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Melvin Butte Vegetation Management Project and Non-Significant Forest Plan Amendments

Sisters Ranger District Deschutes National Forest

Deschutes County, Oregon

T16S, R09E, T17S, R09E W.M.

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SUMMARY

The Deschutes National Forest proposes to maintain and restore forest resiliency and forest health in conifer stands to provide habitat for interior forest species and reduce the hazard of large scale wildfires. The project area is located about nine air miles south of Sisters, Oregon and is within the Sisters Ranger District, Deschutes National Forest, Oregon. This action is needed to reduce fuel loadings and forest vegetation density to lessen the risk of large wildfires to nearby communities and key ecosystem components, such as large old trees. Recent large wildfires such as the 2012 Pole Creek fire have dramatically changed the landscape leaving the Melvin Butte area isolated and thereby increasing the urgency of protecting the remaining forest.

The action alternatives would move the forest closer to the Historic Range of Variability. The high fire hazard would be lowered from about 45% to around 7% across the project area. There would be no effect to the gray wolf, wolverine, or the Pacific Fisher. The proposed action would have no effect to the Northern spotted owl and may effect but is not likely to adversely affect the Northern spotted owl designated Critical Habitat.

The proposed action (Alternative 2) and Alternative 3 would decommission about 8 miles of road and close about 6 miles of road. Under Alternative 2 about 0.80 miles of temporary road would be constructed; no temporary roads would be constructed under Alternative 3.

The proposed action (Alternative 2) would produce about 6.6 million board feet (MMBF) of timber as a result of forest restoration activities; Alternative 3 would produce about 6.3 MMBF of timber.

The action alternatives contain two site-specific Forest plan amendments.

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

- Similar to the proposed action, Alternative 3 would address the key issues of temporary road construction; created openings in conifer stands; and large tree removal in areas with dwarf mistletoe.

Based upon the effects of the alternatives, the responsible official will consider the following factors in making a decision:

1. How well the alternatives meet the purpose and need for action
2. How well does the alternative respond to the key issues and have public comments been considered in the analysis
3. What are the likely environmental effects of the action alternatives and in particular, the short-term and long-term effects to federally-listed threatened and endangered species?

CHAPTER 1 INTRODUCTION

DOCUMENT STRUCTURE

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

- *Introduction:* The section includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Comparison of Alternatives, including the Proposed Action:* This section provides a more detailed description of the agency's proposed action as well as an alternative method for achieving the stated purpose. The second alternative was developed based on Key Issues raised by the public during scoping. This discussion also includes resource protection measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Environmental Consequences:* This section describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area. Within each section, the affected environment is described first, followed by the effects of the No Action Alternative that provides a baseline for evaluation and comparison of the other alternatives that follow.
- *Agencies and Persons Consulted:* This section provides a list of preparers and agencies consulted during the development of the environmental assessment.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental assessment.

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

BACKGROUND

In September of 2012 the Pole Creek fire started and eventually grew to 26,584 acres. This is one of many large wildfires that have affected the Sisters Ranger District since 2002. Between 2002 and 2013 approximately 40% of the district has been affected by wildfire, including the loss of nesting, roosting, and foraging habitat for the Northern spotted owl. For example, prior to the 2003 B&B Fire the district hosted over 24 Northern spotted owl nest cores. Multiple fires eliminated18 nest cores. Currently the district has four functioning nest cores. Fires like the 2003 B&B fire and 2012 Pole Creek fire have resulted in dramatic changes in the amount and quality of forested habitat on the district and a heightened awareness in the community to the potential effects of large wildfires. The potential hazard from large wildfires to nearby communities and private property was considered in this project.

When the Pole Creek fire occurred, the Sisters Ranger District was about to release a Draft Environmental Impact Statement for the Popper Vegetation Management Project, which proposed various vegetation treatments across a 17,192 acre planning area. The Pole Creek fire affected 6,545 acres of the Popper Vegetation Management Project Area (38%). Immediately after the Pole Creek fire the district focused on developing a timber salvage sale within the fire boundary and reevaluated the original Popper planning area for a future project. The Melvin Butte Vegetation Management Project is the outcome of the district planning effort.

Dense forest conditions, large scale wildfires, and insects and disease threaten large old trees and the habit of species that depend on them, including fire maintained ponderosa pine forests in the project area. This threat to remaining large trees is important because there has been a loss of 80% of large trees from historic conditions. Large trees are stressed by dense stand conditions which increase competition for site resources and in-growth of tree species such as white-fir have created ladder fuels that can help wildfire reach into the crowns of old trees. Thinning small trees from below and preparing the stands for prescribed fire would help protect and maintain large old trees and contribute to the restoration of fire's natural role in the ecosystem.

The project area has some of the last remaining mixed conifer stands in that portion of the district. Much of the high quality mixed conifer habitat available for wildlife in the area has been lost to wildfire. A major consideration in the Melvin Butte Vegetation Management Project is the maintenance and restoration of mixed conifer forested habitat. The project would strive to 1) promote development of mixed conifer stands in areas with potential to become multi-storied complex stands and 2) restore or improve resiliency in stands where soil or water conditions would limit the development of quality mixed conifer habitat.

Another consideration is the high presence and severity of dwarf mistletoe in many of the ponderosa pine stands in the lower elevations of the project area. Dwarf mistletoe can provide wildlife habitat and structural diversity but ponderosa pine dwarf mistletoe in the forest overstory often prevents the development of future large diameter trees (see the silvicultural section of this document for detailed information). Where appropriate, the project would consider modified harvest techniques that retain some large diameter overstory trees but provide for the growth of pines relatively free of dwarf mistletoe in the long run. We feel that treating stands infected with dwarf mistletoe provides for long term forest health and creates more favorable conditions for the development of future old growth trees.

The project area contains a Wildland Urban Interface (WUI) as identified in the *Greater Sisters Country Community Wildfire Protection Plan*. The WUI begins in Sisters and follows Forest Road 16 to the popular and highly used Three Creek Lake basin. Many stands in the project area adjacent to Forest Road 16 contain varying levels of unburned fuels that could impact ingress of firefighters and egress of the recreational public along Forest Road 16 in the event of a wildfire. About 642 acres of the 2012 Pole Creek fire are located in the project area, west of Forest Road 16.

The economic aspects of forest restoration work were also considered. Wood products such as saw logs and biomass would be a byproduct of conducting forest health and fuel reduction treatments and help maintain the forest products industry as part of a network of economically diverse local communities. A viable forest products industry is essential to maintain the necessary infrastructure to carry out forest treatments such as thinning and biomass removal and to achieve forest restoration objectives at the landscape level. The proposed action would harvest about 20,371 cubic board feet (CCF) (6.6 million board feet of timber), including biomass, as a byproduct of improving forest health and resiliency in the project area.

Deschutes Collaborative Forest Project

The Melvin Butte project area is located within the *Deschutes Collaborative Forest Project Area, Deschutes Skyline Landscape*, which was selected by the Secretary of Agriculture and an advisory committee in 2010 as a Collaborative Forest Landscape Restoration Project. The Collaborative Forest Landscape Restoration Program (CFLRP) was authorized by Congress in the Omnibus Public Land Management Act of 2009. Selected projects may receive CFLRP funds for implementation and monitoring. The Melvin Butte Vegetation Management Project continues with the collaborative process outlined by the Deschutes Skyline CFLRP proposal that was used for the Popper Vegetation Management

Project. We will continue to work with the collaborative group regarding the Melvin Butte project as we did with the Popper project.

The Melvin Butte Vegetation Management Project was initially presented to the Deschutes CFLRA Steering Committee in March of 2014. There was general support for the project but the collaborative did not provide a consolidated response during public scoping.

A field trip to review the project was held on June 3, 2014. There were 24 attendees including 12 members of the collaborative. The discussion focused on dwarf mistletoe treatments, the size of group openings, and mixed conifer treatments. Some members of the collaborative felt that five acre group openings were excessive in size. As a result of the discussion, group openings were reduced from five to three acres in size.

Additional field trips were held on April 24, 2015 and October 30, 2015 to review silvicultural prescriptions for old growth and mistletoe infected pine stands. There were 18 attendees including seven members of the collaborative. Discussions varied about the best approach to treat old growth stands with large diameter trees less than 150 years old and the relationship of stand stocking levels to potential bark beetle infestation. Other discussions focused on the best approach to treating stands infected with dwarf mistletoe.The latest update to the steering committee occurred on July 12, 2016. A letter of support for the project was received from the CFLRA steering committee on July 15, 2016.

Recommendations on possible treatment of ponderosa pine, dwarf mistletoe stands, and dry mixed conifer were developed by the collaborative group and considered in the development of potential treatment options in the project area (see the silviculture section of this document).

LOCATION

The Melvin Butte Vegetation Management Project area includes about 5,375 acres of National Forest System lands approximately nine air miles southwest of Sisters, Oregon in Townships T16S, R09E and T17S, R09E, W. M. and is adjacent to the western boundary of the 33,000 acre Cascade Timberlands property. See Figure 1 for the location of the project area.

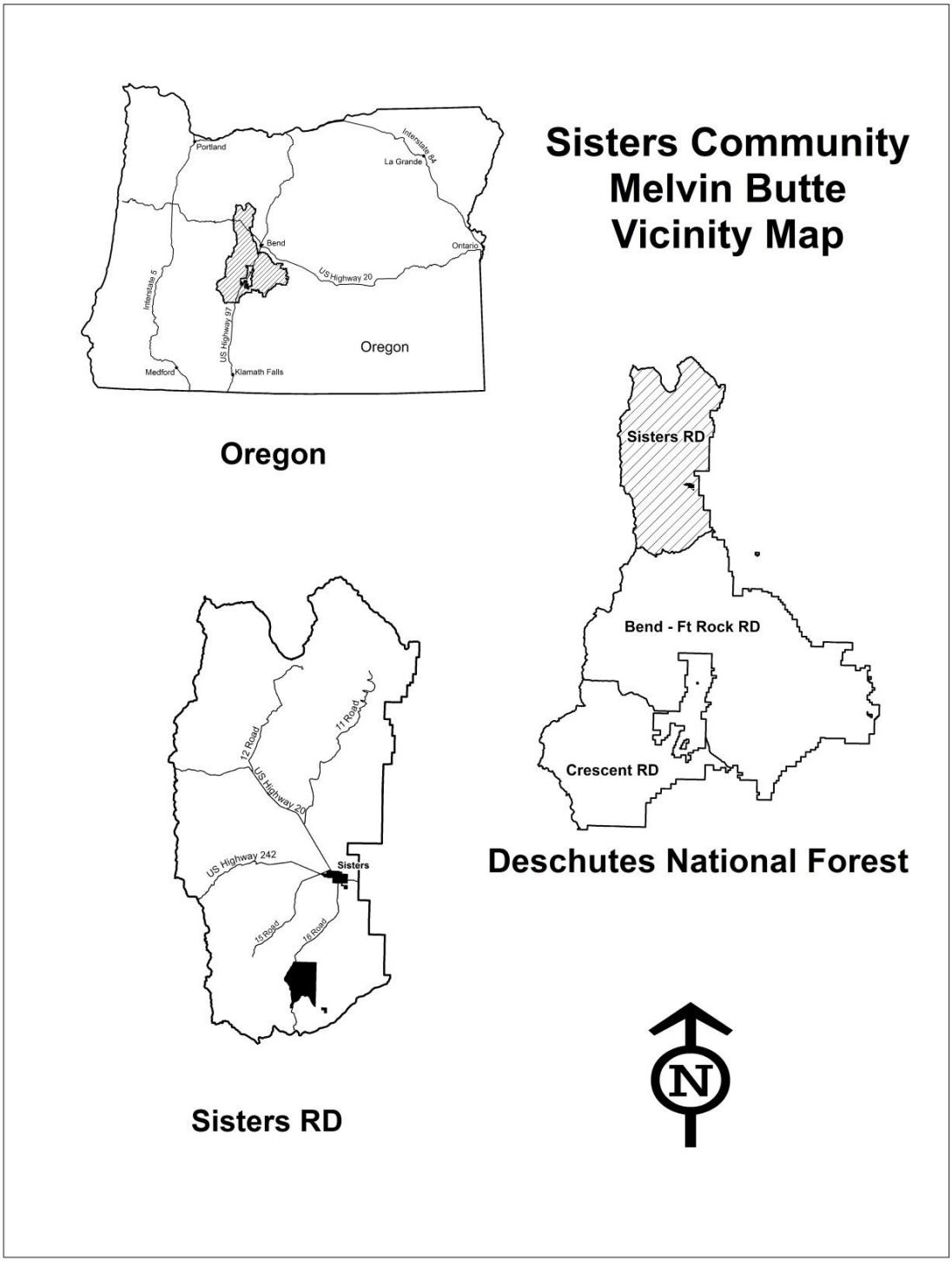

Figure 1 Project vicinity map

PLANNING FRAMEWORK

Development of this environmental assessment follows the implementation regulations of the National Forest Management Act (NFMA); Title 36, Code of Federal Regulations, Part 219 (36 CFR 219; Title 36 Code of Federal Regulations, Part 200 (36 CFR 220); Council of Environmental Quality, Title 40; CFRs, Part 1500-1508, and the National Environmental Policy Act (NEPA).

Many federal and state laws, including the Forest and Rangeland Renewable Resources Act (RPA), Endangered Species Act, Clean Air Act, and the Clean Water Act also guide planning and analysis.

Deschutes National Forest Land and Resource Management Plan

This environmental assessment is tiered to the Final Environmental Impact Statement (FEIS) for the Deschutes National Forest Land and Resource Management Plan (LRMP). The Record of Decision (ROD) was signed on August 27, 1990. The LRMP was amended by the Northwest Forest Plan in 1994.

The 1990 Deschutes National Forest Land and Resource Management Plan (LRMP), as amended, guides all natural resource management activities and provides standards and guidelines for the Deschutes National Forest. The goals for each land allocation are given below (see Figure 2).

Scenic Views (MA-9): The goal is to provide Forest visitors with high quality scenery that represents the natural character of Central Oregon.

Old Growth (MA-15): The goal of this land allocation is to provide naturally evolved old growth forest ecosystems for (1) habitat for plant and animal species associated with old growth 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.

Front Country (MA-18): The goal of this land allocation is to provide and maintain a natural appearing forested landscape on the slopes northeast of the Three Sisters and Tam MacArthur Rim while providing high and sustainable levels of timber production. Portions of the area which cannot be seen from the significant viewer locations will be managed similarly to land in General Forest.

The acres in the project area by the LRMP land allocation are shown in Table 1.

Table 1 LRMP land allocations in the Melvin Butte Vegetation Management Project area

LRMP Management Allocations	Acres
Scenic Views (MA-9)	1,265
Old Growth (MA-15)	167
Front Country (MA-18)	3,943
Total Acres	5,375

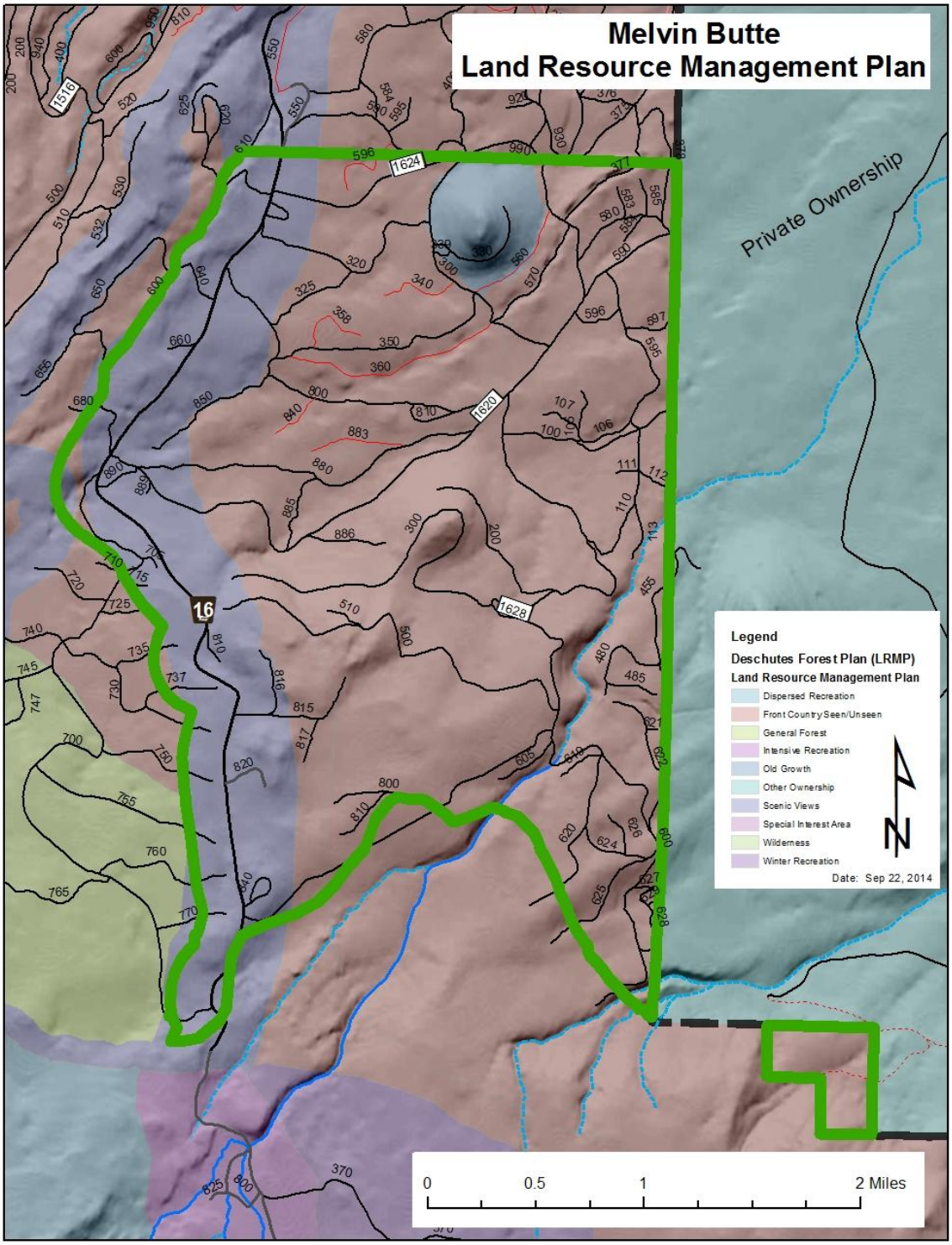

Figure 2 Land and Resource Management Plan land allocation

Northwest Forest Plan

In addition to management direction found in the LRMP, the project area is managed under the Northwest Forest Plan (NWFP). The NWFP amended the LRMP in 1994. The project area contains three NWFP land allocations as described below (see Figure 3).

Administratively Withdrawn: These areas are identified in current Forest Plans where management emphasis precludes scheduled timber harvest and which are not included in calculations of the allowable sale quantity.

Matrix: The Matrix consists of areas where most timber harvest and other silvicultural activities would be conducted, according to standards and guidelines. Most scheduled timber harvest takes place in the matrix.

Riparian Reserves: These areas are a key element of the Aquatic Conservation Strategy. Riparian Reserves provide an area along all streams, wetlands, ponds, and lakes where riparian-dependent resources receive the primary emphasis.

The Melvin Butte Vegetation Management Project area is located in a *Tier 2 Key Watershed* as defined in the NWFP. There are two types of Key Watersheds: Tier 1 Key Watersheds were established to serve as refugia for maintaining and recovering habitat for at-risk stocks of anadromous salmonids and resident fish species such as bull trout. Tier 2 Key Watersheds were selected as sources of high quality water and may not contain at-risk fish stocks. A watershed analysis is required prior to vegetation management activities, such as timber harvest, in a Key Watershed (NWFP standard and guideline C-7). The Whychus Watershed Analysis was updated in 2013 and supports the analysis conducted for this project.

