis Fire (starting on Page 238 of the DEIS). Following implementation of project design features and mitigation measures, all activity units would meet regional soil quality (DEIS, pages 49 and 55).

Comment: ***Most watershed evaluation criteria are "functioning at risk" yet the cumulative effects of this extensive project and other past, present, and foreseeable projects (as well as the changing baseline related to recent fire activity) in the area will further degrade watershed functions in violation of the ACS objectives (which, according to the 1994 ROD as affirmed by recent case law, must be met at all four spatial scales). There's only so much disturbance that these watersheds can handle . . .*** (#13 - 15)

Response: The "functioning at risk" is relevant to the checklist for documenting environmental baseline and short-term effects of proposed action(s) on indicators for bull trout (DEIS, page 223), and the project has been determined to have "no effect" to these species or their habitat.

In this project, the potential effects to hydrologic resources from a direct, indirect, or cumulative nature is relatively benign due a range of reasons (DEIS, Chapter 3, Hydrology), but mostly due to the limited activity in proximity to water and at the bottom of a closed watershed. There are no areas identified as areas of concern for stability. There is no harvest or temporary road construction inside riparian reserves adjacent to stream channels. Two units (756 and 757) are located within the Davis Lake riparian area. These units would utilize a cable logging system, which would incur the lowest amount of soil disturbance as compared to a ground logging systems. Equipment would be restricted to the hardened surface of the existing road in the riparian area next to Davis Lake. Implementation of BMPs reduces or eliminates the risk of sediments entering water bodies, so there would be no degradation of water quality (DEIS, page 243).

This project is consistent with the Deschutes Land and Resource Management Plan as Amended by the Northwest Forest Plan Record of Decision for the Aquatic Conservation Strategy (ROD, B-9). As a result of implementation of Best Management Practices (BMPs) and Standard and Guidelines listed in Appendix A of the DEIS, and management direction in the soils and hydrology section of this document, beneficial uses of the streams in the project area will be protected in a manner consistent with the Aquatic Conservation Strategy (ACS) outlined in the Northwest Forest Plan and the Clean Water Act of 1972. These BMPS have been used numerous times on the Deschutes National Forest in contract provisions and for Project Design Criteria for various projects and have been proven to be effective. Text regarding consistency with Aquatic Conservation Strategy Objectives has been added to the FEIS, in the section titled "Hydrology."

Comment: ***According to the Aquatic Conservation Strategy of the Northwest Forest Plan:***

"Forest service and BLM-administered lands within the range of the northern spotted owl will be managed to:

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.
5. Maintain and restore the sediment regime under the aquatic ecosystems involved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetlands habitat and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected." NWFP ROD B-11.

The Forest Service needs to take a hard look at the impact of proposed activities on aquatic ecosystems. Most of the discussion in the DEIS centers around fire, fuels, 1ate successional forests, and other terrestrial things. But perhaps the most significant impact of thinning projects is felt by streams and aquatic species.

"The collateral impacts of fuel treatments are of considerable concern due to the existing aquatic context. Across the West, aquatic systems are significantly and pervasively degraded (Rieman et ai., 2003; Beschta et ai., 2004). As a result, many populations of aquatic species, including most native trout and sa1monids, have undergone severe contractions in their range and number and remaining populations are now imperiled and highly fragmented (Frissell, 1993; USFS and USBLM, 1997a; Kessler et ai., 2001; Behnke, 2002; Bradford, 2005). Additional damage to watersheds and aquatic systems reduces the prospects for the protection and restoration of imperiled aquatic species (USFS and USBLM, 1997c; USFWS, 1998; Karr et ai., 2004)." (Rhodes, p.1).

"There is a high degree of certainty that MFT [mechanized fuels treatment]will increase erosion and sediment delivery to stream systems with consequent negative impacts on water quality. This is due to the activities involved, their likely extent and frequency, and their likely placement within the watershed context. As concluded by Megahan et ai. (1992) and USFS and USBLM (1997c) it is not possible to log areas without increasing erosion and sediment delivery, regardless of BMPs involved or care in implementation, especially when roads are involved." (Rhodes, p.23). (#17 - 10)

Response: See response to comment #13-15 above.

Comment: ***On March 30, 2007 a federal judge in the Western District of Washington enjoined the amendments to the Aquatic Conservation Strategy, making the original 1994 ACS Standards and Guidelines applicable to this project. These standards include the following:***

As a general rule, standards and guidelines for Riparian Reserves prohibit or regulate activities in Riparian Reserves that retard or prevent attainment of the Aquatic Conservation Strategy. Objectives. NWFP ROD C-31.

Timber Harvest, including salvage, can not occur in Key Watersheds without a watershed analysis. NWFP ROD B-19.

The amount of existing system and nonsystem roads within Key Watershed should be reduced through decommissioning of roads. Roads closures with gates and barriers do not qualify as decommissioning or a reduction in roads mileage. If funding is insufficient to implement reductions, there will be no net increase in the amount of roads in Key Watersheds. That is, for each new mile of new road constructed, at least one mile of roads should be decommissioned, and priority given to roads that pose the greatest risks to riparian and aquatic ecosystems. NWFP ROD B-19.

The information from the watershed analyses will contribute to decision making at all levels. Project-specific NEP A planning will use information developed from watershed analysis. NWFP ROD B-2.

Prohibit tim[b]er harvest, including fuelwood cutting, in Riparian Reserves, except as described below. NWFP ROD C-31.

Apply Silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain ACS objectives. NWFP ROD C-32.

The Five Buttes Project will lead to substantial increases in fine sediments in streams. "Increases in fine sediment in streams sharply reduce the survival and production of all salmonid species. Bull trout and

cutthroat trout undergo especially sharp drops in survival with increased levels of fine sediment (Weaver and Fraley, 1991). Increased levels of fine sediment also negatively affect salamanders, which require relatively coarse channel substrate (Jackson et al., 2001)." (Rhodes p.28). (#17 - 11)

Response: See response to comment #13-15 above.

Comment: ***. . .it is known that commercial thinning, grapple piling and burning, landings, skid trails and road construction create many impacts to watershed functioning and aquatic systems that may well outweigh any benefits.*** (#5 - 13)

Response: The Interdisciplinary Team has reviewed the Jonathan Rhodes "The Watershed Impacts of Forest Treatments to Reduce Fuels and Modify Fire Behavior" February, 2007 paper and recommendations as it relates to proposed activities in Five Buttes. The project appears consistent with the Rhodes "sideboards" to reduce potential adverse impacts to watersheds. Five Buttes project was designed to use mechanized fuel activities in areas where it can be most effective on a landscape scale. The goal is to retain the largest trees. Except in NRF, where the goal is to retain spotted owl habitat over the short-term, use of prescribed fire to maintain an appropriate fire regime is planned for many of the areas where fire behavior modification occurs, in lieu of additional mechanical fuels treatments for future maintenance. Wildland fire, or "Fire Use Fire" is being considered in appropriate places at this time. In this project, the potential effects to hydrologic resources from a direct, indirect, or cumulative nature is relatively benign due a range of reasons (DEIS, pages 234- 243, Hydrology), but mostly due to the limited activity in proximity to water.