The project area does not contain the Late Successional Reserve (LSR) management area.

The acres in the project area by the NWFP land allocation are shown in Table 2.

Table 2 NWFP allocations in the Melvin Butte Vegetation Management Project area

NWFP Management Allocations	Acres
Matrix	5,208
Administratively Withdrawn	167
Riparian Reserves*	102
Total Acres	5,375

Note: Riparian Reserve*acres are included as a subset contained within other NWFP land allocations.

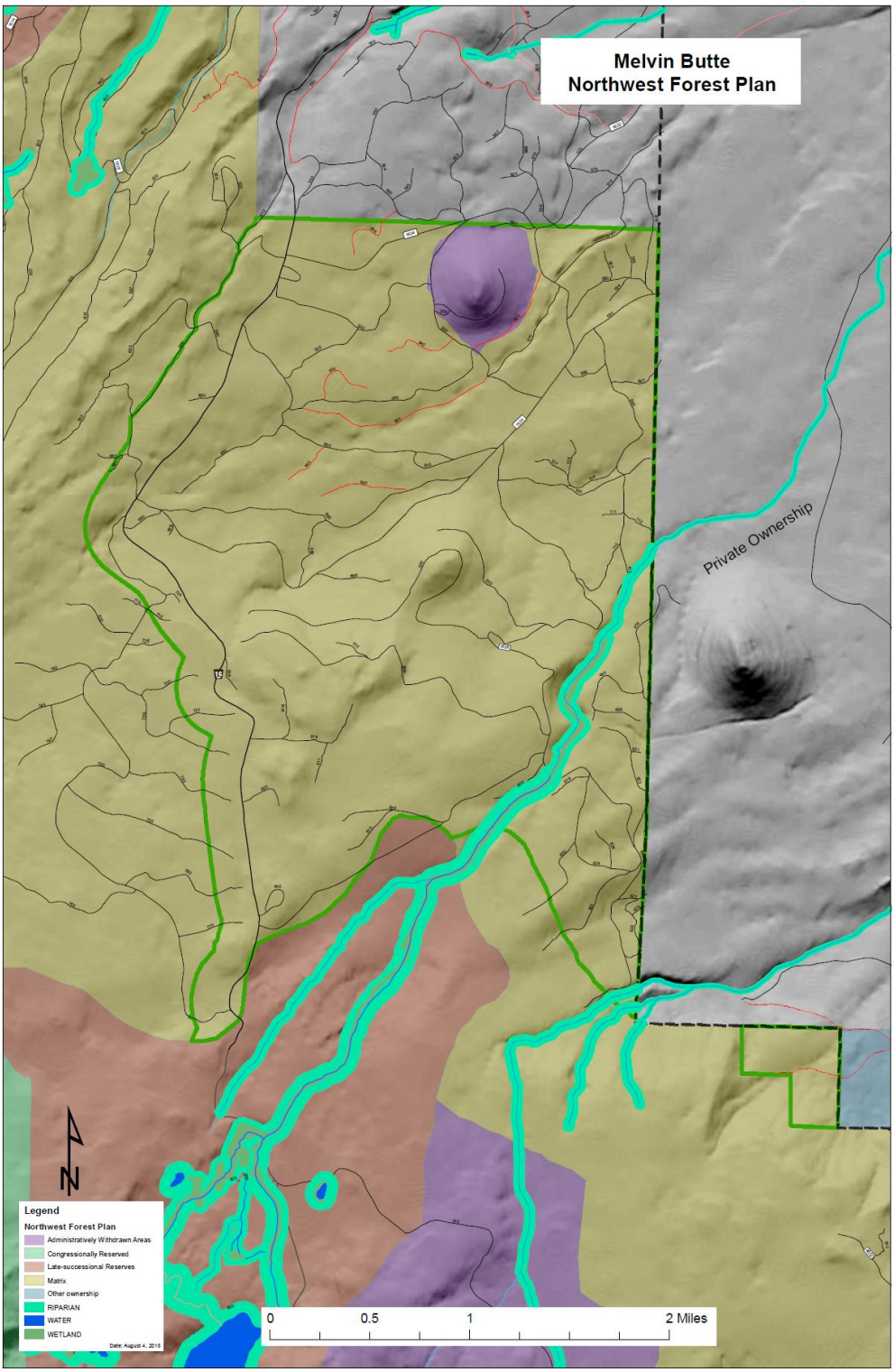

Figure 3 Northwest Forest Plan land allocations

Other Documents Used in Project Planning

The Whychus Watershed Analysis completed in 1998, updated in 2009, and updated again in 2013 to document environmental changes associated with the 2012 Pole Creek fire, provides for a general understanding of the ecological conditions and processes within the seven sub-watersheds that comprise the Sisters/Whychus analysis area. The information contained in the watershed analysis serves as a guide for land management planning and makes recommendations for future projects based on the current landscape condition. The watershed analysis provides an opportunity to synthesize and integrate trends and ecosystem risks. The proposed action is located in a Tier 2 Key Watershed.

The project area is located in *Area 1: Cascade Forest* as described in the watershed analysis. The *Cascade Forest* identified multiple goals for a variety of forest restoration and forest management projects. Goals include the restoration of forest habitats; reduction of the potential for habitat loss due to stand replacement fires; insects and disease; use of prescribed fire in conjunction with silviculture activities such as thinning; provision of forest commodities; and maintenance and restoration of scenic quality. The updated watershed analysis provides a baseline in order to describe and evaluate the cumulative effects associated with the Melvin Butte Vegetation Management Project.

***Revised Recovery Plan for the Northern Spotted Owl* (*Strix occidentalis caurina*)** was completed in June 2011 by the U.S. Fish and Wildlife Service. The goal of the plan is to improve the status of the species so it can be removed from protection under the Endangered Species Act (ESA). The Melvin Butte Vegetation Management project is located in CHU 7: East Cascade North 8. The Critical Habitat units became official in January 2013.

The recovery strategy has four basic steps: 1) completion of a rangewide habitat modeling tool; 2) habitat conservation and active forest restoration; 3) barred owl management; and 4) research and monitoring. In addition, there are three recovery objectives: 1) spotted owl populations are sufficiently large and distributed such that the species no longer requires listing under the ESA; 2) adequate habitat is available for spotted owls and will continue to exist to allow the species to persist without the protection and 3) the effects of threats have been reduced or eliminated such that spotted owl populations are stable or increasing and spotted owls are unlikely to become threatened again in the foreseeable future.

The recovery plan of 2011 and the Critical Habitat final rule of December 2012 and implemented in January 2013 were used to guide project design to eliminate or reduce impacts to the northern spotted owl.

Northern Spotted Owl Consultation

A Level 1 review was initiated on August 18, 2014 to discuss the project's potential impacts to the northern spotted owl Critical Habitat. A Biological Assessment (BA) was prepared and submitted to the U. S. Fish and Wildlife (USFW) on February 15, 2015 and a Letter of Concurrence was issued by the USFW on March 5, 2015.

Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines was completed in January 2001 by the U.S. Forest Service and the Bureau of Land Management. The Record of Decision (ROD) amended a portion of the Northwest Forest Plan by adopting new standards and guidelines for Survey and Manage, Protection Buffers, and other mitigation measures for various plant and animal species.

The action alternatives use the *Pechman Exemptions* in the absence of pre-disturbance surveys to allow for activities in plantations and prescribed fire only treatment units. See the Botany and Fuels section of this environmental assessment for a discussion of the use of the exemptions in the context of the 2001 ROD.

The 2001 ROD was used to determine potential effects to Survey and Manage species found in the project area. The project utilizes the December 2003 species list. The project is in compliance with the 2001 Survey and Manage Record of Decision.

Travel Management, 36 CFR, Part 212

The Forest Service adopted *The Travel Management Rule* nationwide in 2005. The Rule is subdivided into three parts:

1. Subpart A: Administration of the Forest Transportation Plan.
2. Subpart B: Designation of Roads, Trails, and Areas of Motorized Use.
3. Subpart C: Use by Over-Snow Vehicles.

To comply with the new rule the Deschutes and Ochoco National Forest along with the Crooked River National Grassland completed an Environmental Impact Statement and associated Record of Decision to provide direction to manage the use of motorized vehicles across the Forests and the Grasslands.

The Record of Decision directed the completion of Subpart B: Designation of Roads, Trails, and Areas of Motorized Use. To comply with Subpart B the Forest developed Motor Vehicles Use Maps. The maps display roads, trails, and areas of designated motorized use as the primary tool to manage public use of the Forest transportation system.

In 2013 the Deschutes and Ochoco National Forests along with the Crooked River National Grassland began the process to complete Subpart A: Administration of the Forest Transportation Plan. The objective was to analyze all roads associated with the Forest transportation system. This analysis would include prior roads analysis associated with NEPA projects such as forest vegetation management, wildland fuels reduction, and other management actions that included Forest roads. The Forest Service utilized a six step science based process to analyze the transportation system. The analysis included:

1. Setting up the Analysis.
2. Describing the Situation.
3. Identifying Issues.
4. Assessing Benefits, Problems, and Risks.
5. Describing Opportunities and Setting Priorities.
6. Reporting.

In September 2015 the Deschutes and Ochoco National Forests, the Crooked River National Grassland completed a Forest Wide Travel Analysis to comply with Subpart A of the Travel Management Rule. The goal of the analysis is to define a sustainable transportation system in line with present and future management needs and budgetary constraints. To compliment the Forest wide roads analysis a project specific roads analysis was conducted for the Melvin Butte Vegetation Management Project. This analysis is discussed in the Transportation section of this environmental analysis.

OTHER LAWS, REGULATIONS AND POLICY

The following is a brief explanation of other laws, regulations and policy that apply to the Melvin Butte Vegetation Management Project.

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.

In order to comply with this act cultural resource surveys were conducted in the Melvin Butte Vegetation Management Project area.

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 or destroyed. Section 106 of this Act requires Federal agencies to review the effects proposed projects may have on the cultural resources of the analysis area.

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 "Historic Properties Avoided" was determined for the Melvin Butte Vegetation Management Project. This finding is based on avoidance of all eligible and unevaluated sites.

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".

Effects to threatened, sensitive, and endangered species are documented in the biological evaluation assessment prepared for the Melvin Butte Vegetation Management Project.

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" (16 USC 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).

Effects to bird species listed under the Migratory Bird Treaty Act are described in the wildlife report prepared for the Melvin Butte Vegetation Management Project.

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 damage 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 and disclosure, environmental analysis, and documentation.

The Melvin Butte Vegetation Management Project followed the format and content requirements of environmental analysis and documentation. The entire process of preparing this environmental assessment was undertaken to comply with NEPA. Cumulative effects were assessed and displayed where they occur in the manner most informative and logical to display. Also, the depth of analysis was tailored to the degree of effect. In many instances within this analysis, past and present activities, including timber sales, were included in the existing condition. Foreseeable actions were also addressed if there was a proposed action and if it is in the public domain.

The National Forest Management Act (NFMA)

This 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 in 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.

About 3,660 acres would receive some level of timber harvest under the proposed action. These acres would be reforested, if necessary, as required under the National Forest Management Act.

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.

Effects to water quality and 303(d) listed stream are described in the hydrology section of the environmental assessment prepared for the Melvin Butte Vegetation Management Project.

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." Action alternatives are 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 fuels reduction activities (burning of logging slash piles) proposed for the Melvin Butte Vegetation Management Project would be conducted in compliance with the State of Oregon Smoke Management System and would meet smoke management objectives for total emissions.

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.

The action alternatives have no specific actions that adversely affect wetlands and floodplains. Proposed activities are compliant with the orders and USDA Departmental Regulation 9500-3 which guide wetlands management on public lands.

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. All lands proposed for active management in the Pole Creek Fire Timber Salvage Project analysis area are classified "suitable." Actions proposed in 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 (Chapter 3, Soil Quality).

The Melvin Butte Vegetation Management Project is in compliance with all federal policies and regulations in regards to land suitability and associated timber harvest.

Migratory Bird Executive Order 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."*

The Melvin Butte Vegetation Management Project is in compliance with Executive Order 131186.

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."

Invasive Plant Treatments: Deschutes and Ochoco National Forests, Crooked River National Grasslands Final Environmental Impact Statement

The 2012 Final Environmental Impact Statement (FIES) outlines treatment methods for invasive plants found on National Forest Systems lands in the project area. The range of treatments include manual e.g., hand pulling, cutting), mechanical (e.g., weed wacking), cultural (solarization), burning, and herbicide (e.g., ground-based broadcast spraying, spot spraying). New detections of invasive plants that are not identified in the FEIS are approved for treatment under the Early Detection/Rapid Response Strategy. The Record of Decision (ROD) was signed in May 2012.

Effects to invasive plant species and their control are documented in the botany report prepared for the Melvin Butte Vegetation Management Project.

Civil Rights Impact Analysis

Civil Rights Impact Analysis (CRIA) identifies the potential social impacts of a decision on employees and customers, so that these impacts will be considered and appropriately mitigated as part of the decision-making process. CRIA is required for any major decision which has a significant social or civil rights impact (FSM 1730.3). Decisions include natural resource management decisions that potentially impact Forest Service employees or customers. A decision with a significant civil rights impact is one that abolishes positions or reduces services or programs offered to the public.

The current project will not affect employees or customers of the Deschutes National Forest; therefore a CRIA is not required.

PURPOSE AND NEED FOR ACTION

The **purpose** of this project is to maintain and restore forest resiliency and forest health in stands that provide habitat for interior forest wildlife species and pose a potential hazard of large scale wildfires in the Melvin Butte project area.

There is a **need** to reduce fuel loadings and forest vegetation density to lessen the hazard of large wildfires to nearby communities and key ecosystem components, such as large old trees. Recent large wildfires have dramatically changed the landscape leaving the project area isolated and thereby increasing the urgency of protecting the remaining forest.

The project area is currently at risk of stand replacement wildfire associated with insects, disease, and overstocking and represents some of the remaining unburned forest in the area. The project area also contains a Wildland Urban Interface (WUI) located along Forest Road 16. This project would also meet a need to provide wood products to the local and regional economy as a byproduct of landscape level treatments.

This action responds to the goals and objectives outlined in the Deschutes National Forest Land and Resource Plan, as amended, and helps move the project area towards desired conditions described in that plan. The Whychus Watershed Analysis provides a framework to conduct vegetation management activities in the project area.

Rationale for the Purpose and Need For Action

Existing Forested Condition

Forested vegetation in the project area varies from southwest to northeast as the elevation changes from 6,200 feet to 4,200 feet respectively. The primary plant association groups include the Ponderosa Pine

plant association (21% of the area); the Mixed Conifer plant association (69% of the area); the Lodgepole Pine plant association (10% of the area); and the Mountain Hemlock plant association (<1% of the area).

Broadly, three factors have shaped the existing condition and the purpose and need for action: 1) biotic risk factors such as the presence of western dwarf mistletoe and bark beetles; 2) past management actions such as past logging, fire suppression, and fire exclusion; and 3) and the large-scale 2012 Pole Creek Fire. These factors interact and affect the resistance and resiliency of the project area from future unknown disturbances including wildfire, insects/disease, public safety and ongoing climate warming and drying. Biotic risk factors (primarily western dwarf mistletoe) within the project area are no longer within the historic range of variability and as such threaten ponderosa pine tree longevity and/or development.

Forest tree species composition and sizes have changed over time in the project area. Past management has resulted in more ladder fuels from understory and mid-story trees directly or indirectly impacting the survival of trees within the project area in the event of a wildfire. Under severe conditions, about 40% of the area is predicted to be high severity fire (stand replacement) (this is similar to the result of the adjacent 2012 Pole Creek Fire).

About 88% of the project area contains tree density arrangements (e.g., overstocked stands) that indicate risk to important ecosystem elements by disturbance factors. Dense stands of trees are primarily a result of ingrowth from fire suppression/exclusion or past management actions such as clear-cutting (and subsequent replanting). Seventy-five percent of the project area is now dominated by small trees less than 20 inches diameter at breast height with dense multi-storied canopies, resulting in contiguous ladder fuels or plantations with uniform canopies and a high density shrub layer. About 2/3rd of the project area contains low to high levels of western dwarf mistletoe. These acres are considered at a higher risk for bark beetle (mountain and western pine beetles) mortality, stand replacement fire, further dwarf mistletoe infection, and overall reduction in tree vigor and longevity among all size classes including large old growth ponderosa pine.

In addition, the 2012 Pole Creek Fire created abundant standing and down wood (fuel) along the Forest Road 16 and Wildland Urban Interface (WUI) corridor.

Departure from the Historic Range of Variability

Historically, about 40 to 50 thousand acres of the 1.6 million acre Deschutes National Forest burned annually, primarily in frequent fire adapted ponderosa pine forest but also in mixed conifer forest in the upper elevations of the project area. Fires were a mix of low and mixed severity that maintained the structural and compositional stages within the historic range of variability (HRV). Historic or past forest management practices such as regeneration harvest (clear-cutting and overstory removal) and fire suppression and exclusion have shifted the structural stages outside of the HRV in the Melvin Butte project area. The project uses the HRV as a reference framework for historical estimates of forest size-classes (structure) and seral stages, tree species (or lack of) proportional dominance, that may have been present at any given point in time in the past 300 years (see the silviculture section of this environmental assessment for more details).

The greatest departure from HRV occurs in the ponderosa pine, where large diameter open ponderosa pine stands were once distributed across a larger portion of the landscape in both the ponderosa pine and mixed conifer plant association groups (Whychus Watershed Analysis). About 90% of the project area was dominated by ponderosa pine across most plant association groups. Currently more than 75% of the project area is dominated by trees less than 20 inches diameter at breast height. Much of this acreage occurs as small blocks of plantations (about 22% of the project area); second growth stands; regenerated stands from wildfire; lodgepole pine stands; or other areas dominated by small trees. The silviculture

report contained in this environmental assessment details how the project complies with the NWFP standards and guidelines to meet the 15% retention of late successional old growth in 5th field watersheds.

Species composition across the project area is outside of HRV. The most dramatic changes have occurred in the mixed conifer (dry and wet) plant association groups because of overstory removal of ponderosa pine and fire suppression and exclusion. There has been an overall increase in advanced grand/white fir persistence and abundance at the expense of ponderosa pine regeneration compared to the reference condition. These conditions can preclude the growth and development of large diameter ponderosa pine over the long term because of competition for site resources such as water, nutrients, and growing space. The densities of grand/white fir regeneration and subsequent development of shade intolerant trees as ladder fuels put the existing overstory old ponderosa pine trees at risk to high intensity wildfires and their potential loss of these cap-stone species reduces the resiliency of the landscape to respond to disturbance over time.

The project proposes to create conditions that move the project area towards the HRV over the long-term. Moving areas towards the HRV would maintain and restore forest resiliency and forest health and help meet the purpose and need for action. This would not occur on every acre; some stands would be retained in their current condition to provide habitat for the northern spotted owl, provide dispersal habitat for other forest wildlife species, or to meet other land management objectives.