Comment: ***. . . It is known that commercial thinning, grapple piling and burning, landings, skid trails and road construction create many impacts to watershed functioning and aquatic systems that may well outweigh any benefits.***

See the upcoming (March 2007) literature review by Jon Rhodes, which will be available from the Pacific Rivers Council. See also "Fuel Treatments alter the effects of wildfire in a mixed-evergreen forest, Oregon, USA"by Raymond and Peterson, 2005 and "Fire, fuels and restoration of ponderosa pine-Douglas fir forests in the Rocky Hountains, USA" by Baker, Veblen and Sherriff, 3006 regarding mixed conifer longer fire interval forests and "Avoiding a New 'Conspiracy of Optimism': The Economics of Forest Fuel Reduction Strategies" by Power in Wild Fire,- A Century of Failed Forest Policy, 2006 by the Foundation for Deep Ecology. (#6 - 20)

Response: See response to comment #5-13.

Comment: ***Ground Disturbing Management Activities:***
Alternative B: "Of the action alternatives, implementation of Alternative B would result in the least extent of physical soil effects due to logging facilities." (p. 50)

Even though Alternative B has more commercial acres, the DEIS states it will have the least extent of physical soil effects. (#7 - 13)

Response: No response necessary.

Comment: ***Fuel reduction and "understory thinning" within the Crescent Creek Wild and Scenic Rivers designation could negatively affect Sensitive-listed Redband trout, and potentially Threatened-listed Bull Trout as well.*** (#5 - 9)

Response: Risk reduction would occur outside riparian reserves/riparian habitat conservation areas on streams. Therefore, there would be no effect on features such as stream shade, water temperature, large wood recruitment, habitat, potential for sediment delivery, or any 303(d) parameter for Crescent Creek. Bull trout are believed to be extirpated from the Crescent watershed and redband trout are depleted. This is presumably due to barriers for passage and a modified hydrograph due to dam operations at Crescent Lake.

Comment: ***Fuel reduction and "understory thinning" within the Crescent Creek Wild and Scenic Rivers designation could negatively affect Sensitive-listed Redband trout, which are present at depleted levels. There is also some potential for the Five Buttes Project to harm Threatened -listed Bull Trout.*** (#6 - 17)

Response: See response to comment #5-9.

Comment: ***There are numerous and diverse fungi, edible mushrooms and rare saprophytic, plants within Five Buttes Project sale units. There are also Survey and Manage-designated plant species within the project area and potentially within logging or fuel reduction units, including a rare moss and a rare fungus (see pp. 247-248.) It is unclear what the scale of negative effects there could be to a Survey and Manage fungus, Ramaria amyloidea (see Table 3-83, p. 247.)*** (#6 - 14)

Response: The species and sites listed in Table 3-84 (DEIS, page 249) were documented in the Five Buttes area as a result of the surveys. Only one site for a Survey and Manage listed species occurs in or near a proposed activity unit. *Tritomaria exsectiformis* occurs in Unit 678 (Alternative C) on Class III and IV decayed wood in the perennial low-flow channel of Dell Spring. A 100-foot buffer from activities would be maintained and has been demonstrated on the district and forest (i.e. Charlie Brown project) to be an effective measure (DEIS, page 27). The sites for all other Survey and Manage species documented in the Five Buttes project area would not be affected by project activities, because the sites are not in the proximity of units or road management activities proposed in the action alternatives.

The known site in the Five Buttes planning area for *Ramaria amyloidea* (Table 3-83, DEIS page 247) is not in or near any units proposed in the action alternatives. *Ramaria amyloidea* is in Category B (see page 248 of the DEIS for the categories and their respective Standards and Guidelines).

The comments have a photograph referring to the ‘rare' species *Alectoria menziezii* (candystick). The correct botanical name for candystick is *Allotropa virgata* Torrey and Gray, not *Alectoria menziezii.* Alectoria is a genus of lichens and there is no species *Alectoria menziezii* in the Pacific Northwest.

Comment: ***We are also concerned that planned high levels of soil disturbance from logging, fuel reduction, road construction and road maintenance could greatly increase introduction and dispersal of exotic invasive plants that could outcompete native plants and give rise to increased amounts of toxic herbicide use (which is planned for invasive plants on the Deschutes National Forest) which would further threaten native plants. (See DEIS p. 259)*** (#6 - 15)

Response: "All projects that propose ground-disturbance activities will have Project Design Features (PDFs) appropriate to the project. The PDFs are taken from the national *Guide to Noxious Weed Prevention Practices* (USDA Forest Service, 2001), the Region 6 Invasive Plant EIS, and the Deschutes and Ochoco National Forests and Crooked River National Grassland Prevention Guidelines. Project Design Features have been shown to be effective in reducing the risk of the introduction and spread of invasive plants. The Region 6 Invasive Plant Final Environmental Impact Statement (FEIS) Record of Decision (ROD) (USDA Forest Service, 2005) adopted Standards and Guidelines that will be followed.” (DEIS, page 259)

The Standards and Guidelines (S&Gs) and Project Design Features (PDFs) that are appropriate to the Five Buttes project are listed on pages 259 and 260 in the DEIS.

The Deschutes and Ochoco National Forests and the Crooked River National Grassland have prepared a Draft Environmental Impact Statement for Invasive Plants that is site specific. It is tiered to the Region 6 Invasive Plant Final Environmental Impact Statement. While there is no decision yet, actions proposed in the DEIS for invasive plant management are expected to have a positive effect on reducing the potential for invasive plant introduction and spread on a large landscape (central Oregon).

Past Activities
Invasive plant inventory and treatments have been occurring on the Deschutes National Forest including the project area in past years. Accurate documentation of noxious weed sites began in the early 1990s. After the Deschutes National Forest Noxious Weed Control Environmental assessment was approved in 1998, chemical treatment was permitted on selected sites, including a section of Cascade Lakes Highway east of Davis Lake in the project area. Past treatment of noxious weeds has reduced the density of weeds on many sites. Approximately ¼ acre along Cascade Lakes Highway within the project area was treated in 2005 using approximately nine ounces of dicamba. In 2000, the first year the site was treated with herbicides, approximately ½ acre along Cascades Lake Highway within the project area was treated with 17 ounces of dicamba. (Langland, pers. comm., 2005). The amount of herbicide needed every year is trending downward as the treatments have been very effective.

The Deschutes and Ochoco National Forests and the Crooked River Grassland have prepared a site-specific Draft Environmental Impact Statement for Invasive Plants that overlaps the area in time and space along major travelways (Highways 46, 58 and road 61) and railroad tracks within the analysis area. This document is tiered to the Region 6 Invasive Plant Final Environmental Impact Statement. At this time, there is insufficient detail to determine the additive effects. The proposed use of herbicides would not have an additive effect to the activities planned in the project area. Activities proposed in the DEIS are expected to have a positive effect on reducing the potential for invasive plant introduction and spread on a large landscape (central Oregon).

Access to all forms of recreation, including Off Highway Vehicle use has potential for an additive effect. To date, the Crescent Ranger District has successfully managed a prevention program through monitoring and rapid response through handpulling of weeds. There is no indication the addition of the Five Buttes project would change this success.

Invasive plant monitoring in the Davis Fire area has shown that existing sites for invasive plants, especially existing bull thistle and common mullein sites in past harvest units and along roadsides, are spreading to adjacent areas where the fire killed trees and created bare ground. One site for Dalmatian toadflax on the 6240-010 road that was found in 2000 before the fire was visited for the first time after the fire in 2006. One Dalmatian toadflax plant was found and pulled. Manual treatment in 2000-2002 reduced the infestation from about 50 plants to the one plant found in 2006. As trees and other vegetation grow, shading will increase and bare ground will decrease, which will have a positive effect over the long term in reducing the potential for invasive plant establishment and spread.