Desired Future Condition for Forested Vegetation

The desired future conditions for forested vegetation in the Melvin Butte project area include the following goals:

- Maintain and improve long-term[1] habitat for interior forest species
- Reduce fire risk for large[2] stand replacement events[3]
- Improve potential[4] for large ponderosa pine tree development
- Maintain and enhance stand densities[5] that favor resistance and resiliency to future unknown disturbances

The desired future condition would be a forest with medium to large ponderosa pine arrayed in a spatially complex arrangement that reflects to the extent possible[6] the historic range of variability and a variety of stand conditions distributed among a large tree matrix that as a whole is receptive to fire without likelihood for stand replacement. Stand densities and fuel loadings would be consistent with natural fire frequencies. Snags and down log levels would be consistent with historic levels and the standards and guidelines established in the Northwest Forest Plan. The forest would be near-natural appearing with continuous forest canopy dominated by large trees that would be less susceptible to insects and disease epidemics and large-scale stand replacement fires. This forest would provide habitat for a wide array of forest wildlife species, including providing dispersal habitat for the northern spotted owl.

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[1] Long-term defined: as >30 years.
[2] Large defined as: a total area >537 acres or >10% of Melvin Butte analysis area.
[3] An event defined as: a proportion less than adjacent Pole Creek Fire (2012) which resulted in >40% stand replacement of area burned.
[4] Potential defined as: favorable abiotic and biotic growing environment for large tree development and/ or maintenance.
[5] Density measures provide a framework for understanding inter-tree competition and potential for stands to withstand disturbances
[6] Adjustment of past management activities is not an overnight process – rather a movement towards HRV amongst social and ecological frameworks.

More specific information about desired future condition for each plant association group in the project area is located in the silvicultural report of this environmental assessment.

CHANGES TO THE PROPOSED ACTION SINCE PUBLIC SCOPING_____

A number of changes to the proposed action have occurred since the March 26, 2014 public scoping. These changes are based on field reconnaissance, use of remote sensing data (i. e., LIDAR), and further review by the project Interdisciplinary Team (IDT). These changes more accurately reflect on-the-ground conditions and would better meet the purpose and need for action. These changes include the following:

- *Scenic Views Enhancement Treatment*: This is a new treatment type comprising about 240 acres. The treatment would help meet the goal for the Scenic Views Management Area (MA-7) as described in the LRMP. The treatment area is located along the west edge of Forest Road 16 in the southwest section of the project area. This portion of the project area experienced mixed severity and stand replacement fire during the 2012 Pole Creek fire.
- *Ponderosa Pine Mistletoe Treatment*: Originally this treatment area contained two treatment types based on the number of trees per acre infected with dwarf mistletoe. Further field reconnaissance indicated that only one treatment type fit conditions found in the forest. About 160 acres would be treated; however, mistletoe treatment stands are not homogeneous and may include small areas within stands where the thinning or mixed conifer treatments could be applied.
- *Prescribed Fire Treatment*: The number of acres of this treatment type has changed from 993 acres to 809 acres. Further field reconnaissance indicated that some acres would better fit the Wildlife Retention Strategy.
- *Lodgepole Pine Improvement Treatment*: The number of acres of this treatment type has changed from 445 acres to 249 acres. Further field reconnaissance indicated that some acres would better fit the Scenic Views Enhancement Treatment.
- *Thinning with Group Openings Treatment*: The number of acres of this treatment type has changed from 1,030 acres to 839 acres. Further field reconnaissance indicated that some acres would better fit the Scenic Views Enhancement Treatment.
- *Thinning Treatment*: The number of acres of this treatment type has changed from 1,367 acres to 998 acres. Further field reconnaissance refined the areas in need of density management.

Plantation Treatments remain the same as described in the original proposed action. About 1,174 acres would be treated.

PROPOSED ACTION _____

The Sisters Ranger District has identified treatment units on 4,469 acres within the project area to meet the purpose and need for action.

Potential forest restoration treatments were developed by an interdisciplinary team to address hazardous fuels reduction in the wildland-urban interface, tree density reduction for forest health, maintenance of dispersal and foraging habitat for various wildlife species, maintenance and improvement of scenic quality, and protection of special habitats.

Ground-based logging systems would be used. Only areas less than 30% slope would be logged. Secondary treatments could include pruning, mowing and/or mastication, prescribed fire, road closure and road decommissioning. The proposed action contains about 0.80 miles of temporary road construction.

The proposed action would treat about 642 acres of the 2012 Pole Creek fire. These acres are located in the Wildland Urban Interface (WUI) adjacent to Forest Road 16. Treatment of these acres would facilitate meeting the objectives of the *Great Sisters Country Community Wildfire Protection Plan* and also assist in meeting the goals and objectives for the Scenic Views (MA-9) land allocation.

The proposed action also includes two site-specific Forest plan amendments for the Scenic Views land allocation. See the section Site-Specific Forest Plan Amendments of this environmental assessment for more details.

Project Design Strategy

Two key project design strategies were used to develop the proposed action: 1) a wildlife habitat retention strategy based on soil productivity and 2) a wildland fire urban interface and fuel reduction strategy based in part the *Greater Sisters Country Community Wildfire Protection Plan*. These strategies are discussed in detail below.

Wildlife Habitat Retention Strategy

The IDT developed a wildlife habitat retention strategy using a combination of soil type groupings and future habitat needs to identify areas with the greatest potential to develop into mature multi-storied mixed conifer forest structure or areas more likely to become single story mature ponderosa pine. Using the inherent site productivity of different soil types within the planning area, three major soil groupings were identified based on soil textures, depth, rock fragments and the resulting soil water supplying capacity. These three soil types were identified for conifer retention levels of 10%, 15%, and 20%. Areas with higher retention levels had the greatest potential to become mature multi-storied mixed conifer stands. Lower retention levels indicate areas with more potential to become single story mature ponderosa pine stands. See the soils section of this environmental assessment for more detail.

Within these areas, the retention standard would be used to identify no treatment areas that would amount to 10%, 15% or 20% of the area. The eventual size of these areas would vary but would attempt to mimic historic natural variation in the distribution and arrangement of mature stands. The intent of the differing retention strategies is to develop landscape level variation in stand conditions across the planning area.

There are about 745 acres in the project area that would be retained as no-treatment areas to meet this strategy. In addition, there is a 30 acre block that could be underburned using prescribed fire if the conifer overstory can be retained for a total of 775 acres. Riparian Reserves would also not be treated and could provide more acres to supplement the retention strategy. See Table 3 for retention acres by the soil type category.

Table 3 Retention area description for the Melvin Butte Vegetation Management Project

Category	Retention Acres -No Treatment	Retention Acres -Prescribed Fire	Total
10 %	129	30	159
15 %	235		235
20 %	381		381
Total Acres	745	30	775

Wildland Fire Urban Interface and Fuels Reduction Strategy

This strategy would be applied to lands described as Wildland Urban Interface (WUI) in the *Greater Sisters Country Community Wildfire Protection Plan*, specified Forest Roads, and areas adjacent to private property (the Cascade Timberlands property east of the planning area). After treatment these areas

would provide for lower fire intensity and allow for more effective and safe fire suppression. A WUI map is located in the fire and fuels section of this environmental assessment.

Three areas within the project area are the focus of this strategy:

1. Reduce hazardous fuels along the designated Wildland Urban Interface corridor adjacent to Forest Roads 16. Fuel reduction treatments would include thinning from below, retention of residual green trees in areas of high lodgepole pine mortality, mastication and/or mowing of shrubs, and prescribed burning.
2. Reduce hazardous fuels adjacent to Forest Roads 1620, 1624, and 1628. These are primary travel routes within the project area. Fuel reduction treatments would include thinning from below, mastication and/or mowing of shrubs, and prescribed burning.
3. Reduce hazardous ladder fuels along the western boundary of the Cascade Timberlands property and along the eastern edge of the project area. This would help prevent fires from moving from National Forest System lands onto private property. Fuel reduction treatments would occur in a 600 foot buffer as measured from the private property boundary and include thinning from below, mastication and/or mowing, and prescribed burning.

Treatment Descriptions

Treatments to meet the purpose and need for action are described below:

Lodgepole Pine Improvement Treatment (249 acres): *The goal is to create a mosaic of even aged stands with natural appearing openings within the lodgepole pine, while providing a fuel break adjacent to Forest Road 16.*

Improvement cutting activities (thinning and group openings) are proposed in lodgepole pine stands that were affected by the mountain pine beetle outbreak of the 2000s. Improvement cutting is the removal of less desirable trees of any species in a stand of poles or larger trees, primarily to improve composition and quality. The overstory trees that exhibit poor crowns and/or heavily-infected mistletoe would also be removed. These trees have poor growth rates and potential for infecting the understory with mistletoe is high. These stands would have fewer remaining overstory trees than in those stands that are thinned. The existing understory would contribute considerably to future growth.

A series of patch cuts (up to approximately 3 acres) would also occur across the area, where appropriate, to break up the continuity of the stands, creating a mosaic of even aged stands. No snags would be removed except those that pose a safety hazard under OSHA guidelines.

This treatment in the lodgepole pine plant association would provide a discontinuous fuel bed east of Forest Road 16 to support of the Wildland Urban Interface strategy. Within the Wildland Urban Interface stands would be continually thinned to maintain a fuel break along the road.

Plantation Treatment (1,174 acres): *The goal is to create more structurally diverse forests*.

Plantations in the Melvin Butte area are a result of clear cutting or group selection harvest practices. Plantation treatments could include small tree thinning, pruning to remove mistletoe, mowing of shrubs, and prescribed burning. The edges of adjacent stands would be treated to remove dwarf mistletoe infestations (e.g. pruning, small tree thinning, and girdling) to avoid infection of smaller trees. Tree planting would occur in areas heavily infected with mistletoe where the majority of trees are removed.

Thinning treatments would be based on variable density thinning sometimes referred to as a "gappy/patchy/clumpy" treatment. About 500 acres of plantations could be thinned within the next five year period.

Ponderosa Pine infected with Dwarf Mistletoe Treatment (160 acres): *The goal is to maintain and restore ponderosa pine stands relatively free of mistletoe while recognizing the role that mistletoe plays in ecosystem function*.

These areas occur primarily in the lower elevations of the project area. All dwarf mistletoe treatments would include removal of the infected pine understory while leaving as many uninfected or lightly infected understory trees as possible. Secondary treatments may include shrub mowing, prescribed burning, pruning, and planting ponderosa pine in understocked areas. In some areas, dwarf mistletoe is not evenly distributed throughout a particular stand; portions of these areas would be thinned as in the thinning treatment described below. Overstory treatment types are based on the number of trees per acre and include:

Treatment Type: Stands with 4-14 trees per acre that are greater than 21 inches dbh (147 acres):

- Girdle the overstory trees to meet wildlife habitat requirements; harvest the remaining overstory trees as wood products.

This treatment type is based on recommendations from the Deschutes Forest Collaborative. The focus would primarily be on treating areas infected with dwarf mistletoe. However, there may be areas with the stands which may require a thinning only treatment.

Prescribed Fire Treatment (809 acres): *The goal is to manage in-growth of trees, reduce fuels, and reintroduce fire back into the ecosystem*.

This treatment would be applied to 1) areas that have been previously harvested and require understory maintenance burning; and 2) areas where prescribed fire would be used to maintain fire climax ponderosa pine stands.

The Survey and Manage *Pechman Exemption (d)* would be used to treat about 809 acres under the Prescribed Fire Treatment prescription. These acres are Late Successional Old Growth (LSOG); prescribed burning can be conducted without pre-disturbance surveys for survey and manage species. Precommercial small tree thinning (< 8" diameter at breast height) would take place to reduce ladder fuels that reach into the crowns of old large trees. Thinning slash would be piled by hand and burned. No commercial timber harvest or biomass removal would take place. Fire effects would range from light to moderate burn intensities. See the Botany section of this environmental assessment for a discussion of the use of the Pechman Exemptions.

Thinning Treatment (998 acres): *The goal is to maintain fire climax ponderosa pine*.

Thinning would occur in the Ponderosa Pine and Mixed Conifer Dry plant association groups. These areas have a predominance of older pine or second growth ponderosa pine in the overstory with some small diameter ponderosa pine and white fir in the understory. Thinning is intended to move multi-story late old structure stands to single story late old structure stands. This change in stand structure is intended to move conditions to where larger trees are more likely to survive stand replacement wildfires, have lower susceptibility to bark beetle attack, and extend the lifespan of large trees.

Treatment Type 1: Treatments within the old growth stands would include thinning from below, mowing of shrubs, and prescribed burning. This would move multi-story, late old structure stands toward single-story, late old structure stands.

Treatment Type 2: Thinning treatments in the second growth ponderosa pine would be based on variable density thinning ("gappy/patchy/clumpy"). Thinning in the second growth would include removal of some larger trees, mainly white fir, to change the current spatial arrangement of the trees and prepare the stand for future treatments such as prescribed fire that would move it toward the desired condition for fire climax ponderosa pine.

Thinning with Group Openings Treatment (839 acres): *The goal is to maintain and restore fire climax ponderosa pine stands*.

These treatment areas are predominately located in the mixed conifer wet plant association and are dominated by white fir. The two treatment types proposed are based on the relative presence or absence of ponderosa pine in the overstory.

Treatment Type 1: These areas have a moderate amount of residual ponderosa pine in the overstory with young white-fir/ponderosa pine ladder fuels in the understory. Treatments would include thinning from below, mowing of shrubs, and prescribed burning.

Treatment Type 2: These are areas where currently ponderosa pine is widely scattered, or absent and had been present in the past. Many of these areas had the overstory pine harvested with an objective of managing the white-fir understory or where pine was lost due to insects and disease.

To restore areas where pine is absent, group openings ranging from 1-3 acres in size would be created and planted to ponderosa pine. Created openings could be up to 30% in area of a stand. Where there is some scattered residual ponderosa pine, small diameter trees would be thinned to protect the remaining overstory pine from inter-tree competition and western pine beetle attack. Residual areas between groups and pine overstory treatments would not be thinned and would serve as dispersal and foraging habitat for various wildlife species.

Scenic Views Enhancement Treatment (240 acres): *The goal is meet the direction for the Scenic Views management area.*

Scenic quality standards and guidelines are not being met due to areas of mixed severity and stand replacement fire that occurred during the 2012 Pole Creek Fire along a Scenic Views -Foreground management area adjacent to and west of Forest Road 16. Forest Road 16 is the main travel artery to the popular Three Creek Lakes recreation area.

In order to meet the long-term goals for the Scenic Views – Foreground management area that is classified as *High Scenic Integrity – SMS* (Retention – VMS), green trees and scattered clusters of fire killed trees would remain in order to slowly transition the area to become scenic once again in the future. Removal of some dead trees < 8 inches dbh would create a random cluster grouping and feathered edge instead of a uniformed shape and straight edge of trees when viewed from the road. Newly planted trees in the open areas surrounding the scattered clusters of dead trees would eventually change the appearance of this edge of the forest over time from burned to green. Logging debris would be lopped and scattered adjacent to Forest Road 16 to meet scenic quality standards and guidelines.

The proposed action also includes two non-significant Forest Plan amendments (see below).

Table 4 provides a summary of the proposed treatments.

Table 4 Summary of proposed treatments

Treatment Type	Acres
Lodgepole Pine Improvement	249

Plantation	1,174
Pondarosa Pine infected with Dwarf Mistletoe	160
Prescribed Fire	809
Thinning	998
Thinning with Group Openings	839
Scenic Views Enhancement	240
Total	4,469

A number of connected actions are associated with the Proposed Action:

- About 8 miles of Forest Roads would be decommissioned
- About 6 miles of Forest Roads would be administratively closed
- About 0.80 miles of temporary road maybe necessary to access stands for treatment. If these roads are needed they would be closed and restored after use
- Reconstruct a curve radius of a section of Forest Road1628000

See Alternative 2 (Proposed Action) for a discussion of logging systems and post-harvest treatments.

Inventoried Roadless Areas

There are no Inventoried Roadless Areas (IRA) located in the project area. There will be no new or temporary road construction or timber harvest in any Inventoried Roadless Areas. An Inventoried Roadless Area analysis is included in this environmental assessment.

SITE-SPECIFIC FOREST PLAN AMENDMENTS

Affected Environment

The Melvin Butte Vegetation Management Project proposes two Forest Plan amendments. The amendments are specific to the project area. The use of amendments to existing standards and guidelines follow guidance contained in the 1982 Planning Rule at 36 CFR 219.7 – Effective Dates and Transition.

The amendments are focused on the Scenic Views (MA-9) land allocation Foreground Retention Timber/Mixed Conifer standards and guidelines as defined in the Deschutes National Forest Land and Resource Management Plan, as amended. The goal for Scenic Views is "*To provide forest visitors with high quality scenery that represents the natural character of Central Oregon.*" The Scenic Views land allocation on the Ranger District follows major State highways such as Highway 20 and Highway 242; arterial roads such as Forest Roads 15 and 16 (Forest Road 16 is located within the project area); major topographic features such as Black Butte; and areas in the Metolius Basin and Meadow Lakes Basin. About 19,423 acres are allocated to the Scenic Views land allocation on the Ranger District.

The scenic resources within the planning area have experienced visible changes over time such as the loss of large diameter old trees in Foreground areas and large old tree dominated habitats, with a 75-80% departure of late and old forest structure habitats from historic conditions across the planning area. There are higher tree densities, as well as an ongoing species shift to more shade tolerant species, such as white fir in the Scenic Views Foreground areas as a result of fire suppression and fire exclusion. The combination of these conditions has led to a degradation of scenic quality in Foreground areas adjacent to Forest Road 16.

A Wildland Urban Interface (WUI) as described in the *Greater Sisters Country Community Wildfire Protection Plan* is located as a subset within the Scenic Views Foreground Retention land allocation (see the Fire and Fuels section of this environmental assessment). The WUI basically encompasses the Forest

Road 16 corridor that links the city of Sisters, Oregon with the Three Creek Lake basin which is a unique recreation asset adjacent to the project area. The Three Creek Lake Basin is extremely popular and is one of the most heavily used recreation areas on the Sisters Ranger District.

Additionally, areas adjacent to Forest Road 16 were impacted by the 2012 Pole Creek fire. Impacts include areas affected by the fire itself, including some areas of stand replacement fire, and fire suppression activities such as mowing, felling of snags, and back burning operations. In many areas 100% of the tree canopy is scorched from fire. Forest Road 16 approximates the eastern edge of the Pole Creek fire. Given the impacts of the 2012 Pole Creek fire and fire suppression effort many Foreground areas do not meet the goals and objectives for the Scenic Views land allocation and are in need of restoration.

Figure 4 shows the Scenic Views land allocation in the Melvin Butte project area (Note: The Scenic Views land allocation is the same for Alternative 3).