A Risk Assessment was prepared for all alternatives (DEIS, page 261). Alternative C poses the highest risk for invasive plant introduction and spread based on the greater number of acres of ground-disturbance and the greater number of miles of road maintenance, re-opening closed roads, and commercial haul routes, which will cause more negative effects to soils.

Comment: ***Regarding proposed mitigations: What are "advanced logging systems"? (DEIS p. 26) There should be no logging within campgrounds -- the Crescent District already made a horrible mess of a campground on Wickiup Reservoir by commercially logging it. Precommercial thinning and under-burning to reduce fire risk from campgrounds can be acceptable aesthetically and otherwise, but commercial logging of campgrounds seems to advantage commercial interests only and should be discontinued.*** (#16 - 21)

Response: Advanced logging systems are identified in this analysis as skyline or helicopter.

Lava Flow campground is a popular destination for visitors in the summer months, creating a greater potential source for human-caused ignition source – such as the Davis Fire. In its current condition, it offers a direct fire pathway up Davis Mountain (DEIS, page 83), posing an elevated risk to humans and the remaining northern spotted owl nesting, roosting and foraging habitat upslope. The portion of the campground that is most used and contains tables, fire rings, and bathrooms, is within a much larger stand and it is anticipated very little basal area needs to be removed. However, the campground portion remains as part of the larger commercial timber sale to accomplish the necessary work. The silvicultural prescription is designed to retain a diversity of species and the largest trees will remain on site. All activity fuels would be piled by hand and disposed. The objective is to maintain a recreational experience of "roaded and natural." To achieve this, commercial harvest activities would utilize seasonal restrictions, limiting operation to outside of the summer recreation season. The summer recreation season is considered to be from Memorial Day weekend through Labor Day weekend (DEIS, page 272).

Comment: ***Please delay the destruction and/or obliteration of any/all roads and/or trails (either existing or to be developed and put into place) until considerations and decisions have been completed concerning the in-progress Transportation Plan. Specifically, there is a need to consider additional access and use of these roads and trails for recreational and forest/land management purposes.*** (#2 - 2)

Response: Temporary and Maintenance Level 1 roads would be obliterated and closed (respectively) as a requirement of the Project Design Criteria because the environmental effects are based on timely implementation. This type of project access needed for management activity is typically very short with little recreational benefits. Maintenance Level 1 roads are usually closed in a manner that allows future forest management access.

Comment: ***We do support Alternative B that involves lowering stand density by means of thinning, salvage harvesting, prescribed burning, slash piling and re-construction and/or construction of temporary roads. However, we don't support obliteration of the 6.4 miles of roads identified in the alternative, but would support blocking them after project use. Keep them so they can be re-opened and used for fire fighting or future administrative uses.*** (#10 - 2)

Response: See response to comment #2-2 above.

Comment: ***. . . We [Sierra Club] are . . . concerned about: Excessive road activity in an area that already has too many roads. This has significant implications for soil, water, wildlife, weeds, etc.*** (#13 - 2)

Response: Implementation of proposed activities within the Five Buttes planning area would result in the use of the existing transportation system for the purpose for which it was designed and constructed. Road densities in the planning area and their relationship to Standards and Guidelines are discussed in the Wildlife Section on Pages 169 – 171 and 174 -175, including those areas where densities do not meet Deschutes National Forest Land and Resource Management Plan Guidelines. The lack of significance of road use associated with either Alternative B or C is discussed at the following locations in the DEIS:

Soil: Pages 50 and 55 identify that all temporary roads would be subsoiled to mitigate detrimental soil compaction after use; **Water**: Sediment delivery, as shown in the Fisheries Section on Page 224 and the Hydrology and Water Quality Section on Page 243, would not be expected due to the proximity of project activities, low stream density, high infiltration rates and highly porous soils; **Wildlife**: Page 103 identifies that temporary roads will have no significant or long-term impacts to spotted owls. Page 120 displays that the Biological Assessment for both Alternative B and C, including road activities, reached a **"May Affect, But Is Not Likely To Adversely Affect"** determination. Page 125 references the limited effect that road activities would likely have on Pacific fishers. Page 133 discusses that no road activity would be occurring within or adjacent to suitable wolverine denning habitat. Pages 174-5 display the limited extent of impact to deer and elk by road activities and availability of elk security cover. Pages 212-3 show that road activity would not be considered to change the existing continuity of the forest throughout the 160,000 acre planning area; **Botany**: Pages 259 – 260 in the Botany Section display the Project Design Features developed to mitigate infestation or spread of noxious weeds by human activity, including road use.

Comment: ***. . . temporary roads are not really temporary, since the clearing of the forest canopy, fragmentation of the forest, compaction of soils, and opening of access to off road vehicles, hunters, invasive plants, etc. are lasting impacts even if the "temporary" road entrance is later blocked and all but one of these impacts persist past subsoiling if it occurs.*** (#16 - 11)

Response: The term "temporary" refers to the use for management activities. It is not intended to infer short or long-term effects. Refer to paragraph 3 of the Temporary Roads section, DEIS page 274. Further, the effects of the opening and fragmentation are considered in the 3rd paragraph on page 103 which states: "After the completion of all associated activities, the temporary roads would be subsoiled and allowed to re-vegetate." The impacts to the spotted owl would be so small, they would be considered negligible overall. In addition the temporary roads would be obliterated after the completion of harvest activities and post-sale work." Short term effects to big game (deer and elk) are acknowledged in the 1st paragraph discussing the effects of roads on page 174. It says, "This temporary increase in open road density during project operations will likely result in some animal displacement. In a study of elk use and roads within the Blue Mountains of eastern Oregon, Rowland et al. (2005) noted elk will tend to avoid areas near open roads. Because most sales generally operate for several years this effect on elk may last several seasons. However, not all sales would be operating at the same time nor would every herd or band of elk in the project area be impacted since many tens of thousands of acres are not being affected by new roads, timber harvest or fuels reduction work. After the completion of all sale work, temporary roads would be subsoiled and would be closed once again to vehicular traffic. There would be no net increase in open road densities in any subwatershed after project work has been completed and roads have been re-closed. To minimize disturbance to deer and elk during the fawning/calving season, a limited operating period would be applied to treatment areas near water sources during the period of May 1 through June 30 (See Mitigation Measures listed in Chapter 2 of this DEIS for specific units)."

Concerning fragmentation, temporary roads are discussed under the fragmentation topic, 1st paragraph in the Alternatives B and C Direct and Indirect Effects section on page 212 of the DEIS. In summary, "On the Crescent Ranger District due to available seed source, vegetative recovery on subsoiled roads is usually established within 5 years[21]. Although temporary road construction has effects that have been disclosed for other resources in this analysis … due to the temporary nature of the effects (less than 5 years) and the limited access for short-term, this activity would not be considered to change the existing continuity of the forest throughout the 160,000 acre planning area. Also, the potential for introduction of invasive plants associated with temporary road construction is discussed in the section titled "Invasive Plants" in Chapter 3 of this DEIS. Activities proposed would not create additional habitat fragmentation to mid- or late-seral forested stands in the project area." As noted above, the "Invasive Plants" section, page 260, says of all roads, including temporary roads, "As trees and other vegetation grow, shading will increase and bare ground will decrease which will have a positive effect over the long term in reducing the potential for invasive plant establishment and spread." The hydrology and water quality section in the 2nd paragraph on page 243 states, "Temporary road construction is not expected to have an effect on basin hydrology or aquatic resources."