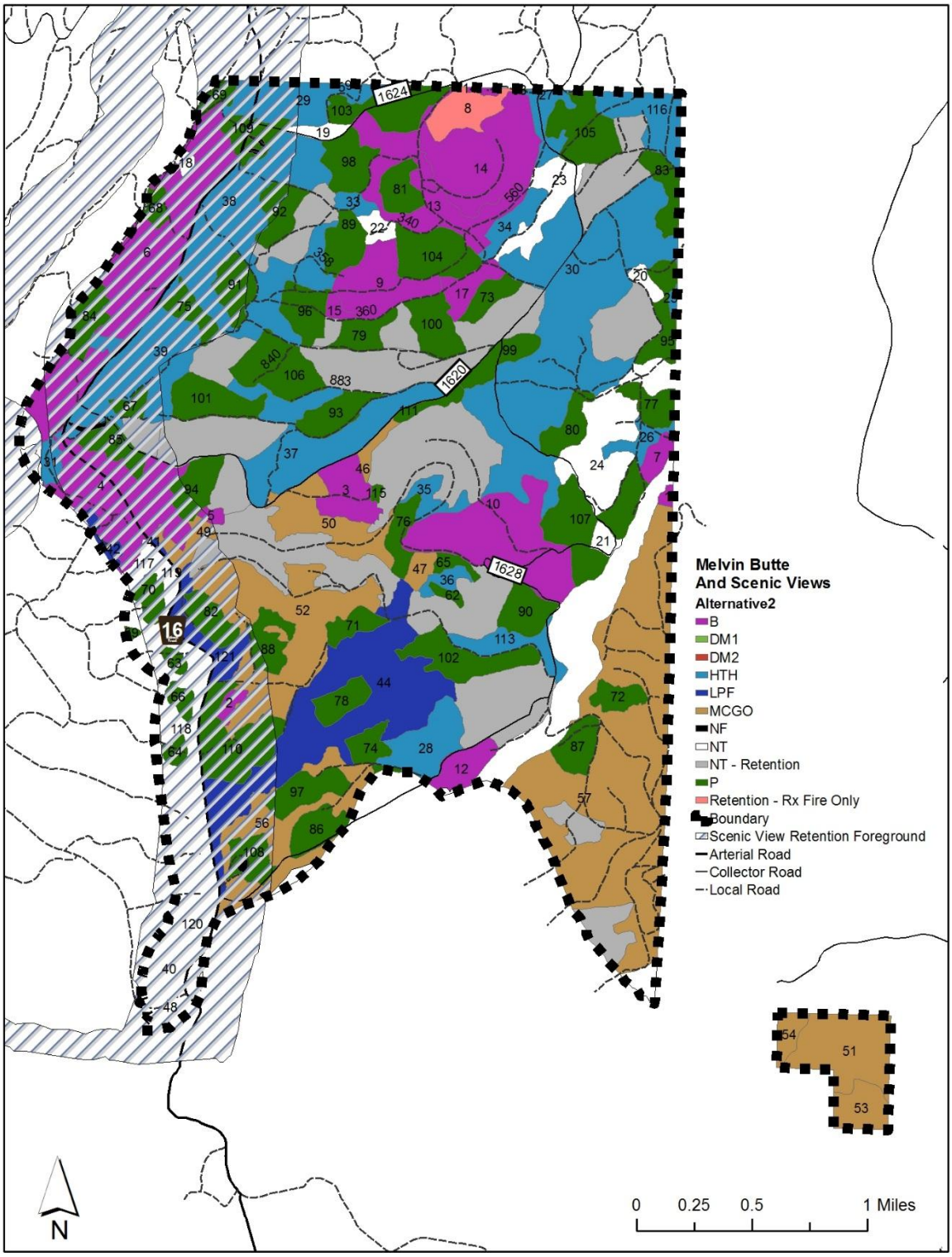


Figure 4 Scenic Views land allocation in the Melvin Butte project area.

Standards and Guidelines that would be Amended

The plan amendments would apply to Alternatives 2 and 3. The following Forest Plan standards and guidelines for Timber/Mixed Conifer – Foreground would be amended:

M9-27 *(LRMP 4-125) states: In Retention Foregrounds slash from a thinning or tree removal activity, or other visible results of management activities, will not be visible to the casual forest visitor one year after the work has been completed. In partial retention foregrounds, logging residue or other results of management activities will not be obvious to the casual forest visitor two years following the activity.*

M9-90 *(LRMP page 4-131) states*: *Low intensity prescribed fires will be used to meet and promote the Desired Visual Condition within each stand type. Prescribed fire and other fuel management techniques will be used to minimize the hazard of a high intensity fire. In foreground areas, prescribed fire will be small, normally less than 5 acres, and shaped to appear as natural occurrences. If burning conditions cannot be met such that scorching cannot be limited to the lower 1/3 of the forest canopy, then other fuel management techniques should be considered.*

Effects Analysis: General Overview

No Action Alternative

Under the no action alternative no management activities as listed under the proposed action would take place. No thinning or prescribed burning treatments would occur in Foreground Scenic Views areas or in the Wildland Urban Interface. Hazardous fuel conditions adjacent to Forest Road 16 could impact the egress of Forest visitors or the ingress of fire suppression resources in the event of a wildfire. The Foreground areas would not meet the goals and objectives for the Scenic Views land allocation.

Alternatives 2 and 3: Amendment #1 Direct and Indirect Effects

Timing of Slash Clean-up (M9–27)

Although the treatment of activity fuels would be implemented over a period time the use of prescribed fire or slash from small tree thinning would create visual impacts (e.g. blackened, scorched vegetation and tree trunks, and slash piles) up to a five year period, which exceeds the amount of time management actions can be visible within the Partial Retention Foreground addressed by this standard and guideline. In addition, logging residues can take up to two years to cure (dry out) and subsequent slash pile burning are often be staggered over a period of time contingent on such factors as weather and smoke dispersal requirements. To address these conditions a Forest Plan amendment would be required to increase the time allowed for slash cleanup and ameliorate visual effects from a two year to a five year period to meet the intent of this standard and guideline.

Amendment Change

The project would amend M9-27 to allow the visible effects of slash cleanup and fuels reduction for approximately a five year period for Alternatives 2 and 3 to meet the desired future condition for Timber/Mixed Conifer Foreground areas. The amendment would be applied up to 1,217 acres in the Scenic Views land allocation.

Alternatives 2 and 3: Amendment #2 Direct and Indirect Effects

Extent of Underburning and Scorch Height of the Tree Canopy (M9-90)

Limiting the acreage for the use of prescribed fire to five acres in the Foreground areas of the Scenic Views management allocation would not meet the stand and fire management objectives for the Melvin

Butte project area. Allowing some prescribed burn areas greater than five acres would have the direct beneficial effect of reducing the risk of wildfire, contributing to a defensible fuel break along Forest Road 16 (a designated Wildland-Urban Interface), and providing for the safe ingress of fire suppression resources and egress of the public in the event of a wildfire event.

Allowing prescribed burn areas greater than five acres in Foreground areas could also enhance scenic quality over the long-term. Creating burn blocks greater than five acres could facilitate the blending of stands of trees and other vegetation affected by the Pole Creek fire and fire suppression activities with other ongoing thinning and fuels reduction activities in Foreground areas. The visual effects to the casual forest visitor would be short-term and areas are expected to return to background conditions after a five year period.

Currently many fire burned areas located adjacent to Forest Road 16 have tree scorch height greater than 1/3 of the tree canopy. Trees were scorched either by the fire itself or as a result of back burning operations associated with fire suppression activities during the 2012 Pole Creek fire. Under the action alternatives areas would be thinned from below to reduce ladder fuels and prescribed burned. To the extent practicable, scorch height would be limited as described below but given the stochastic nature of fire some scorching greater than 1/3 of the tree canopy is expected. The visual effects to the casual forest visitor would be short-term and areas are expected to return to background conditions after a five year period.

In areas accessible to mechanized equipment the following treatments would be used to limit scorching below 30% of the tree canopy (it should be noted that all stands slated for thinning have thinning, mowing, and prescribed burning as linked and associated treatments):

- If stand density is too dense to burn without substantial mortality, thinning with follow-up slash pile and burning would be used.
- If shrubs are present and stand density is low, mowing would be followed with prescribed burning. In some of these areas, tree mortality is expected.
- If stand density is low and no shrubs are present, the areas would be assessed to determine if treatment is needed.
- To achieve stand under-burning objectives, follow-up fuels treatments may be necessary.

Amendment Change

The project would amend M9-90 to allow for prescribed burn units to exceed the five acre minimum for fuels treatments and the 1/3 scorch height limitation for Alternatives 2 and 3 to meet the desired future condition for Timber/Mixed Conifer Foreground areas. The amendment could be applied up to 835 acres in the Scenic Views land allocation; actual burn unit size wouldn’t always exceed five acres but would be based on stand and fuel conditions, the location of roads for the location of burn units boundaries, minimizing fireline construction, and other factors. Additionally, about 40% of the total number of acres may experience scorch height greater than 1/3 of the forest canopy. This estimate is based on the professional experience of fire managers on the Sisters Ranger District.

Cumulative Effects

The cumulative effects area is the Scenic Views land allocation starting at the Forest boundary south of Sisters, Oregon following Forest Road 16 to the Three Creek Lakes recreation area. The use of this cumulative effects area best encompasses the effects of the Melvin Butte project in combination with similar projects occurring in the same land allocation and general geographic area. The time frame is the last five years. The timeframe reflects the amount of time the impacts or amendments would be in place after treatments are initiated.

Cumulative effects to the Scenic Views and Front country Seen/Unseen management areas would impact scenic quality during the short-term (0 to 5 years). Over the long-term (more than 5 years) overall scenic quality would be met due to treatment and management of overstocked stands, improved forest health, lower tree density, regrowth of shrubs, and less fuel loading.

Forest Plan amendments to extend cleanup activities from one-year and two-year time frames to five years and to exceed the five acre limitation for fuels treatments would allow scenic quality standards and guidelines to be met in Scenic Views – Foreground management areas classified as High Scenic Integrity – SMS (Retention – VMS) and Moderate Scenic Integrity – SMS (Partial Retention – VMS).

Previous projects in the cumulative effects area include the Sisters Area Fuels Reduction Project (SAFR). About 2,102 acres of the Scenic Views land allocation are located along Forest Road 16 in the SAFR project area; these acres were treated to meet the objectives of the Wildland Urban Interface. However, the SAFR project did not include site-specific Scenic Views plan amendments as part of the project design. Therefore there would be no additive effect to the amendments outlined for the Melvin Butte project area. Cumulatively, the Melvin Butte project would affect about 0.64% of the total number of acres of the Scenic Views land allocation found at the Forest Plan level.

Findings

The proposed revised Scenic Views standards and guidelines would not appreciably change Forest-wide impacts disclosed in the Forest Plan Environmental Impact Statement, based on the following factors:

Timing

The effects of the proposed revised Scenic Views standards and guidelines for implementing the Melvin Butte Vegetation Management Project are predicted to occur in the short-term (approximately 5 years after the start of treatment) for prescribed burning and post harvest activities.

Location and Size

The effects of the proposed revised Scenic Views standards and guidelines are site specific and would only affect the area within the Melvin Butte Vegetation Management Project area boundary. About 1,217 acres (23% of the total project area) would be affected by the use of site-specific Forest Plan amendments.

Goals, Objectives, and Outputs

The proposed revised Scenic Views standards and guidelines would not alter the long-term relationship between levels of good and services projected by the Forest Plan. There would not be any change in timber outputs over what might be available if the project was designed without the proposed amendments.

Management Prescriptions

The proposed revised Scenic Views standards and guidelines would not change the desired future condition for land and resources from that outlined by the existing management direction in the Forest Plan in the short-term. It would not affect the entire Forest Plan planning area: about 1,217 acres of National Forest System lands within the Melvin Butte Vegetation Management Project area which would be amended for a short period of time. The proposed amendments would not change the Forest Plan allocations or management areas.

Conclusion

The proposed amendments would allow for more effective and efficient fuels treatments in the Timber/Mixed Conifer Foreground areas, help meet the desired future condition for lands located in a designated Wildland Urban Interface, in addition to providing safe egress of the public and ingress of fire suppression resources in the event of a wildfire, as well as meeting long-term management goals for the Scenic Views land allocation.

Extent of Plan Amendments

The proposed amendments are site-specific and limited to the Melvin Butte Vegetation Management Project. The proposed plan amendments would apply to Foreground areas contained in the Scenic View land allocation and by extension the Wildland Urban Interface. Fuels reduction activities could be conducted on about 1,217 acres.

The proposed plan amendments would apply to the following units in the project area: Units 2, 4, 5, 6, 18, 19, 29, 31, 38, 39, 40, 41, 42, 44, 48, 49, 52, 56, 63, 64, 66, 67, 68, 69, 70, 75, 82, 84, 85, 88, 91, 92, 94, 97, 108, 109, and 110.

Conclusions by Resource Area

Soils

In areas of Retention Foregrounds (M9-27), visible slash or other visible results of management activities for up to a five years, rather than two years, are expected to have no direct or indirect effects to the soil resource. In areas of Foreground (M9-90), allowing burned areas to be greater than five acres may result in less ground disturbance due to less of a need to construct fire line and more opportunities to use existing features such as roads for containment of prescribed fire. Thus, the direct effect of less ground disturbance reduces the risk of the cumulative effect of increased detrimental soil disturbances due to fire line construction in excess of that allowed by FS Region 6 Soil Quality Standards. Scorch height of the forest canopy in these areas is expected to have no direct or indirect effects on key soil functions.

The effects of revising Forest Plan Standard and Guideline M9-27 and M9-90 on the soils resource are extremely minor to nonexistent and would not affect the soils resource nor add to cumulative effects.

Hydrology

Increasing the time visual effects from management activities could occur would not affect the hydrology resource because visual effects, in general, do not affect it. Increasing the extent of burn in the Foreground area and the allowable scorch height also would not affect the hydrology resource based on analysis in the streamflow and sedimentation section contained in this environmental assessment. Although underburning may occur across a small portion of an ephemeral channel, burn severity would not be at a level to alter soil infiltration rates and associated overland flow rates. Allowing higher scorch heights would not increase overland flow because overland flow in the project area does not generally occur from a reduction in evapotranspiration when trees are killed because infiltration and permeability rates often exceed precipitation rates and stands are already over stocked. Therefore, soil within 30 feet of potentially hydrologically connected areas (ephemeral draws) would not be detrimentally impacted by activities associated with the M9-27 and M9-90 plan amendments.

The effects of revising Forest Plan Standard and Guideline M9-27 and M9-90 on the hydrology resource are extremely minor to nonexistent and would not affect the hydrology resource nor add to cumulative effects.

Fisheries

Given there are no direct or indirect effects to fisheries or aquatic resources from the action alternatives, there would be no effects from the proposed plan amendments. The proposed amendments changes are located outside of Riparian Reserves and would not significantly increase ground disturbance as outlined in the action alternatives.

The effects of revising Forest Plan Standard and Guideline M9-27 and M9-90 on the fisheries resource are extremely minor to nonexistent and would not affect the fisheries nor add to cumulative effects

Wildlife

The proposed Forest Plan amendments are associated with the scenic and aesthetic quality of the Scenic Views land allocation adjacent to Forest Road 16. Habitat analysis wasn't specially done for the plan amendments but instead looked at the effects to wildlife habitat, including thinning from below and prescribed burning, across the entire project area or at the landscape level, whichever scale was appropriate.

See the wildlife section of this environmental assessment for a summary of project effects to various wildlife species.

The effects of revising Forest Plan Standard and Guideline M9-27 and M9-90 on the Wildlife resource are extremely minor to nonexistent and would not affect wildlife species or add to the cumulative effects

Silviculture

The amendments address issues regarding visual quality along the Forest Road 16 corridor. The amendments would result in beneficial direct and indirect effects in regards to implementation (efficiency and efficacy implied) within the Scenic Views land allocation. The amendments ensure the implementation of these thinning acres including fuels reduction and visual treatments including prescribed fire and hazardous fuel removal along the Wildland Urban Interface located along Forest Road 16. As such these amendments help meet the desired future condition, the purpose and need of the project, and in the long term scenic views goals and objectives.

Fuels and Fire

The proposed forest plan amendments would help achieve the desired conditions for a designated Wildland Urban Interface. Without the amendments prescribed burning would be difficult and likely result in fewer acres treated within the Wildland Urban Interface. Road-to-road burning creates less ground disturbance as the need to construct new containment line is reduced. The effects of the Pole Creek fire are visible on the west side of Forest Road 16 and some areas already show tree canopy scorch up to 100%. Mechanical methods to limit canopy scorch height would be used to the extent practicable but given the stochastic nature of fire it is not always possible to limit scorching of trees, especially in stands that already experience high intensity fire. The Forest Plan amendments would meet the intent for fuels reduction and public health and safety within the Wildland Urban Interface.

Botany

The proposed plan amendments would have no direct or indirect effects on botanical resources or invasive plants. Fire is a natural function of this forest ecosystem and is beneficial to growth and reproduction of the native plants. No Sensitive or Survey and Manage Plant species would be affected. There are no known invasive plant populations in the area which could be stimulated by fire; the area is currently being monitored for invasive plant introduction.

The effects of revising Forest Plan Standard and Guideline M9-27 and M9-90 on the Botanical resource are extremely minor to nonexistent and would not affect botanical resources nor add to cumulative effects

Visuals

Forest Plan Amendment #1 to extend cleanup activities from one-year and two-year time frames to five years and Amendment #2 to exceed the five acre limitation for fuels treatments would allow scenic quality standards and guidelines to be met in Scenic Views – Foreground management areas classified as High Scenic Integrity – SMS (Retention – VMS) and Moderate Scenic Integrity – SMS (Partial Retention – VMS).

In Scenic Views – Foreground management areas along Road 16, prescribed fire is proposed to reduce the risk of wildfire, create a defensible fuel break, and provide for safe ingress of fire suppression resources and egress of the public in the event of a wildfire event. Prescribed burn units that are greater than the five acre limitation would be necessary to accomplish safety needs and to enhance future scenic quality. Scorch height greater than 1/3 of the tree canopy may have a short term visual impact to the casual forest visitor but should be less after a five year period. Additional short-term visual impacts include the presence of logging slash piles until they are burned and some dead trees as the result of prescribed burning. Melding vegetation restoration activities would allow enhancement of scenic quality especially in areas impacted by the 2012 Pole Creek Fire along Forest Road 16.

Heritage

The proposed forest plan amendment, M9-27 would have no direct or indirect effects to cultural resources. There are no resources in the project area that have landscape visual considerations such as a historic property, historic landscape, or traditional cultural property.

The proposed forest plan amendment, M9-90 would have a positive indirect effect on cultural resources. The increased burn area would reduce fuels and fire intensity around cultural resources sensitive to high intensity fires such as obsidian lithic scatters; low intensity burning would have a positive effect on such resources. Project design avoids all identified cultural resources that could be affected by ground disturbing activities; there are no recorded sites that have landscape visual considerations in any treatment units.

Because there are no negative direct or indirect effects and one positive indirect effect to cultural resources there is a positive additive effect on cultural resources from the proposed Forest Plan amendments.

Transportation

The effects to the Forest transportation system are very similar with or without the site specific plan amendments. The amendments focus on duration of activities and the scenic values along Forest Road 16 and these activities would not result in a change to the Forest transportation system. A potential indirect effect to the transportation system would be an increased traffic control during log haul along Forest Road 16 which receives substantial recreation traffic associated with the Three Creek Lake basin.

There are no direct effects and potential indirect effects due to log haul traffic control from implementation of the Forest Plan amendments.

Climate Change

The proposed forest plan amendments would not contribute to impacts to climate change that differ from analysis completed for the three alternatives. The time period of activities being visible does not change

the amount of work originally proposed. Allowing for increased scorch height may not result in increased tree mortality and larger prescribed burn areas could increase short carbon outputs but is expected to improve the resiliency of the stands and therefore reduce potential for increased fire intensity should a wildfire occur.

Cumulative Effects of Site-Specific Forest Plan Amendments at the Forest Plan Level.

This section provides the context to discuss the cumulative effects of the proposed site specific Forest Plan amendments for the Melvin Butte Vegetation Management Project at the Forest Plan level.

About 189,744 acres of the Scenic Views land management allocation is located on the Deschutes National Forest. A number of ongoing projects on the Forest have site-specific Forest Plan amendments, amending the same standards and guidelines, as those proposed for the Melvin Butte project. These project acreages would be compared to the Melvin Butte project in order to make a determination regarding cumulative effects. These projects are shown in Table 5.

Table 5: Ongoing Forest Level Projects with Site-Specific Forest Plan Amendments

Name of Project	District	Type of Amendment	Timber Type	Acres
Rocket Vegetation Management Project	Bend-Fort Rock	MA9-90 – Fire Management	Ponderosa Pine (PP)	1,374
West Bend Vegetation Management Project	Bend-Fort Rock	M9-27 Timing of Cleanup Activities (MC) M9-90 – Fire Management	Ponderosa Pine (PP) Mixed Conifer (MC)	2,216
Rim Paunina Project	Crescent	M9-90 – Fire Management		468
			Total Acres	**4,058**

Two assumptions are made to frame the analysis. The first assumption is the visual effects of treating logging debris in Scenic Views Foreground areas would be mitigated (i.e. slash piles have been burned and/or other methods used to remove logging debris) after a five year period, are not obvious to the casual forest visitor, and meet the desired visual condition for each timber type as outlined in the Forest Plan. The second assumption is that trees that have been scorched by fire (tree have blackened boles due to prescribed fire) and prescribed burned areas greater to or less than five acres in size in Foreground areas have had adequate time (greater than five years) for vegetative recovery and now blend into foreground areas. Treatments greater than five years old are considered part of the existing condition and consistent with the Forest Plan for the purposes of the cumulative effects analysis.

Analysis

The cumulative effects area is the Deschutes National Forest and the timeframe are projects that are ongoing or less than five years old since the date of implementation.

About 1,217 acres of the Scenic Views land allocation are proposed for site-specific Forest Plan amendments in the Melvin Butte project area. Currently about 5,275 acres across the Forest, including the Melvin Butte project, would allow for site-specific Forest Plan amendments.

Amendment M9-27 in the Melvin Butte project would allow Foreground slash clean up to occur over a five year period as opposed to a 2 year period as currently stated in the Forest Plan. This action combined

with the extended time period of foreground slash clean-up activities on the Bend Fort Rock and Crescent Ranger Districts would mean that along Scenic Views travel routes the visual effects of cleanup activities would be visible to the casual forest visitor several years beyond a 1-2 year period. Spatially, the amendments do not occur at a single location in time so short term visual impacts are distributed across the Forest. However, after the five year period allowed under the proposed plan amendments the visual effects of logging debris would be mitigated and Foreground areas would contribute to the desired future condition and are consistent with the standards and guidelines as outlined in the Forest Plan (standard and guideline M9-20, LRMP pages 4-124 and 4-125).

The Melvin Butte project would amend 1,217 acres of the Scenic Views allocation, or less than 1% of the total Scenic Views acres treated. Cumulatively, with other ongoing projects, 5,275 acres in Scenic Views would be amended out of a total of 187,744 acres, for a total of about 2.8% of the Forest wide Scenic View acres treated.

The cumulative effect to the casual forest visitor would be minimal given the time period has been extended from 2 years to a five year period, the visual effects to the Scenic Views land allocation is across the entire Forest and not experienced at one single location in time, implementation would be staggered over time, and the emphasis is on meeting the desired visual condition for the land allocation.

Amendment M9-90 in the Melvin Butte project area would allow prescribed burn acres greater than five acres in size in Foreground areas. The amendment would also allow tree canopy scorch height greater than 30% in areas where it is not possible to mitigate scorch height by mechanized equipment. This action combined with similar actions on the Bend Fort Rock and Crescent Ranger Districts would reduce the risk of wildfire, create defensible space along travel routes, and where applicable, allow for the safe ingress of fire suppression resources and egress of the public in the event of a wildfire event at the Forest level.

The cumulative effects of this amendment are expected to be beneficial over the short and long term by providing safe travel routes to Forest destinations by reducing wildfire risk. Spatially the amendment does not occur at a single location so the short term visual impacts (i.e. scorch height) are distributed across the Forest. In the long term allowing prescribed burn areas greater than five acres in size could help blend landscape features to better match the landscape by showcasing mid to large sized trees in Foreground areas and contribute to the desired future condition for the Scenic Views land allocation at the Forest Plan level.

Conclusion

The effects of the Melvin Butte Vegetation Management Project plan amendments when combined with similar project amendments at the Forest level would cumulatively have a beneficial effect in meeting project goals and achieving the desired future condition for various timber types located in the Scenic Views land allocation. Cumulatively, about 2.8% of the Scenic Views land allocation would be treated using site-specific plan amendments at the Forest Plan level.

DECISION FRAMEWORK

The Forest Supervisor, Deschutes National Forest, is the responsible official for deciding the type and extent of management activities in the Melvin Butte Vegetation Management area. The responsible official can decide on several courses of action ranging from no action, to one of the action alternatives or a combination of treatments. The responsible official will also determine whether Forest Plan amendments are necessary and will identify which resource protection measures will apply to project implementation.

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

1. How well the alternative meets the project purpose and need for action
2. How well does the alternative respond to the key issue(s); and have public comments been considered in the analysis?
3. What are the likely environmental effects of the proposed actions, and in particular, the short and long-term effects to habitat of federally-listed threatened and endangered species?

PUBLIC INVOLVEMENT

The proposal was listed in the Schedule of Proposed Actions in Spring 2013. The proposal was provided to the public and other agencies on March 26, 2014 for comment during scoping. Seven scoping letters were received. Comments were received from the Sisters Forest Products, INTERFOR (a forest products industry), Cascadia Wildlands, Oregon Wild, Central Oregon Land Watch, Blue Mountain Biodiversity Project, and one individual.

A scoping letter was provided to the tribal chairs for the Burns-Paiute Tribe, Klamath Tribe, and the Confederated Tribes of the Warm Springs, Oregon on February 24, 2014. The Tribes did not express any concerns regarding the project.

Comments addressed a wide range of issues including roads and invasive plants, dwarf mistletoe treatments, group opening treatments, carbon storage, wildland-urban interface treatments, citizen-identified unroaded areas, fire hazard and fire regimes, and construction of temporary roads.

Using the comments from the public, the interdisciplinary team developed a list of key issues to address. The key issues resulted in the development of Alternative 3.

The draft environmental assessment was released for 30-day public comment on January 8, 2016. A legal notice was placed in *The Bulletin*, the newspaper of record. Comments were received from the American Forest Resource Council (AFRC), INTERFOR, a forest products company, Oregon Wild, Blue Mountains Biodiversity Project, and Quicksilver Contracting, a logging, chipping, and restoration company. A Response to Comments section is included in Appendix I of this environmental assessment.

PROJECT RECORD

This environmental assessment herby incorporates by reference the Project Record (40 CFR 1502.21). The project record contains the Specialists Reports and other technical documentation used to support the analysis and conclusions in this environmental assessment. A summary of the Specialists reports in adequate detail to support the decision rationale and appendices provide supporting documentation for the effects analysis are contained in this environmental assessment.

Incorporating these Specialists Reports and the project record implement the Council on Environmental Quality (CEQ) Regulations that agencies should reduce NEPA paperwork (40 CFR 1500.4), that the document shall be “analytic rather than encyclopedic,” and that the document “shall be kept concise and no longer than absolutely necessary” (40 CFR 1502.0). The objective is to furnish adequate site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated without repeating detailed analysis and background information available elsewhere. The Project Record is available for review at the Sisters Ranger District office, Pine Street and Highway 20, Sisters, Oregon, Monday through Friday 8:00 a.m. to 4:30 p.m.

ISSUES

The Forest Service separated the issues into two groups: Key and non-Key issues. Key issues were defined as those directly or indirectly caused by implementing the proposed action. Non-Key issues were

identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations require this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A list of non-Key issues and reasons regarding their categorization may be found at Sisters Ranger District office in the project record.

As for key issues, the Forest Service identified three different topics raised during scoping.

Key Issue 1: Do Not Construct any Temporary Roads: A scoping comment suggested the development of an action alternative that did not require the use of temporary roads. The indicator would be the number of miles of temporary road construction.

Key Issue 2: Do Not Include Group Openings in the Mixed Conifer Plant Association: A scoping comment suggested the development of an action alternative that did not include group openings in the Mixed Conifer plant association group. Group openings were not considered an appropriate silvicultural tool for this plant association. Areas that would have received a group opening treatment were converted to thinning. The indicator would be the number of acres of group openings.

Key Issue 3: Do Not Remove Large Diameter Ponderosa Pine Trees with Dwarf Mistletoe: A scoping comment suggested the development of an alternative silvicultural prescription in areas with dwarf mistletoe that did not remove large diameter trees. These mistletoe areas were converted to an understory thinning. The indicator would be the number of acres of infected dwarf mistletoe ponderosa pine above the upper management zone treated through density reduction.

The district IDT evaluated these potential key issues during the review of public scoping comments. The IDT concluded that these key issues could be best combined into a single action alternative; this created Alternative 3.

Analysis Issues

In addition to the Key Issue, other environmental components will be addressed in the effects analysis section of this document as a way to compare alternatives, though they did not result in differing design elements between alternatives. These analysis issues are important for providing the responsible official with complete information about the effects of the project. See individual sections of this environmental assessment for more detailed effects analysis.

Soils

Issues: The action alternatives have the potential to increase the amount and distribution of soil disturbance within individual activity through the use of ground based logging equipment. The resulting soil disturbance from ground-based equipment operations and prescribed fire in activity areas may have the potential to negatively affect key soil functions by harvesting trees in the project area.

Hydrology

Issue: The action alternatives have the potential to affect water quality, water yield, peak flows, and hydrologic function and condition by harvesting trees in the project area. Specifically, actions could affect stream flow, sedimentation, water temperature, and water body condition by harvesting trees in the project area.

Fisheries and Aquatic

Issue: The action alternatives have the potential to affect streamflow, sedimentation, stream temperature, waterbody condition, wetland condition, riparian vegetation, large wood recruitment, fish populations, and fish habitat by harvesting trees in the project area.

Forest Vegetation

Issue: The action alternatives have the potential to affect stand structure and composition by harvesting trees in the project area.

Wildlife

Issue: The action alternatives have the potential to affect nesting, denning and foraging habitat for some wildlife species and connectivity of habitat by harvesting trees in the project area.

Fire, Fuels and Air Quality

Issue: The action alternatives have the potential to affect fire hazard by harvesting trees in the project area. The action alternatives could reduce the production of particulate matter associated with a wildfire in the project area.

Botany

Issue: The action alternatives have the potential to impact plants through ground disturbance, wildfire, or prescribed fire by harvesting trees in the project area. The action alternatives have the potential to increase the risk of spread of invasive plants by harvesting trees in the project area.

Recreation

Issue: The action alternatives have the potential to affect recreation resources by harvesting trees in the project area.

Scenic Resources

Issue: The action alternatives have the potential to affect scenic quality by harvesting trees within the project area.

Heritage

Issue*:* The action alternatives have the potential to affect archaeological resources by harvesting trees in the project area.

Potential Wilderness Areas

Issue: The action alternatives have the potential to affect areas meeting the inventory for potential wilderness by harvesting trees in the project area.

Citizen Identified Unroaded Areas

Issue: The action alternatives have the potential to affect areas identified as unroaded in the Oregon Wild unroaded forest inventory by harvesting trees in the project area.

Inventoried Roadless Areas

***Issue**:* The action alternatives have the potential to affect Inventoried Roadless Areas (IRA) located adjacent to the project area.

Climate Change

Issue: The action alternatives have the potential to affect climate change through changing local greenhouse gas (GHG) pools. Effects of climate change may also have the potential to affect the action alternatives by creating unprecedented climatic conditions in the future.

Transportation

Issue: The action alternatives have the potential to affect an increase in road maintenance on roads not currently maintained; increase industrial truck traffic, and increase motorized vehicle access by harvesting trees in the project area.

Economics

Issue: The action alternatives have the potential to have associated economic costs and benefits. The alternatives may have a negative net present value (higher expenditures than cash inflows), but may create local jobs and provide revenue to the government by harvesting trees in the project area.

CHAPTER 2 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This section describes and compares the alternatives considered for the Melvin Butte Vegetation Management 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 among options by the decision maker and the public. 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.

ALTERNATIVES

Alternative 1 - No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. Ongoing management activities such as fire suppression would continue as well as other public uses such as firewood cutting and dispersed recreation activities. No vegetation management activities as proposed in the action alternatives would occur. Stand densities would increase overtime across the project landscape, putting large old trees at risk to insects and disease, as well as continued competition for site resources such as nutrients and water. There would also be an increase in fire hazard due to the lack of treatment in the Wildland-Urban Interface; this could affect public health and safety as well as a heightened risk to wildland firefighters entering the project area. The no action alternative serves as a comparative baseline to analyze the action alternatives.

Alternative 2 – Proposed Action

The Sisters Ranger District has identified treatment units on 4,469 acres within the project area to meet the purpose and need for action. Alternative 2 incorporates the *Wildlife Habitat Retention Strategy*, the *Wildland Urban Fire Urban Interface Strategy*, and the *Resource Protection Measures* developed for the project.

Treatment Descriptions

The following treatments are proposed. Potential treatment units are displayed on Figure 5.

Lodgepole Pine Improvement Treatment (249 acres): *The goal is to create a mosaic of even aged stands with natural appearing openings within the lodgepole pine, while providing a fuel break adjacent to Forest Road 16.*

Improvement cutting activities (thinning and group openings) are proposed in lodgepole pine stands that were affected by the mountain pine beetle outbreak of the 2000s. Improvement cutting is the removal of less desirable trees of any species in a stand of poles or larger trees, primarily to improve composition and quality. The proportion of their overstory that exhibit poor crowns and/or heavily-infected mistletoe would also be removed. These trees have poor growth rates and potential for infecting the understory with mistletoe is high. These stands would have fewer remaining overstory trees than in those stands that are thinned. The existing understory would contribute considerably to future growth.

A series of patch cuts (up to approximately 3 acres) would also occur across the area, where appropriate, to break up the continuity of the stands, creating a mosaic of even aged stands. No snags would be removed unless the pose a safety hazard under OSHA guidelines.

This treatment in the lodgepole pine plant association would provide a discontinuous fuel bed east of Forest Road 16 to support of the Wildland Urban Interface strategy. Within the Wildland Urban Interface stands would be continually thinned to maintain a fuel break along the road.

Plantation Treatment (1,174 acres): *The goal is to create more structurally diverse forests*.

Plantations in the Melvin Butte area are a result of clear cutting or group selection harvest practices. Plantation treatments could include small tree thinning, pruning to remove mistletoe, mowing of shrubs, and prescribed burning. The edges of adjacent stands would be treated to remove dwarf mistletoe infestations (e.g. pruning, small tree thinning, and girdling) to avoid infection of smaller trees. Tree planting would occur in areas heavily infected with mistletoe where the majority of trees are removed.

Thinning treatments would be based on variable density thinning sometimes referred to as a "gappy/patchy/clumpy" treatment. About 500 acres of plantations could be thinned within the next five year period.

Ponderosa Pine infected with Dwarf Mistletoe Treatment (160 acres): *The goal is to maintain and restore ponderosa pine stands relatively free of mistletoe while recognizing the role that mistletoe plays in ecosystem function*.

These areas occur primarily in the lower elevations of the project area. All dwarf mistletoe treatments would include removal of the infected pine understory while leaving as many uninfected or lightly infected understory trees as possible. Secondary treatments may include shrub mowing, prescribed burning, pruning, and planting ponderosa pine in understocked areas. In some areas, dwarf mistletoe is not evenly distributed throughout a particular stand; portions of these areas would be thinned as in the thinning treatment described below. Overstory treatment types are based on the number of trees per acre and include:

Treatment Type: Stands with 4-14 trees per acre that are greater than 21 inches dbh (147 acres):

- Girdle the overstory trees to meet wildlife habitat requirements; harvest the remaining overstory trees as wood products.

This treatment type is based on recommendations from the Deschutes Forest Collaborative. The focus would primarily be on treating areas infected with dwarf mistletoe. However, there may be areas within the stands which may require a thinning-only treatment.

Prescribed Fire Only Treatment (809 acres): *The goal is to manage in-growth of trees, reduce fuels, and reintroduce fire back into the ecosystem*.

This treatment would be applied to 1) areas that have been previously harvested and that require understory maintenance burning and 2) areas where prescribed fire would be used to maintain fire climax ponderosa pine stands.

The Survey and Manage *Pechman Exemption (d)* would be used to treat about 809 acres under the Prescribed Fire Treatment prescription. These acres are Late Successional Old Growth (LSOG); under the Pechman Exemptions prescribed burning can be conducted without pre-disturbance surveys for survey and manage species. Precommercial small tree thinning (< 8" diameter at breast height) would take place to reduce ladder fuels that reach into the crowns of old large trees. Thinning slash would be piled by hand and burned. No commercial timber harvest or biomass removal would take place. Fire effects would range from light to moderate burn intensities. See the Botany section of this environmental assessment for a discussion of the use of the Pechman Exemptions.

Thinning Treatment (998 acres): *The goal is to maintain fire climax ponderosa pine*.

Thinning would occur in the Ponderosa Pine and Mixed Conifer Dry plant association groups. These areas have a predominance of older pine or second growth ponderosa pine in the overstory with some small diameter ponderosa pine and white fir in the understory. Thinning is intended to move multi-story late old structure stands to single story late old structure stands. This change in stand structure is intended to move conditions to where larger trees are more likely to survive stand replacement wildfires, lower susceptibility to bark beetle attack, and extend the lifespan of large trees.

Treatment Type 1: Treatments within the old growth stands would include thinning from below, mowing of shrubs, and prescribed burning. This would move multi-story, late old structure stands toward single-story, late old structure stands.

Treatment Type 2: Thinning treatments in the second growth ponderosa pine would be based on variable density thinning ("gappy/patchy/clumpy"). Thinning in the second growth would include removal of some larger trees, mainly white fir, to change the current spatial arrangement of the trees and prepare the stand for future treatments such as prescribed fire that would move it toward the desired condition for fire climax ponderosa pine.

Thinning with Group Openings Treatment (839 acres): *The goal is to maintain and restore fire climax ponderosa pine stands*.

These treatment areas are predominately located in the mixed conifer wet plant association and are dominated by white fir. The two treatment types proposed are based on the relative presence or absence of ponderosa pine in the overstory.

Treatment Type 1: These areas have a moderate amount of residual ponderosa pine in the overstory with young white-fir/ponderosa pine ladder fuels in the understory. Treatments would include thinning from below, mowing of shrubs, and prescribed burning.

Treatment Type 2: These are areas where currently ponderosa pine is widely scattered, or absent and had been present in the past. Many of these areas had the overstory pine harvested with an objective of managing the white-fir understory or where pine was lost due to insects and disease.

To restore areas where pine is absent, group openings ranging from 1-3 acres in size would be created and planted to ponderosa pine. Created openings could be up to 30% in area of a stand. Where there is some scattered residual ponderosa pine, small diameter trees would be thinned to protect the remaining overstory pine from inter-tree competition and western pine beetle attack. Residual areas between groups and pine overstory treatments would not be thinned and would serve as dispersal and foraging habitat for various wildlife species.

Scenic Views Enhancement Treatment (240 acres): *The goal is meet the direction for the Scenic Views management area.*

Due to the stand replacement fire that occurred during the 2012 Pole Creek Fire along a Scenic Views - Foreground management area adjacent to and west of Forest Road 16, scenic quality standards and guidelines are not being met. The public travels on Forest Road 16 to recreation sites in the area.

In order to meet the long-term goals for the Scenic Views – Foreground management area that is classified as *High Scenic Integrity – SMS* (Retention – VMS), green trees and scattered clusters of fire killed trees would remain in order to slowly transition the area to become scenic once again in the future. Removal of some of the dead trees would create a random cluster grouping and feathered edge instead of a uniformed shape and straight edge of trees when viewed from the road. Newly planted trees in the open

areas surrounding the scattered clusters of dead trees would eventually change the appearance of this edge of the forest over time from burned to green. Logging debris would be lopped and scattered adjacent to Forest Road 16 to meet scenic quality standards and guidelines.