Comment: ***. . . logging will require an expanded and improved road system, which will combine with the more open forest to invite more human use such as firewood cutting and OHV trespass and thus increasing the risk of fire ignitions.*** (#13 - 10)

Response: Expansion of the road system would be short-term and consist of the construction of temporary roads and the opening of Maintenance Level 1 roads for proposed activities. All temporary roads would be barricaded to eliminate motor vehicle access and would be subsoiled as part of post-treatment soil remediation activities to facilitate their return to vegetative productivity (Transportation Section, DEIS, Page 274). Maintenance Level 1 roads would be closed to vehicular traffic at the conclusion of treatment activities (DEIS, Page 275). The maintenance of the open road system, consisting primarily of roadside brushing (which on Maintenance Level 2 roads means just the traveled way), blading, and drainage maintenance, would result in only a short-term improvement of that portion of the transportation system, given that the Maintenance Level 2 roads that make up the bulk of that system do not receive recurring maintenance. There is no evidence from recent vegetative management activities on Crescent Ranger District – even in the short-term when roads used for those activities look "improved" – that such a combination results in an actual increase in human uses above that seen prior to implementation.

[21] Ken Kittrell, Transportation Manager for the Crescent Ranger District, June, 2006.

Comment: ***[Re: DEIS p. 30: #6 and #7]***
Small dbh thinning and fuels hand piling and disposal is not required for fire risk reduction. It defeats the purpose and need. (#16 - 26)

Response: Page 30 of the DEIS prioritizes money collected from timber sales for certain projects, and in this case, additional thinning, handpiling and disposal not already discussed in this document has been identified as a potential activity for enhancement. Pages 83 and 84 of the DEIS disclose how activities such as small diameter thinning and ladder fuel reduction in conjunction with modification of crown bulk density and alteration of ground fuels can be very effective in reducing risk in strategic areas; which has been identified as necessary for this analysis area.

Comment: ***Alternative C according to the DEIS was developed after scoping to respond to two Key Issues identified during scoping. These two Key Issues are: spotted owl habitat and strategic landscape-level reduction of risk due to disturbance events. But these statements in the DEIS are not consistent with what was in the NOI and scoping letter. In both cases spotted owl habitat and landscape scale risks of disturbance were both identified by the interdisciplinary team. In fact, both were identified previously in the Davis Lake Late Successional Reserve analysis.***

AFRC points this out because it is very confusing. It is also relevant because the DEIS states that Alternative C was developed in response to these two Key Issues being identified during the scoping notice. But AFRC suspects that in reality, these two Key Issues (not referred to by that term) were identified by the interdisciplinary team before the NOI (Notice of Intent) was sent out. Furthermore, AFRC believes that Alternative C was developed after scoping because some interest groups did not want to see as much commercial activity as was in the original Proposed Action (Alternative B). (#7 - 1)

Response: The purpose of scoping is to identify the scope and the significant issues to be analyzed in depth in the EIS {CEQ 1501.7 (2)}. The Purpose and Need (in part) was to strategically reduce fuel loadings and forest vegetation density so as to lessen the risk that disturbance events such as insects, disease, and wildfire that could lead to large-scale loss of forest (DEIS, page 4). After the public scoping and additional analysis using the latest landscape modeling tools, the Deciding Official determined the Proposed Action did not go far enough in reducing risk. In addition, the potential effect to the northern spotted owl was considered under the proposed action, but additional analysis identified a key issue.

Comment: ***The DEIS states it was the identification of these two Key Issues,[identified in scoping] both of which were apparent before the scoping process, that led to the development of Alternative C. In other words, the message is to address spotted owl habitat and risk reduction, there must be less commercial activity and more fuel treatments-something AFRC does not agree with. Instead, AFRC believes that both can occur together while meeting these two key issues.*** (#7 - 2)

Response: See response to comment # 7-1 above.

Comment: ***. . .there is an approximately 24% reduction in commercial activity between Alternatives Band C. The other significant difference is that Alternative C, with 24% less commercial activity has more fuel treatments outside commercial units. These fuel treatments were not even considered and analyzed as part of Alternative B for no apparent reason.*** (#7 - 11)

Response: See response to comment #7-1 above.

Comment: ***In Chapter 2, page 14, where Alternative B is described, there is no mention of the Key Issues whereas on page 15 it says Alternative C "was developed to address both key issues associated with landscape scale fire behavior modification and retention of spotted owl habitat." The fact that Alternative B is silent on the Key Issues would lead the reader to believe it addresses neither when in fact that is not true as is shown in Chapter 3 where there is very little significant difference between the two action alternatives.*** (#7 - 3)

Response: Alternative B was the Proposed Action, therefore, it was the alternative that drove identification of key issues and subsequent alternative development in response to scoping. When proposed actions are developed to respond to a need, initial areas of concern are usually identified if known; but public comment and additional analysis can focus the analysis in an area that may or may not have been apparent during scoping. Both alternatives display how they each relate to the key issues.

Comment: ***"Alternative C was developed to respond to both Key Issues identified in Chapter 2 of this EIS . . . Strategically Placed Landscape-area Treatments (SPOTS) is the concept used to optimize fuels reduction on the landscape." (p. 83) Does Alt. B not respond to the Key issues?*** (#7 - 22)

Response: See response to comment #7-3 above.

Comment: ***. . . There are different treatments being proposed for the two action alternatives. Alternative B has more commercial units and less fuel treatments not associated with commercial activity. Alternative C has less commercial units and more fuel treatments not associated with commercial activity. Yet the environmental consequences in Chapter 3 show very little, if any significant difference between Alternatives B and C. There are, however, some clear distinctions, most that would actually indicate Alternative B as being more preferable. . . .see the topics under Ground disturbing management activities; Sensitive soils; Maintain and enhance existing late and old structured stands using silvicultural treatments; Basal area; Fire and fuels; Invasive Plants; and Economic and Social.***

. . . given the near similarity between the environmental consequences of the two action alternative it raises the question of being arbitrary and capricious when Alternative C is chosen over Alternative B. (#7 - 6)

Response: The commenter points out clear distinctions between the two action alternatives. Alternative C was identified as the Preferred Alternative, but the Deciding Officer will consider public comment and the tradeoffs associated with all three alternatives before reaching a decision.

Comment: ***There have been an inadequate range of alternatives offered for this project. I believe that the alternatives given are all unacceptable for this planning project, for the following reasons: . . .***

. . . The highest use of this area is recreational and for wildlife protection, both of which would be impaired by commercial logging. (#5 - 2)

Response: Alternatives considered in detail along with resource protection measures are discussed starting on page 11. Additional alternatives, including small diameter thinning (only), are discussed on page 27. As part of the Purpose and Need for the area, there is a need to contribute to the local and regional economies by providing timber and other wood fiber products (DEIS, page 4).

The tradeoffs associated with active management and recreation/wildlife are disclosed in the DEIS on pages 267 and 91, respectively.

Comment: ***The Five Buttes Interface area near Davis Lake and Wickiup Reservoir is exhilarating for its natural beauty and biodiversity and has outstanding recreational values which receive high public use including: fishing, swimming, boating, camping, off road vehicle use, cross-country skiing and hiking. The highest use of this area is recreational and for wildlife protection, both of which would be impaired by commercial logging.*** (#6 - 1)

Response: See response to comment # 5-2 above. Page 267 of the DEIS discloses effects to the recreating public.

Comment: ***The DEIS . . . Has inadequate cumulative effects analysis, simply listing other timber sales, fires and agency activities without following through with assessment as to what the combined effect of these and the currently proposed Five Buttes project would be for affected species, water quality, fisheries, soil integrity, recreation, etc. and what the net result would be for species viability for various***

listed and rare species in the project area. This is completely contrary to court rulings that require these determinations. of combined effects and net results to natural values to be made. (#16 - 8)

Response: Where there is an overlapping zone of inflluence from a past, present, or foreseeable action, the cumulative effect is disclosed. In many cases where there may be past activities such as timber sales, they are included in the discussion under the heading "Existing Condition" and any effects associated with this federal action are disclosed under direct and indirect effects. This type of disclosure is much more informative to the reader and Decision Maker, instead of incremental effects associated with cataloging each individual action that may or may not have any associated additive effects.

The June 24, 2005 Council of Environmental Quality letter provides guidance on the consideration of past actions in cumulative effects analysis. It states review of past actions can occur in two ways:

> Based on scoping, agencies have the discretion to determine whether, and to what extent, information about the specific nature, design, or present effects if a past action is useful for the agency's analysis of the effects of a proposal for agency action and its reasonable alternatives. Agencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effect of all past actions combined. **Generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the details of individual past actions** (emphasis added).
>
> Second, experience with information about past direct and indirect effects of individual past actions may also be useful in illuminating or predicting the direct and indirect effects of a proposed action. However, these effects of past actions may have no cumulative relationship to the effects of the proposed action. Therefore, agencies should clearly distinguish analysis of direct and indirect effects based on information about past actions from a cumulative effects analysis of past actions.
>
> Agencies should ensure that their NEPA process produces environmental information that is useful to decisionmakers and the public by reducing the "accumulation of extraneous background data" and by emphasizing real environmental issues and alternatives {40 CFR 1500.2(b)}.

Comment: ***Riparian reserve areas are naturally denser due to higher moisture and should not be logged, roaded, or otherwise degraded by fuel reduction activities. Riparian zones contain the highest levels of biodiversity in eastern and central Oregon forests and were set aside to protect these values, . . .*** (#16 - 13)

Response: There were some very positive as well as negative effects associated with the Davis Fire as it burned through riparian areas. The only activities associated with the Five Buttes Project that are within Riparian Reserves are: 1) understory commercial thinning, handpiling, and disposal of forest residue on 53 acres at Davis Lake; and 2) hauling and maintenance on up to 4.2 miles of road in Alternative B. None of these activities are within areas typically associated with riparian vegetation. Based on these observations and analysis, action alternatives comply with the Riparian Reserve and Key Watershed standards and guidelines as specified in the Northwest Forest Plan, as well as the Inland Native Fish Riparian Habitat Conservation Area direction (see page 324). In addition, the Odell Watershed Analysis (October, 1999) specifies the objective at Davis Lake, "Vegetative treatments should be designed to promote development of large tree dominated stands, late successional forest, and bald eagle habitat and may include prescribed fire and thinning" (page 157, Recommendations).

Comment: ***AFRC [American Forest Resource Council] requests the District consider the following:***

Include an analysis of the CO2 emissions from the potential fires after both action alternatives are implemented. In addition, include an analysis of the CO2 emissions of the increased acres of prescribed burning in Alternative C. AFRC believes such an analysis would indicate mechanical treatments contribute less to greenhouse gas emissions. (#7 - 9)

Response: This analysis was completed and added to the fire and fuels discussion in the FEIS.

Comment: ***As for Purpose and Need #2, The region and this District have been so over-logged and there are so many current timber sales across the Deschutes that care must be taken to preserve other values from logging, such as Northern Spotted owls, wildlife in general (especially old growth and interior forest-dependent wildlife), recreation and biodiversity. This "project" (aka timber sale or sale) violates the second Northwest Forest Plan objective stated on p.4 [DEIS]: "Provide old-growth tree stands for (1) preservation of natural genetic pools, (2)habitat for plants and wildlife species associated with over-mature tree stands, (3) contributions to the diversity spectrrun, (4) aesthetic appeal." Logging with no size limit in old growth stands such as proposed is probably the fastest and surest way to destroy these ,values, as well as, in this case, driving the Northern Spotted owl to local extirpation, up-listing, and eventually, extinction.*** (#16 - 6)

Response: The objective cited in this comment is referring to the Deschutes National Forest Land and Resource Management Plan (LRMP) for management of old growth. The Five Buttes Project proposes active management in two areas. One near Maklaks Mountain within the Davis LSR (unit #810) proposes to thin 143 acres for risk reduction within the Old Growth Management Area, as well as strategically reduce the likelihood of a wildfire burning into the adjacent and upslope occupied northern spotted owl home range. The prescription is to maintain a multi-storied mixed conifer forest with fewer trees per acre. The overall goal is to retain the largest trees on site. By selectively reducing risk in that one area, it collectively reduces the risk of wildfire severely impacting the connected late-successional forested stands from above Odell Lake easterly along the southern flanks of Maklaks Mountain then running north (DEIS, page 214). It is consistent with a site-specific plan (Davis Late-Successional Reserve Assessment) which focuses on landscape-level resources and strategies for managing late and old forest-dependent focal species. It is also consistent with the overall objective for "managing to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl" (NWFP Record of Decision C-11).

Unit #690 in the Crescent Creek Old Growth Management area has similar site-specific and strategic objectives, but it is outside the boundaries of the Northwest Forest Plan. It is also consistent with Old Growth Management Area direction. Both active management scenarios have been designed to enhance and perpetuate old growth characteristics.

Consistency findings can be found within Appendix A of the DEIS and FEIS.

Comment: ***Implementation of the Five Buttes project would directly and significantly affect the members and volunteers of our organizations [Sierra Club] because the proposed logging activities would disrupt natural forest conditions causing further degradation of the ecological integrity, wildlife habitat, soil hydrology, and aquatic systems in and around the project area.*** (#13 - 1)

Response: No response necessary.

Comment: ***You are proposing a massive logging project in Late-Successional Reserves, Critical Habitat for threatened species, and other protected areas and old-growth forests. As far as we [Cascadia Wildlands] are concerned, it is your responsibility and legal obligation to explain why this timber sale is different (i.e., legal) than any other. The DEIS is grossly inadequate, and we hope that the FElS will provide more insight about the Five Buttes Project.*** (#17 - 14)

Response: No response necessary.

Comment: ***The DEIS fails to accurately assess and disclose significant cumulative impacts caused by the Davis Fire, recent post-fire salvage, other recent and proposed fuel reduction projects in the area, OHV use in the area, disrespectful human intrusion including trash dumping throughout the area, combined with this Five Buttes proposal. . .*** (#13 - 7)

Response: There are over 200 references to the Davis Fire, including effects associated with post-fire salvage. Discussions on recent and proposed fuels reduction projects are included throughout, especially in the fire and fuels section in Chapter 3. OHV use in the area is discussed in the wildlife, invasive plant, access, and recreation sections. Trash dumping is not a very large problem in the area and there are no additive effects to this federal action.

Comment: ***[Re: DEIS p. 65]***
"Many floral and faunal species depend on late and old forested conditions, which include large trees. Once the large trees are gone, it may take several centuries to replace them."

[Therefore you] need to retain all remaining large trees and LOS/OG. . . . So should not remove M and OG PP, DF, WP, SP, etc. [Table 3-13, DEIS page 65] (#16 - 28)

Response: The purpose and need is to reduce the risk of loss of large trees to disturbance processes as evidenced by the Davis Fire.