Alternative 2 contains two non-significant Forest Plan amendments.

See Table 6 for a summary of proposed treatments. Table 8 provides a stand-by-stand summary of proposed treatments.

Table 6 Summary of proposed treatments

Treatment Type	Acres
Lodgepole Pine Improvement	249
Plantation	1,174
Pondarosa Pine infected with Dwarf Mistletoe	160
Prescribed Fire	809
Thinning	998
Thinning with Group Openings	839
Scenic Views Enhancement	240
Total	4,469

A number of connected actions are associated with the Proposed Action:

- About 8 miles of Forest Roads would be decommissioned
- About 6 miles of Forest Roads would be administratively closed
- About 0.80 miles of temporary road maybe necessary to access stands for treatment. If these roads are needed they would be closed and restored after use
- Reconstruct a curve radius of a section of Forest Road 1628000

Logging Systems for Alternative 2

Table 7 outlines the type of logging systems that would be used in Alternative 2.

Table 7 Logging systems and activity fuels treatments for Alternative 2

Ground-based Logging Systems – Both Action Alternatives (Lodgepole Pine Improvement, Ponderosa Pine infected with Dwarf Mistletoe, Thinning, Thinning with or without Group Openings, and Scenic Views Enhancement)	Ground based logging systems would be used (a combination of harvesters that cut and accumulate trees in combination with skidders that pull cut trees back to a landing area where are processed and loaded onto trucks). Cut trees would be sorted into sawlogs, chip logs, or as biomass at landings. Only slopes less than 30% slope are included in timber harvest. Minor inclusions of slopes greater than 30% slope could exist within the interior of units. These areas could either be long-lined to remove cut trees (no equipment would be allowed) or left as uncut areas. Because cut trees would be whole-tree yarded it is anticipated there would be little to no activity fuel (slash) left in the harvest units.

Plantations – Both Action Alternatives	Ground based logging systems would be used (a combination of harvesters that cut and accumulate trees in combination with skidders that pull cut trees back to a landing area where are processed and loaded onto trucks). Slash generated by variable density thinning would lopped and scattered and/or hand piled.
Prescribed Fire – Both Action Alternatives	Based on existing levels of shrubs and small diameter trees, prescribed burning units could be masticated (mowed) to reduce surface fuels to avoid impacts to overstory trees during burning operations. All snags (standing dead trees) would be retained unless they pose a safety hazard under OSHA guidelines. Some incidental loss of snags is expected during prescribed burning operations.

Post-harvest Treatments Associated with Alternative 2

A number of post-harvest treatments are associated with the proposed action based on the treatment type. Post-harvest treatments could include the following: mowing and/or mastication to reduce scrubs; prescribed fire; planting of trees; pruning trees infected with dwarf mistletoe; road closures; and

decommissioning.

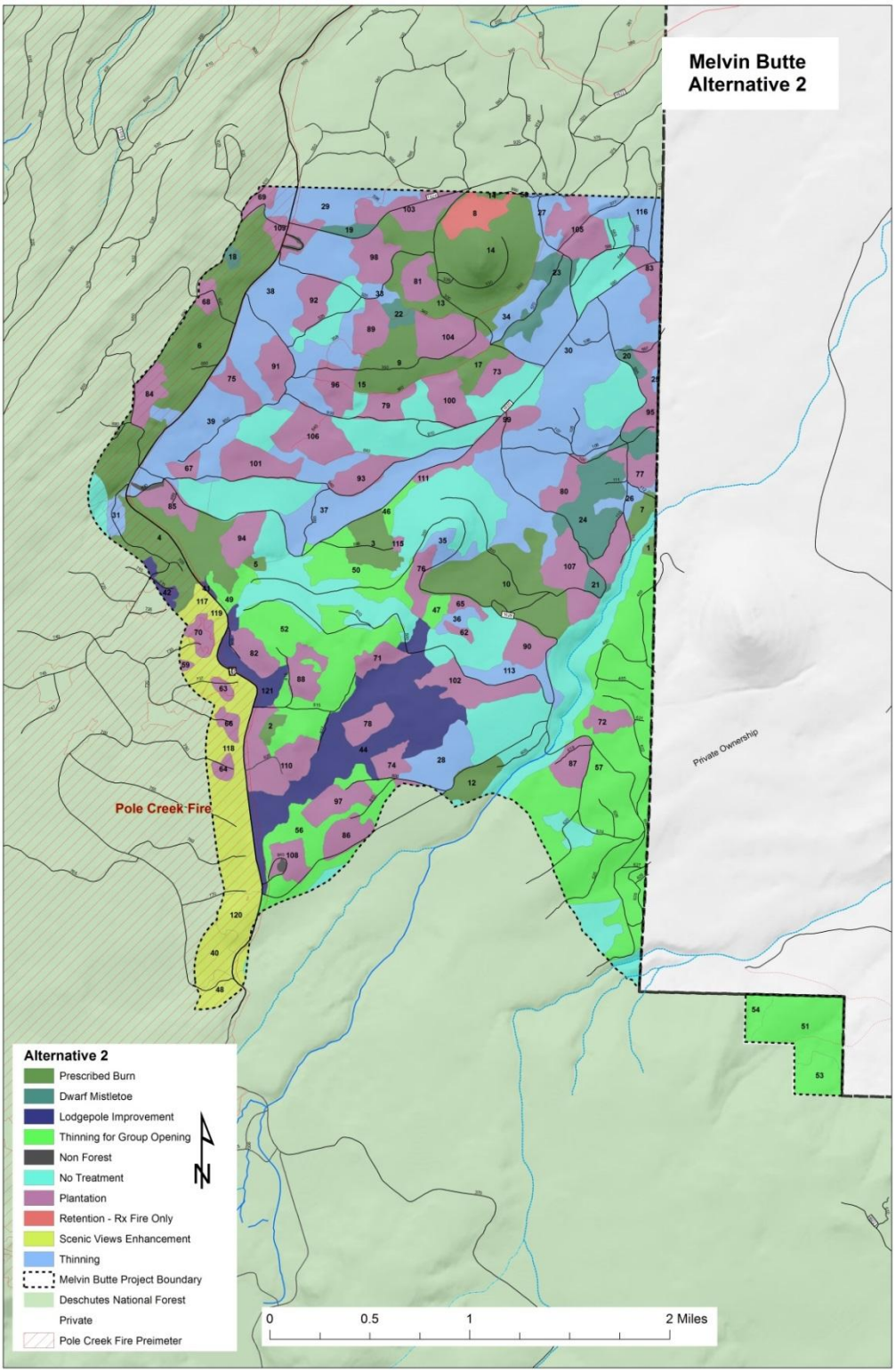


Figure 5 Alternative 2

Table 8 Stand table for Alternative 2

Unit	Treatment	Secondary	NWFP	LRMP	Acres
1	Prescribed Fire	None	Matrix	M18	3.0
2	Prescribed Fire	None	Matrix	M9	6.9
3	Prescribed Fire	None	Matrix	M18	34.9
4	Prescribed Fire	None	Matrix	M18	13.4
	Prescribed Fire	None	Matrix	M9	146.2
5	Prescribed Fire	None	Matrix	M9	1.2
	Prescribed Fire	None	Matrix	M18	3.0
6	Prescribed Fire	None	Matrix	M18	3.8
	Prescribed Fire	None	Matrix	M9	132.3
7	Prescribed Fire	None	Matrix	M18	12.0
8	Retention (RX FIRE)	None	Administratively Withdrawn	M15	29.8
9	Prescribed Fire	None	Matrix	M18	54.6
10	Prescribed Fire	None	Matrix	M18	126.5
12	Prescribed Fire	None	Matrix	M18	22.3
13	Prescribed Fire	None	Matrix	M18	56.5
	Prescribed Fire	None	Administratively Withdrawn	M15	25.0
14	Prescribed Fire	None	Administratively Withdrawn	M15	111.8
15	Prescribed Fire	None	Matrix	M18	5.7
17	Prescribed Fire	None	Matrix	M18	19.5
18	Dwarf Mistletoe	MMPB	Matrix	M18	0.2
	Dwarf Mistletoe	MMPB	Matrix	M9	4.3
19	Dwarf Mistletoe	MMPB	Matrix	M9	0.8
	Dwarf Mistletoe	MMPB	Matrix	M18	7.9
20	Dwarf Mistletoe	MMPB	Matrix	M18	7.1
21	Dwarf Mistletoe	MMPB	Matrix	M18	7.6
22	Dwarf Mistletoe	MMPB	Matrix	M18	9.9
23	Dwarf Mistletoe	MMPB	Matrix	M18	35.8
24	Dwarf Mistletoe	MMPB	Matrix	M18	85.4
25	Thinning	MMPB	Matrix	M18	2.7
26	Thinning	MMPB	Matrix	M18	14.0
27	Thinning	MMPB	Matrix	M18	21.0
28	Thinning	MMPB	Matrix	M18	44.4
29	Thinning	MMPB	Matrix	M9	31.0
	Thinning	MMPB	Matrix	M18	26.5
30	Thinning	MMPB	Matrix	M18	326.3
31	Thinning	MMPB	Matrix	M18	6.2
	Thinning	MMPB	Matrix	M9	3.8
33	Thinning	MMPB	Matrix	M18	8.4
34	Thinning	MMPB	Matrix	M18	20.4
35	Thinning	MMPB	Matrix	M18	15.8
36	Thinning	MMPB	Matrix	M18	9.1

Unit	Treatment	Secondary	NWFP	LRMP	Acres
37	Thinning	MMPB	Matrix	M18	112.4
38	Thinning	MMPB	Matrix	M9	108.6
	Thinning	MMPB	Matrix	M18	75.3
39	Thinning	MMPB	Matrix	M9	89.8
	Thinning	MMPB	Matrix	M18	13.6
40	Scenic Views Enhancement	MMPB	Matrix	M9	33.4
41	Lodgepole Pine Improvement	MMPB	Matrix	M9	1.8
42	Lodgepole Pine Improvement	MMPB	Matrix	M9	6.4
	Lodgepole Pine Improvement	MMPB	Matrix	M18	2.1
44	Lodgepole Pine Improvement	MMPB	Matrix	M9	39.7
	Lodgepole Pine Improvement	MMPB	Matrix	M18	168.8
46	Thinning with Group Openings	MMPB	Matrix	M18	7.6
47	Thinning with Group Openings	MMPB	Matrix	M18	9.8
48	Scenic Views Enhancement	MMPB	Matrix	M9	19.0
49	Thinning with Group Openings	MMPB	Matrix	M9	15.6
50	Thinning with Group Openings	MMPB	Matrix	M18	57.6
51	Thinning with Group Openings	MMPB	Matrix	M18	74.4
52	Thinning with Group Openings	MMPB	Matrix	M9	48.4
	Thinning with Group Openings	MMPB	Matrix	M18	107.5
53	Thinning with Group Openings	MMPB	Matrix	M18	26.9
54	Thinning with Group Openings	MMPB	Matrix	M18	13.2
56	Thinning with Group Openings	MMPB	Matrix	M9	36.8
	Thinning with Group Openings	MMPB	Matrix	M18	49.5
57	Thinning with Group Openings	MMPB	Matrix	M18	392.3
58	Plantation	MMPB	Matrix	M18	0.3
59	Plantation	MMPB	Matrix	M18	1.9
62	Plantation	MMPB	Matrix	M18	4.3
63	Plantation	MMPB	Matrix	M9	5.5
64	Plantation	MMPB	Matrix	M9	7.0
65	Plantation	MMPB	Matrix	M18	7.0
66	Plantation	MMPB	Matrix	M9	8.5
67	Plantation	MMPB	Matrix	M9	9.3
68	Plantation	MMPB	Matrix	M18	0.8
	Plantation	MMPB	Matrix	M9	8.6
69	Plantation	MMPB	Matrix	M18	0.2

	Plantation	MMPB	Matrix	M9	9.8
70	Plantation	MMPB	Matrix	M9	13.9
	Plantation	MMPB	Matrix	M18	0.2
71	Plantation	MMPB	Matrix	M18	15.0
72	Plantation	MMPB	Matrix	M18	15.1
73	Plantation	MMPB	Matrix	M18	16.1
74	Plantation	MMPB	Matrix	M18	16.7
75	Plantation	MMPB	Matrix	M9	17.4
	Plantation	MMPB	Matrix	M18	0.3
76	Plantation	MMPB	Matrix	M18	18.5
77	Plantation	MMPB	Matrix	M18	18.8
78	Plantation	MMPB	Matrix	M18	18.8
79	Plantation	MMPB	Matrix	M18	19.3
80	Plantation	MMPB	Matrix	M18	20.9
81	Plantation	MMPB	Matrix	M18	20.6
82	Plantation	MMPB	Matrix	M9	21.2
83	Plantation	MMPB	Matrix	M18	21.5
84	Plantation	MMPB	Matrix	M9	22.6
85	Plantation	MMPB	Matrix	M9	21.8
86	Plantation	MMPB	Matrix	M18	22.7
87	Plantation	MMPB	Matrix	M18	22.9
88	Plantation	MMPB	Matrix	M9	5.1
	Plantation	MMPB	Matrix	M18	19.0
89	Plantation	MMPB	Matrix	M18	24.6
90	Plantation	MMPB	Matrix	M18	24.8
91	Plantation	MMPB	Matrix	M9	19.9
	Plantation	MMPB	Matrix	M18	4.9
92	Plantation	MMPB	Matrix	M9	9.0
	Plantation	MMPB	Matrix	M18	15.8
93	Plantation	MMPB	Matrix	M18	25.4
94	Plantation	MMPB	Matrix	M9	8.5
	Plantation	MMPB	Matrix	M18	17.2
95	Plantation	MMPB	Matrix	M18	26.3
96	Plantation	MMPB	Matrix	M18	26.3
97	Plantation	MMPB	Matrix	M9	1.6
	Plantation	MMPB	Matrix	M18	25.8
98	Plantation	MMPB	Matrix	M18	29.8
99	Plantation	MMPB	Matrix	M18	21.6
100	Plantation	MMPB	Matrix	M18	31.0
101	Plantation	MMPB	Matrix	M18	36.0
102	Plantation	MMPB	Matrix	M18	41.7
103	Plantation	MMPB	Matrix	M18	40.1
104	Plantation	MMPB	Matrix	M18	43.4

Unit	Treatment	Secondary	NWFP	LRMP	Acres
105	Plantation	MMPB	Matrix	M18	44.4
106	Plantation	MMPB	Matrix	M18	46.8
107	Plantation	MMPB	Matrix	M18	65.8
108	Plantation	MMPB	Matrix	M9	19.3
	Plantation	MMPB	Matrix	M18	0.3
109	Plantation	MMPB	Matrix	M9	22.2
110	Plantation	MMPB	Matrix	M9	56.6
	Plantation	MMPB	Matrix	M18	2.4
111	Plantation	MMPB	Matrix	M18	8.7
113	Thinning	MMPB	Matrix	M18	26.7
115	Plantation	MMPB	Matrix	M18	2.2
116	Thinning	MMPB	Matrix	M18	42.4
117	Scenic Views Enhancement	MMPB	Matrix	M9	11.9
	Scenic Views Enhancement	MMPB	Matrix	M18	0.1
118	Scenic Views Enhancement	MMPB	Matrix	M8	1.1
	Scenic Views Enhancement	MMPB	Matrix	M9	129.9
	Scenic Views Enhancement	MMPB	Matrix	M18	13.0
119	Scenic Views Enhancement	MMPB	Matrix	M9	3.6
120	Scenic Views Enhancement	MMPB	Matrix	M9	28.7
121	Lodgepole Pine Improvement	MMPB	Matrix	M9	30.6
				Total	4469

Note: MMPB = Mowing and/or mastication and prescribe burn.

Alternative 3

Alternative 3 was created based on key issues identified during public scoping. About 4,405 acres would be treated. Key issues used in alternative development include not constructing temporary roads to access treatment units; not creating group opening treatments in the Mixed Conifer plant association; and not removing large ponderosa pine in the dwarf mistletoe treatment. The IDT determined these key issues could be best addressed in a single action alternative.

This action alternative would convert group openings in the Mixed Conifer plant association to a thinning treatment; covert the dwarf mistletoe treatment into a thinning treatment; and does not require temporary road construction. The Lodgepole Pine Improvement Treatment, Plantation Treatment, Prescribed Fire Treatment, the *Wildlife Habitat Retention Strategy*, the *Wildland Urban Interface Strategy*, and the *Resource Protection Measures* remain the same as Alternative 2.

Treatment Descriptions

The following treatments are proposed. Potential treatment units are displayed in Figure 6.

Lodgepole Pine Improvement Treatment (249 acres): *The goal is to create a mosaic of even aged stands with natural appearing openings within the lodgepole pine, while providing a fuel break adjacent to Forest Road 16.*

This treatment description is the same as Alternative 2.

Plantation Treatments (1,174 acres): *The goal is to create more structurally diverse forests*.

This treatment description is the same as Alternative 2.

Prescribed Fire Only Treatment (809 acres): *The goal is to manage in-growth of trees, reduce fuels, and reintroduce fire back into the ecosystem*.

This treatment description is the same as Alternative 2.

Thinning (1,164 acres): *The goal is to maintain fire climax ponderosa pine*.

Thinning would occur in the Ponderosa Pine and Dry Mixed Conifer plant association groups. These areas have a predominance of old growth or second growth ("black bark pine") ponderosa pine in the overstory with some small diameter ponderosa pine and white fir in the understory. In many cases thinning would move multi-story late old structure stands to single story late old structure stands.

1) Treatments within the old growth stands would include thinning from below, mowing of shrubs, and prescribed burning.

2) Thinning treatments in the second growth ponderosa pine would be based on variable density thinning ("gappy/patchy/clumpy In some cases thinning would include removal of some larger trees, predominantly white fir, to create uneven aged stands to provide for the long term sustainability.

Thinning *without* Group Openings Treatment (769 Acres)**:** *The goal is to maintain and restore fire climax ponderosa pine*.

This treatment is similar to the Thinning with Group Openings as described in Alternative 2 but does not include group openings. While 820 acres are identified for treatment the amount of effective treated acres is expected to be 10%-30% less based on the lack of group openings. The effective acres treated would range from 574 to 738 acres. Specific stand conditions would ultimately guide the effective acres treated.

In mixed conifer stands that are dominated by white fir, thinning would occur adjacent to residual overstory ponderosa pine. Treatments would include thinning from below, removing young white fir/ponderosa pine ladder fuels from around the overstory ponderosa pine, mowing of shrubs and/or prescribed burning.

The total number of acres that would be thinned under Alternative is about 1,933 acres, but the IDT wanted to track the Thinning without Group Openings treatment separately as this treatment type was an issue raised during scoping. For simplicity of analysis, the thinning acres were combined in the Forest Vegetation section of the environmental assessment.

Scenic Views Enhancement Treatment (240 acres): *The goal is meet the direction for the Scenic Views management area.*

This is the same treatment as Alternate 2. Alternative 3 contains two non-significant Forest Plan amendments.

Table 9 provides a summary of proposed treatments. Table 10 provides a stand-by-stand summary of proposed treatments.

Table 9 Summary of proposed treatments

Treatment Type	Acres
Lodgepole Pine Improvement	249
Plantation	1,174
Prescribed Fire	809
Thinning	1,164
Thinning without Group Openings	769
Scenic Views Enhancement	240
Total	4,405

A number of connected actions are associated with Alternative 3:

- About 8 miles of Forest Roads would be decommissioned
- About 6 miles of Forest Roads would be administratively closed
- Reconstruct a curve radius of a section of Forest Rad 1628000

Logging systems and post-harvest treatments are the same as Alternative 2 (Proposed Action).