Comment: ***We ask you to adopt a true restoration alternative with only pre-commercial thinning (up to 6-8" dbh) on the buttes and Davis Mountain, avoiding Spotted owl Nesting, Roosting and Foraging habitat completely and limiting understory thinning in lower elevation (flatter) areas of Ponderosa pine and Lodgepole pine dominance to a maximum of 10-12" dbh, with no new or temporary roads built and avoiding activity in all riparian zones.*** (#16 - 2)

Response: This alternative was eliminated from detailed study because modeling of fire behavior and vegetation indicated that small diameter thinning only would not considerably change expected fire behavior on a landscape scale (Page 28 of the DEIS).

There are design measures to minimize effects from temporary roads starting on page 25. They would be obliterated following implementation and restored to a condition that is hydrologically functional and able to revegetate more quickly. Effects of temporary roads are disclosed for soil resources, DEIS starting on page 43, wildlife habitat starting on page 103, fisheries and hydrology starting on page 224, and invasive plants on page 259.

The only activities associated with the Five Buttes Project that are within Riparian Reserves are: 1) understory commercial thinning, handpiling, and disposal of forest residue on 53 acres at Davis Lake; and 2) hauling and maintenance on up to 4.2 miles of road in Alternative B. None of these activities are within areas typically associated with riparian vegetation.

Comment: ***The key issues identified are artificially narrow compared to the many more issues raised in scoping. There is an inadequate range of alternatives. There is no "restoration only" alternative with no commercial logging, no alternative limiting the size of trees to be logged and no alternative avoiding logging in Northern Spotted owl NRF habitat even though the owl is already federally listed as threatened, is in clear continuing decline in the project area and elsewhere and the DEIS itself makes a strong case for not logging in Spotted owl habitat in the Five Buttes project area.*** (#16 - 1)

Response: The project Interdisciplinary Team sorted the comments received during initial scoping into categories to help issue tracking and response. Key issues are those that cannot be resolved without some consideration of the trade-offs involved and so are used to develop alternatives and design elements. In this analysis, there were two that fit this category (DEIS, page 11). Some issues were not used to develop alternatives and design elements, but nonetheless relate to environmental components that are considered in the analysis in Chapter 3 starting on page 34 of the DEIS.

Alternatives considered but eliminated from detailed study are disclosed on DEIS page 27. Modeling of fire behavior and vegetation indicated that small diameter thinning only would not considerably change expected fire behavior on a landscape scale (Page 28 of the DEIS). An alternative that avoided northern spotted owl nesting, roosting, and foraging habitat was considered. It was eliminated from detailed study because many of the NRF stands are critical for the overall strategy for landscape scale protection. Fuels modification-only activities would not be as effective in reducing the risk of large-scale loss of forest due to wildfire. Also, long-term risk from disturbance agents such as insect and disease would remain at uncharacteristically severe levels, with recovery of many elements of the ecosystem taking centuries to achieve.

The USFWS which is charged with protection and regulation of activities that affect the northern spotted owl are supportive of this project and are in the appendix of this document.

Comment: ***Veg Mgt. [Vegetation Management is] all well and fine as I am concerned, but the total effect over time will not produce good mgt. [management]. The $ [dollars] will be here for the first round but funding will disappear and the veg treatment W/O [without] herbicide on the forest [will] increase the growth especially with fire introduction.*** (#8 - 1)

Response: This project is not expected to increase the need or use of herbicides, including for invasive species.

Comment: ***Even if this "need" to reduce the risk of fuels were to really exist, you have not demonstrated in the DEIS that the proposed Five Buttes Project will do anything to help. According to a February 2007 study by Jonathan Rhodes, "fuel treatments will not always provide these benefits to watersheds, because they are not universally effective in reducing fire severity, restoring fire regimes, or reducing the ecological effects of higher-severity fire." (Rhodes, 2007).*** (#17 - 4)

Response: Problem fire conditions experienced in the Davis Fire, which burned in the middle of the analysis area, were used for the burn probability modeling. Starting on page 86 of the DEIS, the average burn probability decreased significantly from the no action alternative (A) over the entire analysis area under the treatment scenarios in B and C, with alternative C showing the most reduction (Figures 3-18 and 3-19). The highest burn probabilities were clustered in three major areas. Expected loss of owl habitat was substantially reduced by active management; the most reduction was seen in Alternative C. For pixels inside spotted owl habitat, the average burn probability for Alternative C was 40 percent less than alternative A. Thus, the risk was reduced by 40 percent for Alternative C over the no action alternative. Both action alternatives reduced the burn probability in the spotted owl habitat areas to much lower. An explanation of the modeling is on page 90.

The purpose and need for the project is to strategically reduce fuel loadings and forest vegetation density so as to lessen the risk that disturbance events such as insect, disease, and wildfire will lead to large-scale loss of forest. The Team has reviewed the Jonathan Rhodes "*The Watershed Impacts of Forest Treatments to Reduce Fuels and Modify Fire Behavior*" February, 2007 paper and recommendations as it relates to proposed activities in Five Buttes. The project appears consistent with the Rhodes "sideboards" to reduce potential adverse impacts to watersheds. Five Buttes project has designed mechanized fuel activities to areas where it can be most effective on a landscape scale. The goal is to retain the largest trees. Except in NRF, where the goal is to retain spotted owl habitat over the short-term, use of prescribed fire to maintain an appropriate fire regime is planned for many of the areas where fire behavior modification occurs; in lieu of additional mechanical fuels treatments for future maintenance. Wildland fire, or "Fire Use Fire" is being considered in appropriate places at this time. In this project, the potential effects to hydrologic resources from a direct, indirect, or cumulative nature is relatively benign due a range of reasons (DEIS, Chapter 3 page 234, Hydrology); but mostly due to the limited activity in proximity to water at the bottom of a closed watershed system.

Comment: ***Upon reviewing the DElS, we believe that the Forest Service has not taken the required hard look at the project's impacts to soils.***

"[Mechanical Fuel Treatment] activities will reduce soil productivity in an enduring fashion through several mechanisms, including: reductions in sources of organic matter and nutrient capital; soil compaction and consequent effects; soil displacement and disruption; increased erosion; and effects on soil structure.

MFT removes trees, branches, and needles that are the prime sources of organic matter and nutrients vital to long-term maintenance and protection of soil productivity (USFS and USBLM, 1997a; Graham et aI., 2004; Beschta et aI., 2004; Karr et aI., 2004). The removal of this material ultimately leads to persistent losses of soil productivity (Amaranthus and Perry, 1987; USFS and USBLM, 1997a; b; Beschta et aI., 2004).

The loss of organic matter from vegetation removal cumulatively reduces the ability of soils to absorb and store water. Soils with higher levels of soil organic matter typically have higher infiltration rates and are able to store more soil moisture (Rawls et aI., 1993). Amaranthus et aI., (1989) documented that large, decaying and downed logs contain 25 times more moisture than the surrounding soil after fire. Reductions in infiltration rates and the loss of soil water storage capacity both contribute to increased surface runoff and reduced subsurface flow to streams." (Rhodes, 2007). (#17 - 13)

Response: Response to comment #17-4 (above) discusses the Rhodes citation and mechanical fuel treatment. No large class 2 or 3 logs would be removed within activity units, and the trade-offs between soil quality as a result of active management and No Action are displayed starting on page 48 of the DEIS.

Comment: ***The Northwest Forest Plan makes it very clear that thinning in mature stands is appropriate in only very particular circumstances. It states, "Silvicultural activities aimed at reducing risk shall focus on younger stands in Late Successional Reserves." NWFP ROD C-13.***

"While risk-reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: (1) the proposed management activities will clearly result in greater assurance oflong-term maintenance of habitat, (2) the activities are clearly needed to reduce risks, and (3) the activities will not prevent the LateSuccessional Reserves from playing an effective role in the objectives for which they were established." NWFP ROD C-13.

This three-pronged standard sets very clear perimeters on proposals like Five Buttes. First, the Forest Service must show that the logging will "clearly result in greater assurance of long-term maintenance of habitat. " Second, the Forest Service must show that logging is "clearly needed to reduce risks." Third, the Forest Service must assure that the logging "will not prevent the Late Successional Reserves from playing an effective role in the objectives for which they were established."

The Forest Service has not met any of these standards with the DEIS. As an initial matter, the Forest Service has not yet recorded the current risk of fire with any degree of certainty; nor has the Forest Service recorded with any degree of certainty the likelihood that the proposed actions will reduce any risk that exists. Without this information, and without any degree of certainty involved in the analysis whatsoever, the Forest Service cannot meet the "clearly" standard of the first two tests. Moreover, the Forest Service has not disclosed the possibility or likelihood that logging, road construction, and other activities could increase the risk and severity of fire in the project area.

With regard to the third part of this standard, all indications from the DEIS are that both action alternatives will prevent LSRs from playing an effective roles in the objectives for which they were established. According to the DEIS:

"Heavier thins.. .could return to NRF conditions in an estimated 3-5 decades depending on the amount of understory trees left and their growth response to the thinning. Lighter thinning in NRF stands allows the treated stand to recover to a NRF condition in a shorter timeframe, perhaps in 2-3 decades depending on site conditions and the ability of the understory to respond to thinning with increased tree height and crown diameter." (DEIS page 102.) (#17 - 8)

Response: Risk in this analysis is defined as the probability or chance of a fire start, determined by the presence and activities of a causative agent. Due to the multiple parameters and stochastic nature of lightning and human-caused ignitions, fire risk can never be recorded with any degree of certainty (see comment #17-3). However, when problem fire conditions exist on the Deschutes National Forest, there is evidence of potential effect to northern spotted owl habitat. In the past 5 years approximately 16,654 acres of NRF habitat has been lost mostly due to wildfires on the Crescent and Sisters Ranger District (Davis, B&B, and Link Fires). (DEIS, page 111). This does not include two more problem fires that occurred in 2007: Black Crater and Elk Lake II.

Generally harvest and temporary road building operations break up the continuity of fuels in the area, so fire severity is usually lessened. Regarding an elevated risk due to road building and harvest activities, there may be an elevated level of fine fuels (one year or less) in the short-term between harvest operations and post-sale activities. The risk would be from a human-caused ignition. Typically, during the summer months, contract operations are suspended during the times of highest industrial fire precaution levels, or mitigated through additional equipment on site, shut down times, and fire patrol. Historical records have shown that risk of a fire ignition as a result of fire operations is much lower than from the recreating public, and should a fire result, a successful suppression is much more likely due to equipment and personnel on site. This risk was accounted for in the modeling; specifically the human-caused ignitions.

The Five Buttes project is consistent with the Davis LSRA in which the desired condition is to manage at least 60 percent of the remaining unburned area toward a climatic-climax condition through time maintaining at least 25 percent in NRF habitat. This is a landscape-scale strategy to cycle in and out of NRF habitat while maintaining the large tree component throughout the cycle. The cycling from non-NRF to NRF across the landscape over time would reduce risk to large and contiguous blocks of habitat disturbance processes. The objective is to provide habitat for the spotted owl, which is relatively the most vulnerable to disturbance processes. The Davis LSRA also provides habitat management direction for other late-successional species such as white-headed and black-backed woodpeckers and flammulated owls.

Comment: ***[Re: DEIS p. 98] "The Draft Recovery Plan for the Northern Spotted Owl (USDI, USFWS 1992) recognized the threats in the Eastern Cascades province:***
"Low Populations" - Major threats to the owl population reflect viability concerns related to the generally poor distribution and low numbers of owl sites, and the inability to provide suitable habitat conditions over the long-term (due to changes in forest - tree species, composition and habitat loss due to large fires). (Draft Recovery Plan, page 55).
"Vulnerability to Natural Disturbance" - The potential for large-scale loss of owl habitat from fire is higher here than any other Oregon province, and is considered a severe threat. There is a low probability that DCAs (Designated Conservation Areas) in the province will avoid a stand replacing fire over a significant portion of the landscape during the next century. Loss of habitat is currently occurring as drought is creating forest health conditions which are expected to decrease the acreage of suitable habitat in the province." (Draft Recovery Plan, page 56)

With low populations and high natural disturbance, a rational approach would be to fully protect all existing suitable NRF so as to provide a buffer against future disturbance losses of habitat. (#16 - 32)

Response: See response to comment #17-8 (above) regarding the strategy to keep NRF on the landscape.

Comment: ***Mixed conifer may not be a priority for fuel reduction because dense growth and mixed-severity fire are part of the system in those forest types.*** (#13 - 11)

Response: See response to comment #17-8 (above) regarding the strategy to cycle NRF around the landscape through time.

Comment: ***Scientific Uncertainty Regarding the Effectiveness of Commercial Thinning for Reducing, Fire Risk: Commercial thinning may actually create hotter, drier micro-environments and increase fire risk and severity by reducing shade and moisture retention from live tree canopy and potential down wood and increasing wind speeds through openings, defeating most of the purpose and need given for this project. Logging also potentially leaves greater accumulations of highly flammable slash and fine fuels at ground level.*** (#6 - 18)

Response: See response to comment #17-8 above.

Comment: ***. . .given the near similarity between the environmental consequences of the two action alternative it raises the question of being arbitrary and capricious when Alternative C is chosen over Alternative B. This question is particularly relevant when you factor in the economics that clearly shows Alternative B being superior to Alternative C. These economic factors are of extreme importance to AFRC's members. When, using the analysis in Chapter 3, Alternative B would yield an estimated 63 shifts at the mill used in the analysis versus 48 shifts under Alternative C (a 24% difference), it seems clear that Alternative B is the better choice. AFRC need not remind the agency that what little infrastructure remains in Central and eastern Oregon is vital to the agency's ability to get work accomplished. Maintaining this infrastructure should be a high priority for the agency.*** (#7 - 7)

Response: The Deciding Official will choose an alternative after reviewing public comment, responses, and the final environmental impact statement. Economics is an important factor and tradeoffs associated with all three alternatives would be weighed before reaching a decision.

Comment: ***. . . I looked hard to find significant differences between the two action alternatives and could find none. I also kept asking if the additional fuel treatments proposed in Alternative C not associated with commercial activities could be combined with Alternative B. I found no evidence why this could not be done. Indeed, it could be argued that combining the two action alternatives would yield a much better project over the long term.*** (#7 - 8)

Response: See response to comment #7-7 above. The Deciding Official has the option to modify alternatives as long as the appropriate effects are discussed in the analysis. It is true the Alternative B effects disclosed would be similar to Alternative C respective to the landscape-scale fire behavior modification if fuels treatments were added to block up larger areas; however the effects to the northern spotted owl remain dissimilar. Alternative C retains 799 acres of NRF over Alternative B, allowing enough connected NRF acreage in three areas (North Davis Mountain, North Odell Butte, and East Ringo/South Crider Butte) to provide habitat for immediate occupancy for three pairs of northern spotted owls. Figure 3-29 displays the NRF acre differences.