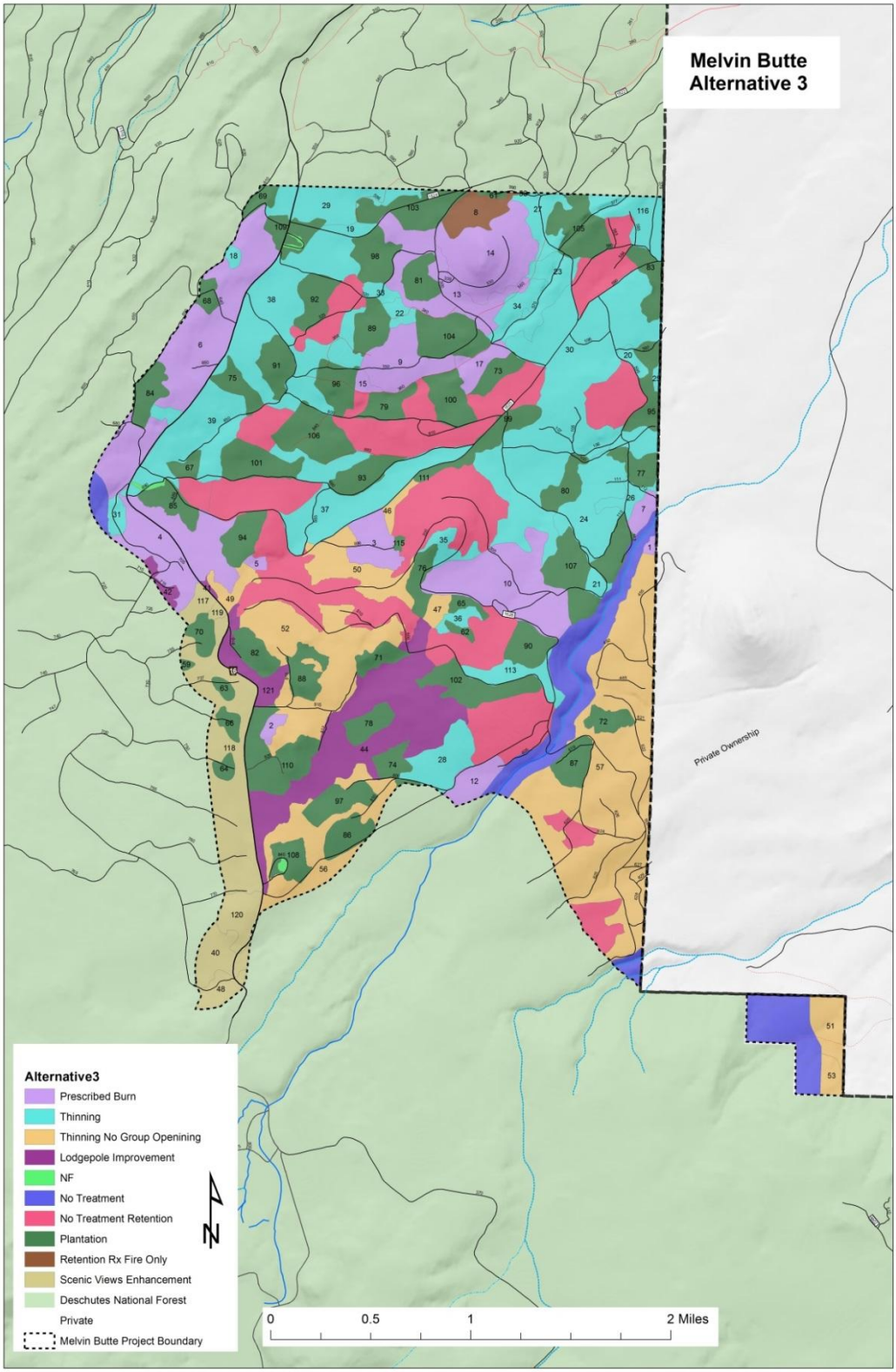


Figure 6 Alternative 3

Table 10 Stand table for Alternative 3

Unit	Treatment	Secondary	NWFP	LRMP	Acres
1	Prescribed Fire	None	Matrix	M18	3.0
2	Prescribed Fire	None	Matrix	M9	6.9
3	Prescribed Fire	None	Matrix	M18	34.9
4	Prescribed Fire	None	Matrix	M18	13.4
	Prescribed Fire	None	Matrix	M9	146.2
5	Prescribed Fire	None	Matrix	M9	1.2
	Prescribed Fire	None	Matrix	M18	3.0
6	Prescribed Fire	None	Matrix	M18	3.8
	Prescribed Fire	None	Matrix	M9	132.3
7	Prescribed Fire	None	Matrix	M18	12.0
8	Retention - Rx Fire Only	None	Administratively Withdrawn	M15	29.8
9	Prescribed Fire	None	Matrix	M18	54.6
10	Prescribed Fire	None	Matrix	M18	126.5
12	Prescribed Fire	None	Matrix	M18	23.3
13	Prescribed Fire	None	Matrix	M18	56.5
	Prescribed Fire	None	Administratively Withdrawn	M15	25.0
14	Prescribed Fire	None	Administratively Withdrawn	M15	111.8
15	Prescribed Fire	None	Matrix	M18	5.7
17	Prescribed Fire	None	Matrix	M18	19.5
18	Thinning	MMPB	Matrix	M18	0.2
	Thinning	MMPB	Matrix	M9	4.3
19	Thinning	MMPB	Matrix	M9	0.8
	Thinning	MMPB	Matrix	M18	7.9
20	Thinning	MMPB	Matrix	M18	7.1
21	Thinning	MMPB	Matrix	M18	7.6
22	Thinning	MMPB	Matrix	M18	9.9
23	Thinning	MMPB	Matrix	M18	35.8
24	Thinning	MMPB	Matrix	M18	85.4
25	Thinning	MMPB	Matrix	M18	2.7
26	Thinning	MMPB	Matrix	M18	14.0
27	Thinning	MMPB	Matrix	M18	21.0
	Thinning	MMPB	AWD	M15	7.2
28	Thinning	MMPB	Matrix	M18	44.4
29	Thinning	MMPB	Matrix	M9	31.0
	Thinning	MMPB	Matrix	M18	26.5
30	Thinning	MMPB	Matrix	M18	326.3
31	Thinning	MMPB	Matrix	M18	6.2
	Thinning	MMPB	Matrix	M9	3.8
33	Thinning	MMPB	Matrix	M18	8.4

Unit	Treatment	Secondary	NWFP	LRMP	Acres
34	Thinning	MMPB	Matrix	M18	20.4
35	Thinning	MMPB	Matrix	M18	15.8
36	Thinning	MMPB	Matrix	M18	9.1
37	Thinning	MMPB	Matrix	M18	112.4
38	Thinning	MMPB	Matrix	M9	108.6
	Thinning	MMPB	Matrix	M18	75.3
39	Thinning	MMPB	Matrix	M9	89.8
	Thinning	MMPB	Matrix	M18	13.6
40	Scenic Views Enhancement	MMPB	Matrix	M9	33.4
41	Lodgepole Pine Improvement	MMPB	Matrix	M9	1.8
42	Lodgepole Pine Improvement	MMPB	Matrix	M9	6.4
	Lodgepole Pine Improvement	MMPB	Matrix	M18	2.1
44	Lodgepole Pine Improvement	MMPB	Matrix	M9	39.7
	Lodgepole Pine Improvement	MMPB	Matrix	M18	168.8
46	Thinning without Group Opening	MMPB	Matrix	M18	7.6
47	Thinning without Group Opening	MMPB	Matrix	M18	9.8
48	Scenic Views Enhancement	MMPB	Matrix	M9	19.0
49	Thinning without Group Opening	MMPB	Matrix	M9	15.6
50	Thinning without Group Opening	MMPB	Matrix	M18	57.6
51	Thinning without Group Opening	MMPB	Matrix	M18	31.0
52	Thinning without Group Opening	MMPB	Matrix	M9	48.4
52	Thinning without Group Opening	MMPB	Matrix	M18	59.7
52	Thinning without Group Opening	MMPB	Matrix	M18	47.8
53	Thinning without Group Opening	MMPB	Matrix	M18	13.1
56	Thinning without Group Opening	MMPB	Matrix	M9	36.8
	Thinning without Group Opening	MMPB	Matrix	M18	49.5
57	Thinning without Group Opening	MMPB	Matrix	M18	392.3
58	Plantation	MMPB	Matrix	M18	0.3
59	Plantation	MMPB	Matrix	M18	1.9
62	Plantation	MMPB	Matrix	M18	4.3
63	Plantation	MMPB	Matrix	M9	5.5
64	Plantation	MMPB	Matrix	M9	7.0
65	Plantation	MMPB	Matrix	M18	7.0
66	Plantation	MMPB	Matrix	M9	8.5
67	Plantation	MMPB	Matrix	M9	9.3
68	Plantation	MMPB	Matrix	M18	0.8
	Plantation	MMPB	Matrix	M9	8.6
69	Plantation	MMPB	Matrix	M18	0.2
	Plantation	MMPB	Matrix	M9	9.8
70	Plantation	MMPB	Matrix	M9	13.9
	Plantation	MMPB	Matrix	M18	0.2
71	Plantation	MMPB	Matrix	M18	15.0

Unit	Treatment	Secondary	NWFP	LRMP	Acres
72	Plantation	MMPB	Matrix	M18	15.1
73	Plantation	MMPB	Matrix	M18	16.1
74	Plantation	MMPB	Matrix	M18	16.7
75	Plantation	MMPB	Matrix	M9	17.4
	Plantation	MMPB	Matrix	M18	0.3
76	Plantation	MMPB	Matrix	M18	18.5
77	Plantation	MMPB	Matrix	M18	18.8
78	Plantation	MMPB	Matrix	M18	18.8
79	Plantation	MMPB	Matrix	M18	19.3
80	Plantation	MMPB	Matrix	M18	20.9
81	Plantation	MMPB	Matrix	M18	20.6
82	Plantation	MMPB	Matrix	M9	21.2
83	Plantation	MMPB	Matrix	M18	21.5
84	Plantation	MMPB	Matrix	M9	22.6
85	Plantation	MMPB	Matrix	M9	21.8
86	Plantation	MMPB	Matrix	M18	22.7
87	Plantation	MMPB	Matrix	M18	22.9
88	Plantation	MMPB	Matrix	M9	5.1
	Plantation	MMPB	Matrix	M18	19.0
89	Plantation	MMPB	Matrix	M18	24.6
90	Plantation	MMPB	Matrix	M18	24.8
91	Plantation	MMPB	Matrix	M9	19.9
	Plantation	MMPB	Matrix	M18	4.9
92	Plantation	MMPB	Matrix	M9	9.0
	Plantation	MMPB	Matrix	M18	15.8
93	Plantation	MMPB	Matrix	M18	25.4
94	Plantation	MMPB	Matrix	M9	8.5
	Plantation	MMPB	Matrix	M18	17.2
95	Plantation	MMPB	Matrix	M18	26.3
96	Plantation	MMPB	Matrix	M18	26.3
97	Plantation	MMPB	Matrix	M9	1.6
97	Plantation	MMPB	Matrix	M18	25.8
98	Plantation	MMPB	Matrix	M18	29.8
99	Plantation	MMPB	Matrix	M18	21.6
100	Plantation	MMPB	Matrix	M18	31.0
101	Plantation	MMPB	Matrix	M18	36.0
102	Plantation	MMPB	Matrix	M18	41.7
103	Plantation	MMPB	Matrix	M18	40.1
104	Plantation	MMPB	Matrix	M18	43.4
105	Plantation	MMPB	Matrix	M18	44.4
106	Plantation	MMPB	Matrix	M18	46.8
107	Plantation	MMPB	Matrix	M18	65.8

Unit	Treatment	Secondary	NWFP	LRMP	Acres
108	Plantation	MMPB	Matrix	M9	19.3
	Plantation	MMPB	Matrix	M18	0.3
109	Plantation	MMPB	Matrix	M9	22.2
110	Plantation	MMPB	Matrix	M9	56.6
	Plantation	MMPB	Matrix	M18	2.4
111	Plantation	MMPB	Matrix	M18	8.7
113	Thinning	MMPB	Matrix	M18	26.7
115	Plantation	MMPB	Matrix	M18	2.2
116	Thinning	MMPB	Matrix	M18	42.4
117	Scenic Views Enhancement	MMPB	Matrix	M9	11.9
	Scenic Views Enhancement	MMPB	Matrix	M18	0.1
118	Scenic Views Enhancement	MMPB	Matrix	M8	1.1
	Scenic Views Enhancement	MMPB	Matrix	M9	129.9
	Scenic Views Enhancement	MMPB	Matrix	M18	13.0
119	Scenic Views Enhancement	MMPB	Matrix	M9	3.6
120	Scenic Views Enhancement	MMPB	Matrix	M9	28.7
121	Lodgepole Pine Improvement	MMPB	Matrix	M9	30.6
				Total	4405

Note: MMPB = Mowing and/or mastication and prescribe burn.

ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL_____

Three comments were received during initial public scoping that suggested alternatives to the proposed action but were not analyzed in detail. In addition, one alternative was considered by the IDT but was not analyzed in detail as discussed below.

Do not treat stands in the Mixed Conifer plant association group

It was suggested that no silviculture treatments occur in the mixed conifer plant association. This alternative would not meet the intent of increasing stand resiliency to insects, disease or wildfire or maintain existing old growth ponderosa pine in the mixed conifer plant association group. The Whychus Watershed Analysis shows a deficit of large ponderosa pine on the landscape resulting from past logging practices, disease and insects, and past fires. The remaining large ponderosa pine would continue to be at risk and could eventually be replaced by white fir as forest succession continues, loss to high intensity wildfire, or mortality from bark beetle attack. The action alternatives would conduct understory thinning around old growth trees to remove ladder fuels and provide for more site resources such as water; understory thinning would help maintain old large ponderosa trees over the long term. This alternative would not meet the purpose and need for action.

Do not remove trees larger than 9, 12, or 15 inches in diameter

It was suggested that varying levels of diameter cutting limits be applied to the project. The IDT evaluated these suggestions and concluded that these diameter limits were arbitrary. Arbitrarily applying a diameter limit would limit the ability to address site specific conditions and the silvicultural needs of the individual stand. For example, removing trees up to 12 inches in diameter may be suitable for fire risk reduction, again dependent on the site density, but may not reduce stand densities to provide for the long

term maintenance of large old trees over time. This alternative would not meet the purpose and need for action.

Only treat second growth ponderosa pine

It was suggested to only treat second growth ponderosa pine in the project area. This would reduce the project area available for treatment by about 80%. This alternative would forego fuels reduction treatments in the Wildland-Urban Interface and the potential fire risk in the project area would be similar to the No Action Alternative. This suggestion would have similar effects as described for the "do not treat stands in the Mixed Conifer plant association group" alternative. This alternative would not meet the purpose and need for action.

Consider an action alternative that did not contain site-specific Forest Plan amendments

An action alternative that didn't contain site-specific amendments to the Forest Plan for the Scenic Views (MA-9) land allocation was considered by the district interdisciplinary team. This alternative would use Scenic Views standards and guidelines M9-27 and M9-90 as currently outlined in the Deschutes National Forest Land and Resource Management Plan (pages LRMP 4-125 and LRMP 4-131).

M9-27 *(LRMP 4-125) states: In Retention Foregrounds slash from a thinning or tree removal activity, or other visible results of management activities, will not be visible to the casual forest visitor one year after the work has been completed. In partial retention foregrounds, logging residue or other results of management activities will not be obvious to the casual forest visitor two years following the activity.*

District experience has shown that visual impacts to the casual forest visitor from thinning, tree removal, and prescribed burning in Retention and Partial Retention Foreground areas in the Timber/Mixed Conifer type can often last up to a five year period. In addition, logging residues can often take up to two years to cure (dry out) and subsequent slash burning must often be staggered over a period of time contingent on such factors as weather and smoke dispersal requirements. Given these factors, coupled with the more urgent need to reduce fuels in the Wildland Urban Interface, the IDT felt that an action alternative that incorporated M9-27 as currently written wasn't operationally feasible and that a period of time greater than one to two years was more realistic to achieve the goals of the Scenic Views land allocation and the *Greater Sisters Country Community Wildfire Protection Plan*.

M9-90 *(LRMP page 4-131*) states: *Low intensity prescribed fires will be used to meet and promote the Desired Visual Condition within each stand type. Prescribed fire and other fuel management techniques will be used to minimize the hazard of a high intensity fire. In foreground areas, prescribed fire will be small, normally less than 5 acres, and shaped to appear as natural occurrences. If burning conditions cannot be met such that scorching cannot be limited to the lower 1/3 of the forest canopy, then other fuel management techniques should be considered.*

The Scenic Views land allocation in the Melvin project area is embedded in a designated Wildland Urban Interface. One goal of treatments in the interface is to reduce fuel loadings adjacent to Forest Road 16 which is the main travel artery to the highly popular Three Creek Lakes basin. The IDT also considred the requirements of M9-90 in the context of restoring Scenic Views in foreground areas impacted by the 2012 Pole Creek fire.

Foreground areas in the Timber/Mixed Conifer type adjacent to Forest Road 16 were impacted by the fire and fireline suppression techniques such as mowing, felling of snags, and back burning operations. Allowing some prescribed burn areas greater than five acres in size in foreground areas would facilitate fuels reduction adjacent to Forest Road 16 and help blend evidence of fire suppression activities with the existing surrounding vegetation. The district also has considerable experience in using mechanized equipment to limit bole scorch by thinning understory trees and shrubs but under the best conditions fire

may scorch boles greater than 1/3 of the tree. Prescribed burning would adhere to fuel and weather parameters outlined in Burn Plans to minimize bole scorch. Given these factors the IDT felt that an action alternative that incorporated M9-90 as currently written wouldn't facilitate the goal of restoring scenic quality in foreground areas impacted by the 2012 Pole Creek fire or adequately address fuels reduction in a Wildland Urban Interface.

For the reasons stated above the IDT did not consider an action alternative that used the standards and guidelines M9-27 and M9-90 as currently written because they wouldn't provide the necessary flexibility to meet the purpose and need for action for the Melvin Butte Vegetation Management Project.

RESOURCE PROTECTION MEASURES COMMON TO THE ACTION ALTERNATIVES

The action alternatives would meet direction in all relevant laws and policies, and the standards and guidelines in the Deschutes National Forest Land and Resource Management Plan, as amended by individual site-specific amendments described in this environmental assessment. Resource protection measures are project design criteria and best management practices that would reduce or eliminate unwanted effects and ensure project activities are implemented to comply with all necessary Forest Plan standards and guidelines.

Resource protection measures are an integral part of project design and would be carried out through project implementation. The effectiveness of each resource protection measure is rated as ***high***, ***moderate***, or ***low*** to provide a qualitative assessment of the expected effectiveness the management activity could have on preventing and/or reducing impacts to resources. Effectiveness ratings are based on the following criteria: (i) literature; (ii) administrative studies (local or within similar ecosystems; and (iii) professional judgment.

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

The effects analysis in Chapter 3 is based on the implementation of the resource protection measures.

Resource protection measures include, but are not limited to, the following: Forest Plan goals, objectives, or standards and guidelines; project design criteria; best management practices; and Invasive Plant Prevention Practices.

Soils

BMP Veg-4. Ground-based Skidding and Yarding Operations

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during ground-based skidding and yarding operations.