Comment: ***Economic factors need to be considered for both lumber and other by-products to help support local and regional economies. Often, economic factors are overlooked or given very little attention when designing project activities.*** (#10 - 4)

Response: See response to comment #7-8 above.

Comment: ***Clearly the difference [between Alts. B and C] is in where treatments are done and there's no reason both can't occur together. After modeling, most units that were dropped from alternative "C" did not significantly affect fire behavior. The reason for this is recent timber sales and fuels treatments in these areas as well as the Davis fire had a major impact on fire behavior modeling.*** (#7 - 21)

Response: See response to comment #7-8 above. Commercial activity units that were dropped in Alternative B did not considerably affect fire behavior on a landscape scale.

Comment: ***AFRC requests the District consider the following:***

Combine the fuels treatments outside commercial units found in Alternative C to Alternative B. This will enhance the project's ability to meet the Purpose and Need for Action. It will also improve the economics over the Preferred Alternative-Alternative C. . . .

Please consider combining treatments and at the least, select Alternative B because it does more for the economy. And as a last thought, remember the 25% payments and 'Secure Rural Schools'? The economy is indeed important. (#7 - 10)

Response: See responses to comments #7-7 and #7-8.

Comment: ***Having read the DEIS, it seems apparent that there is, from an environmental consequences perspective, very little significant difference between the two action alternatives. Furthermore, buried in the DEIS starting at page 284 (of 331 pages), the economic benefits are clearly different and in fact would support choosing Alternative B over Alternative C.*** (#7 - 5)

Response: See responses to comments #7-7 and #7-8.

Comment: ***I support the preferred Alternative C for the Five Buttes Project. Alternative C implements strategic fuels reduction at the landscape level to reduce the risk of a stand replacement wildfire and provides more options for wildfire initial attack and control. I suggest a modification of Alternative C to add the treatment units adjacent to the private lands as proposed in Alternative B.*** (#3 - 1)

Response: See responses to comments #17-3 and #7-8.

Comment: ***. . .Alternative B is the best alternative but it could be enhanced by being a little more aggressive in pro-management areas.*** (#10 - 8)

Response: No response necessary.

Comment: ***Alt. B would be the best because there are lots of acres that need thinning and aggressive thinning.*** (#11 - 1)

Response: No response necessary.

Comment: ***. . . We [The Nature Conservancy] support the Deschutes National Forest efforts to reduce risks of uncharacteristic fire, restore the historic process of fire, and add fire resilience to the old-growth forest structure in the dry-mixed conifer stands found throughout the project area. . . . . We recommend that the U.S. Forest Service select Alternative C as the Proposed Action in the Final Environmental Impact Statement . . .*** (#14 - 1)

Response: No response necessary.

Comment: ***Based on our review, we [EPA] have assigned an LO (Lack of Objections) rating to the Preferred Alternative. This rating and a summary of our comments will be published in the Federal Register.*** (#15 - 5)

Response: No response necessary.

Comment: ***I agree with moving forward but with a total plan for the forest. Merge the veg, the timber, water quality, resource instead of locking it up.*** (#8 - 2)

Response: No response necessary.

Comment: ***. . . Public lands are supposedly governed under the premise of "multiple use". These lands owned by the people have been set aside to provide drinking water, recreation, wildlife habitat - and incongruously - timber. Timber production prevents the uses of drinking water, recreation, and wildlife habitat. Timber production does not fit into the spectrum of "multiple use" and instead monopolizes public lands. . . .***

. . . I urge and insist that you cancel the "Five Buttes" logging sale, . . . Public lands are for the people, not a feeding trough for the corporate extraction industry. (#12 - 1)

Response: No response necessary.

Comment: ***We understand the constraints the U.S. Forest Service is under when choosing***

Alternative B for the Proposed Action. While Alternative C is the most expensive of the two action alternatives in the short term, when considering the potential benefits to reduced wildfire suppression costs in the long run, we feel Alternative C is the most cost effective alternative. As suppression costs on the Davis Fire were over eight million dollars (see DEIS, p. 75), the $766,396 difference in net costs between Alternative C and Alternative B should be worth the long-term reduction in risk of another large-scale event. We urge the U.S. Forest Service to investigate alternative revenue sources that would enable the continuation and completion of future fuels treatments, and would like to work with the Deschutes National Forest to explore options to help achieve this common goal. (#14 - 5)

Response: No response necessary.

Comment: ***You are encouraged to proceed as quickly as possible towards implementation of the proposed action(s). Of extreme concern is the impact of any further delays. Specifically given the already dry conditions and uncontrolled fire risks amongst other impacts such as deterioration of the salvageable timber.***
There is considerable concern about the proposed actions with so much emphasis being placed upon wildlife, fisheries, watershed items and various soil and vegetation items. The document presents nearly overwhelming references that we find nearly impossible to research in support of requirements and conclusions. Some have expressed a need to spend more time to engage in further study. To seek additional time for comment on this draft. As indicated, that is not what we encourage. Rather, we believe it to be critical that you proceed in view of the nature of the project. (#2 - 1)

Response: No response necessary.

Comment: ***EPA understands the risk that natural disturbance processes such as insects, disease and fire may pose to valuable forest resources. As a result, we support many of the vegetation management strategies identified in the Preferred Alternative and which are put forward to improve resource conditions while reducing the risk of large-scale loss of forest from the project area. The draft EIS also includes good analyses of potential impacts to resources in the project area, and includes mitigation measures and Best Management Practices (BMPs) to avoid and reduce the impacts. In particular, we are pleased with the FS plan to manage vegetation with intent to keep all current species and structures on the landscape (p. 67).*** (#15 - 1)

Response: No response necessary.

Comment: ***Make sure your project goals are accomplished by doing enough removal to lower stand densities and don't just go through the motions and accomplish very little with the investment and impact being made on this project area.*** (#10 - 5)

Response: No response necessary.

Comment: ***The Department [DOI] supports the Deschutes National Forest's proposal to implement the Five Buttes Project on a 160,000-acre area to reduce the risk of natural disturbances such as fire that may lead to large-scale loss of forest resources. Based on the information presented in the DEIS, the Department supports the Preferred Alternative, Alternative C, which implements fuels treatments in and adjacent to forest stands that support the Federally listed Northern spotted owl (Strix occidentalis caurina) (spotted owl).***

Alternative C was developed to address two key issues: (1) landscape scale fire behavior; and (2) modification and retention of spotted owl habitat. This alternative would strategically place fuel treatments on the landscape to coordinate with past treatments for the purpose of reducing the potential for stand-replacing disturbance events in key habitat for the spotted owl and the federally listed bald eagle (Haliaeetus leucocephalus), including late and old-structured forest stands. (#4 - 1)

Response: No response necessary.

Comment: ***The CWP [Cascadia Wildlands Project] has a serious and overarching concern that the Forest Service is overstating the threat of high-intensity fire in order to justify logging activities that would otherwise be illegal and highly controversial.*** (#17 - 1)

Response: No response necessary.

Comment: ***Aggressive vegetation management practices are needed to reduce the risk of additional large-scale resource losses caused by insects, diseases and wildfires. We support the purpose and need for action on the 160,000 acres being covered in the Five Butte Project area.*** (#10 - 1)

Response: No response necessary.

Comment: ***The document appears to be quite specific in terms of the action(s). Please do not allow an absence of supervision so that there is compliance and please do not allow action(s) beyond those specified for some other means or purposes than those afforded in the proposed action.*** (#2 - 3)

Response: No response necessary.