Practices: Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

- Use ground-based yarding systems only when physical site characteristics are suitable to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources (BMP Veg-4).
    - Avoid equipment operations on slopes greater than 30 percent (LRMP SL-2) *(Highly Effective – Entire Sale)*.
    - Assess sensitive soils to determine if equipment operations can occur without causing excessive soil disturbance (LRMP SL-3) *(Moderately Effective – Entire Sale)*.
- Use suitable measures during felling and skidding operations to avoid or minimize disturbance to soils and water bodies to the extent practicable (BMP Veg-4).
    - Use directional felling techniques from pre-approved skid trails, and suspend the leading end of logs during skidding operations *(Highly Effective – Entire Sale)*.
    - On steep pitches within a harvest unit (slopes of 30 percent or steeper) and less than 100 feet long, directional felling of trees to skid trails and/or line pulling should be utilized to harvest trees. This method applies to harvest units with small areas of steeper slopes (e.g. less than 5 percent of the unit area) *(Highly Effective – Entire Sale)*.
    - Stop harvest operations when soils become too wet to operate on without causing excessive soil disturbance *(Highly Effective – Entire Sale)*.
- Use existing roads and skid trail networks to the extent practicable (BMP Veg-4).
    - Use old landings and skidding networks whenever possible. Assure that water control structures are installed and maintained on skid trials that have gradients of 10 percent or more. Ensure erosion control structures are stabilized and working effectively (LRMP SL-1) *(Highly Effective – Entire Sale)*.
- Design and locate skid trails and skidding operations to minimize soil disturbance to the extent practicable (BMP Veg-4).
    - In all proposed activity areas, locations of new yarding and transportation systems will 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) *(Highly Effective – Entire Sale)*.
    - Designate locations for new trails and landings so that they properly fit the terrain and minimize the extent of soil disturbance (LRMP SL-3) *(Highly Effective – Entire Sale)*.
    - Restrict skidders and tractors to designated areas (i.e., roads, landings, designated skid trails), and limit the amount of traffic from other specialized equipment off designated areas. Harvester shears will be authorized to operate off designated skid trails at 30 foot intervals and make no more than two equipment passes on any site specific area to accumulate materials *(Highly Effective – Entire Sale)*.
    - When using conventional harvest equipment that include harvester shears and rubber tired or tracked skidders, maintain spacing of 100 to 150 feet for all primary skid trail routes, except where converging at landings. Closer spacing due to complex terrain must be approved in advance by the Timber Sale Administrator and Soil Scientist. Main skid trails have typically been spaced 100 feet apart (11% 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 trails be increased to 150 feet to reduce the amount of detrimentally disturbed soil to 7% of the unit area (Froehlich 1981) *(Highly Effective – Entire Sale)*.
    - When using harvester forwarder equipment space trails a minimum of 60 feet apart. Make use of ghost trails as much as possible on which the harvester makes only one pass and positions harvested materials so they can be reached from alternate harvester forwarder trails *(Highly Effective – Entire Sale)*.

- Use suitable measures to stabilize and restore skid trails after use (BMP Veg-4).
    - Evaluate soil conditions and identify soil restoration opportunities (subsoiling) on skid trails post-harvest *(Highly Effective – Entire Sale)*.

BMP Veg-6. Landings

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from the construction and use of log landings.

Practices: Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

- Minimize the size and number of landings as practicable to accommodate safe, economical, and efficient operations (BMP Veg-6) *(Highly Effective – Entire Sale)*.
- Avoid locating landings near any type of likely flow or sediment transport conduit during storms, such as ephemeral channels and swales, where practicable (BMP Veg-6) *(Moderately Effective – Entire Sale)*.
- Locate landings to minimize the number of required skid roads (BMP Veg-6) *(Moderately Effective – Entire Sale)*.
- Re-use existing landings where their location is compatible with management objectives and water quality protection (BMP Veg-6) *(Highly Effective – Entire Sale)*.

BMP Veg-7. Winter Logging

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from winter logging operations.

Practices: Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

- Conduct winter logging operations when the ground is frozen or snow cover and depth is adequate to avoid or minimize unacceptable rutting or displacement of soil (BMP Veg-7) *(Highly Effective – Entire Sale).*
- Suspend winter operations if ground and snow conditions change such that unacceptable soil disturbance, compaction, displacement, or erosion becomes likely (BMP Veg-7) *(Highly Effective – Entire Sale)*.

BMP Fire-2. Use of Prescribed Fire

Objective: Avoid, minimize, or mitigate adverse effects of prescribed fire and associated activities on soil, water quality, and riparian resources that may result from excessive soil disturbance as well as inputs of ash, sediment, nutrients, and debris.

Practices: A burn plan addressing compliance with applicable DES LRMP standards and guidelines and BMP's will be completed before the initiation of prescribe fire treatments in planning activity areas. Prescribed burn plans need to include the following to protect soils and water quality.

- Conduct prescribed fires to minimize the residence time on the soil while meeting the burn objectives.

  - Manage fire intensity to maintain target levels of soil temperature, duff, and residual vegetation cover within the limits and at locations described in the prescribed fire plan (BMP Fire-2) *(Highly Effective – Entire Sale)*.
- Consider alternatives to ground-disturbing fireline construction such as using existing roads or other already existing suitable features for firelines.
  - If fireline construction is necessary, construct line to the minimum size and standard necessary to contain the prescribed fire and meet overall project objectives (BMP Fire-2) *(Moderately Effective – Entire Sale)*.

Hydrology and Fisheries

Vegetation Management Planning

Objective: Use the applicable vegetation management planning processes to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during mechanical vegetation treatment activities.

Practices: Evaluate and field verify site conditions in the project area to design mechanical vegetation treatment prescriptions that avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources.

- Through the project planning and design process, the following areas are excluded from treatment to protect water quality and riparian resources:
  - No treatments are proposed in Riparian Reserves except for 0.1 miles of road closure and decommissioning (*Highly Effective – Entire Sale Area*)
  - No new roads or new temporary roads will be constructed in Riparian Reserves (*Highly Effective – Entire Sale Area*)

Ground-Based Skidding and Yarding Operations (FSM 2409.15)

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during ground-based skidding and yarding operations by minimizing site disturbances and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies.

Practices: Specific design elements for ephemeral channels and ditches to protect the integrity of channel banks and reduce sedimentation. Some ephemeral channels have been identified below but others may be found during implementation and restrictions would apply. Implement standard logging BMPs to protect water quality.

- Modify mechanical vegetation treatment prescriptions and operations as needed to maintain ecosystem structure, function, and processes.
  - Mechanical treatment and equipment is not allowed within 30 ft. on either side of the ephemeral channels, unless approved by a hydrologist or fisheries biologist. (*Moderately Effective –Units 10, 17, 23, 30, 37, 44, 76, 79, 80, 95, 99, 100, 105, 116*)
  - Removal of trees within 30 ft. on either side of ephemeral channels is not allowed unless approved by a hydrologist or fisheries biologist. (*Moderately effective – Entire Sale Area and Units 10, 17, 23, 30, 37, 44, 76, 79, 80, 95, 99, 100, 105, 116*)
  - Do not pile slash in swales, washes, or depressions. (*Moderately Effective –Units 10, 17, 23, 30, 37, 44, 76, 79, 80, 95, 99, 100, 105, 116*)
  - Ditches and channelized streams that are functioning as a stream should be buffered based on the class of stream for which they are functioning (i.e. Class 4 buffer if the ditch is intermittent, etc.). (*Highly Effective – Entire Sale Area*)

    - Ditches that do not connect back to a stream (i.e. they feed out into a pasture or irrigation device) should be buffered 30 feet to protect the integrity of the channel. No mechanized equipment is allowed within the buffer. Hand-thinning or reaching in with equipment is permitted but cutting of trees within the channel or on the banks is not permitted. Do not fell or yard any trees across the channel in order to protect channel integrity. (*Highly Effective – Entire Sale Area*)
- Locate transportation facilities for mechanical vegetation treatments, including roads, landings, and skid trails outside Riparian Reserves and ephemeral draws to the extent practicable.
    - Crossing of designated ephemeral draws will be limited and approved by a hydrologist or fisheries biologist(*Moderately Effective – Entire Sale Area*)
    - Landings will be located at least 30ft from ephemeral draws and outside of Riparian Reserves. (*Moderately Effective – Entire Sale Area*)
- Implement Best Management logging practices that will reduce erosion and potential water quality effects.
    - Installation of waterbars on skid trails where needed. (*Moderately Effective – Entire Sale Area*)
    - Construction of new landings and skid trails would be minimized. (*Highly Effective – Entire Sale Area*)
    - No ground-based harvest on slopes over 30%. (*Moderately Effective – Entire Sale Area*)
    - See soils BMP document for additional specific measures to minimize effect of ground-based skidding and yarding operations.

Hauling Operations

Objective: Avoid, minimize, or mitigate adverse effects to water quality and riparian resources during hauling operations by minimizing road erosion and maintaining proper road drainage to reduce the introduction of sediment and increased overland flow to waterbodies.

Practices: Limit timing of haul and maintain proper drainage to reduce sediment delivered to Three Creek from hauling operations.

- No haul on hydrologically connected roads or roads within riparian reserves when conditions are wet and can cause sedimentation to reach Three Creek. (*Moderately Effective – Entire Sale Area*)
- No haul across stream fords when streams are flowing. (*Moderately Effective – Entire Sale Area*)
- Improve drainage on unstable hydrologically connected roads before haul can occur and implement regular preventative maintenance. (*Moderately Effective – Entire Sale Area*)
- Consult with a hydrologist or soil scientist to determine if roads are too wet for haul.
- Roads that may need maintenance or that should be monitored for excessive wetness in hydrologically connected areas are (other roads may be identified in the field):
    - 1620-377 – adjacent to ephemeral draw, decommission after use;
    - 1620-570 – adjacent to ephemeral draw, close after use;
    - 1620-880 – adjacent to ephemeral draw;
    - 1624-360 – adjacent to ephemeral draw, decommissioning after use.
- Obliterate all temporary roads. (*Moderately Effective – Units 4, 51, 56*)

Wildlife

Objective: Avoid, minimize or mitigate adverse effects to wildlife and wildlife habitat during ground-based skidding, yarding operations, and location of log landings.

Practice: Develop site-specific BMP prescriptions using Forest Service regional guidance, land management plan direction, and professional judgment.

- Disruptive work activities will not take place within ¼ mile of any newly discovered nest sites for the species listed below. Haul restrictions will be assessed on a case-by-case basis. This condition may be waved in a particular year if nesting or reproductive success surveys reveal that the species indicated in non-nesting or that young are present that year. Waivers are valid only until the start date of the restriction of the following year (Table 11). (*Highly Effective – Entire Sale Area)*

Table 11 Buffer restrictions for nesting raptors

Species	Restriction Period	Buffer Distance Around Nest
Northern spotted owl	March 1 – September 30	¼ mile
Northern goshawk	March 1 – August 31	¼ mile
Cooper's hawk	April 15 – August 31	¼ mile
Sharp-shinned hawk	April 15 – August 31	¼ mile
Red-tailed hawk	March 1 – August 31	¼ mile
Great gray owl	March 1 – June 30	¼ mile
Osprey	April 1 – August 31	¼ mile

- To avoid potential nest destruction and loss of broods, schedule harvest and post-harvest activities outside of nesting season in appropriate habitats (Table 12).(*Highly Effective – Entire Sale Area)*

Table 12 Species nesting season

Species	Dates
Lewis woodpecker	March 15-June 30
White-headed woodpecker	March 15-June 30
Pygmy huthatch	March 15-June 30
Olive-sided flycatcher	March 15-June 30
Pileated woodpecker	March 15-June 30
Northern flicker	March 15-June 30
Blue grouse	March 15-June 30

Goshawk

- Disruptive work activities will not take place within ¼ mile (1/2 mile for helicopter) of newly discovered nest sites from March 1 through August 31. The project will not be operating within any habitat or known nest sites.

Cooper and Sharp shinned hawk

- Restrict disturbance activities within ¼ mile of any newly discovered nests from April 15 through August 31. Haul restrictions will be assessed on a case by case basis. This condition may be waived in a particular year if nesting or reproductive success surveys reveal that the species indicated is non-nesting or that no young are present that year. Waivers are valid only until the start date of the restriction of the following year.

Red-tailed hawk

- Disruptive work activities will not take place within ¼ mile (1/2 mile for helicopter) of any newly discovered nest sites from March 1 through August 31. Haul restrictions will be assessed on a

case by case basis. This condition may be waived in a particular year if nesting or reproductive success surveys reveal that the species indicated is non-nesting or that no young are present that year. Waivers are valid only until the start date of the restriction of the following year.

Snags and Down Wood

- EA Unit 57, when down logs densities need to be reduced to provide access for thinning, maintain down log densities at 120 lineal feet per acre with a minimum of 16 inches diameter and 16 feet long (NWFP C-40).
- Where incidental removal of snags occurs to meet objectives for fuel loading within LPI units and scenic views management all snags >21 inches dbh will be retained.

Botany

Objective: Avoid, minimize or mitigate adverse effects to botanical resources and prevent invasive plants during ground-based skidding, yarding operations, and location of log landings.

Practice: Develop site-specific BMP prescriptions using Forest Service regional guidance, land management plan direction, and professional judgment.

- Discuss invasive plant prevention practices at force account crew or contractor pre-work session. (*Highly Effective – Entire Sale Area)*
- Minimize ground disturbance to the extent practicable. (*Highly Effective – Entire Sale Area)*
- Make sure equipment is clean (weed free). (*Highly Effective – Entire Sale Area)*
- Insure any materials brought to the site are weed free (gravel, rocks, or soil). (*Highly Effective – Entire Sale Area)*
- Minimize disturbance of existing vegetation. If needed, revegetate with local native plant species. (*Highly Effective – Entire Sale Area)*
- Protect any unmapped Whitebark pine discovered during thinning. (*Highly Effective – Entire Sale Area)*

Heritage

Objective: Avoid, minimize or mitigate adverse effects to Heritage resources during ground-based skidding, yarding operations, and location of log landings.

Practice: Develop site-specific BMP prescriptions using Forest Service regional guidance, land management plan direction, and professional judgment.

- Ground disturbing activities within all eligible or potentially eligible sites will be avoided with a 30 meter buffer placed around the sites. If any cultural resources are discovered during project implementation, all project related activities in that area will cease immediately. Workers must immediately notify the onsite supervisor who will contact a Forest Archaeologist. One of the Forest archaeologists will initiate the consultation process as outlined in Section 800.13 of the Advisory Council on Historic Preservation's regulations 36 CFR Part 800.(*Highly Effective – Entire Sale Area*)

Recreation

Objective: Avoid, minimize, or mitigate adverse effects to recreation resources during tree marking, tree felling, and ground-based skidding and yarding operations.

Practices: Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

To avoid significant disruption of the current valued scenery and recreation experience

- Whenever possible, landings, slash piles, and other discordant visual evidence of harvest and treatment activities should not be visible from sno-parks facilities following completion of operations. *(Highly Effective Units 109 and 39)*
- Do not approve long-term storage of bundles or decks where they will affect the function or use of the sno-parks. *(Highly Effective Units 109 and 39)*

To avoid, minimize or reduce impact to recreational use and safety

- Avoid creating sharply diverse vegetation conditions immediately adjacent to sno-parks. Emphasize a "natural" look of the forest as viewed from the sno-parks. sno-parks (*Highly Effective Units 109 and 39)*
- Do not approve slash piles or storage of decks along trails that may create a hazardous situation for snowmobile users. For example, a slash pile covered by snow may appear to be a small hill/obstacle to a snowmobile user, not an unstable slash pile. Mitigate these hazards as necessary. (*Highly Effective - Units: 4, 10, 12, 28, 31, 35, 39, 40, 41, 42, 44, 48, 49, 50, 56, 57, 72, 76, 85, 86, 87, 90, 108, 110, 113, 114)*
- During tree-marking, or tree or brush removal activities within 300 feet of sno-parks, coordinate with recreation staff to emphasize retention and improvement of natural site-defining features. Site boundaries for designated sno-parks are defined by trees, brush, rocks, or down logs. This helps define the edge of where parking is allowed. Maintaining this vegetation entirely or partially or replacing these site-controlling features is critical to future effective site management. *(Highly Effective Units 109 and 39)*
- Retain trees that hold signs (including diamonds that mark winter trails). Replace trail signs that may be damaged or removed during project operations. *(Highly Effective Units: 4, 10, 12, 28, 31, 35, 39, 40, 41, 42, 44, 48, 49, 50, 56, 57, 72, 76, 85, 86, 87, 90, 108, 110, 113, 114)*
- Whenever possible, in accordance with this EA, remove hazard trees within a tree length near sno-parks. *(Highly Effective - Units 109 and 39)*

To avoid indirect, unintended disruption or modification of recreation activities or unintended impact from recreation activities on other resources following completion of treatment activities

- Painted trees should not be visible from sno-parks within a reasonable time period following completion of project activities. Techniques to accomplish could include, but are not limited to, favoring blue paint marking techniques where possible to mark 'take' trees rather than 'leave' trees for units containing or adjacent to sno-parks, or removing leave tree paint within sight of sno-parks. *(Highly Effective - Units 109 and 39)*
- Avoid creating vegetative conditions that would facilitate creation of unauthorized trails, or that would facilitate unauthorized motorized access from FSR 16 or Sno-parks. *(Highly Effective - Units 109 and 39)*
- Place boulders (preferred) or other natural features bounding sno-parks to deter cross-country travel. (*Highly Effective – Forest Road 16)*
- Obliterate unauthorized travel ways adjacent to the sno-parks. (*Highly Effective - Units 109 and 39)*
- Ensure that temporary roads used for project administration do not become future unauthorized trails by effective obliteration after use. *Highly Effective Applies to Alternative 2 only)*

To ensure that there is no inadvertent effect to use of designated snowmobile routes, to the extent that snowplowing is needed during the operating period

- Assure snow berms created by snowplowing activities do not coincide with winter recreationist routes that create a hazard for snowmobile groomers or recreational users. Coordinate trail closures with the recreation staff. (*Highly Effective – Forest Road 16 and Units: 4, 10, 12, 28, 31, 35, 39, 40, 41, 42, 44, 48, 49, 50, 56, 57, 72, 76, 85, 86, 87, 90, 108, 110, 113, 114)*

In order to avoid surprises to recreational users of the area:

- Provide information about timing and location of treatments on websites and at the sno-parks, including information on specific trail or area closures. *(Highly Effective Units 109 and 39)*

To avoid, minimize or reduce impact to special use operations:

- Coordinate with the special use administrator to identify recreation events permitted for the season. Coordinate conflicts with timing and location. *(Highly Effective Forest Road 16 and Units 109 and 39)*
- Do not use Upper Three Creek Sno-Park as a staging area as it receives heavy use and serves as a temporary office location for Three Creeks Backcountry outfitter/guides under special use permit by the Forest Service. *(Highly Effective - Units 109 and 39)*

To avoid significant disruption of the Three Creek recreation area south of the project area:

- Implement traffic control and safety measures on FSR16 during summer recreation use as necessary. Do not close FSR 16 access to recreational sites. *(Highly Effective Forest Road 16)*

Transportation

Objective: Avoid, minimize or mitigate adverse effects to transportation infrastructure during ground-based skidding, yarding operations, and location of log landings.

Practice: Develop site-specific BMP prescriptions using Forest Service regional guidance, land management plan direction, and professional judgment.

Road-1. Travel Management Planning and Analysis

Objective: Use the travel management planning and analysis processes to develop measures to avoid, minimize or mitigate adverse effects to soil, water quality, and riparian resources during road management activities.

Practices: Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

Operations

- Use existing roads when practicable *(Highly Effective –Entire Sale Area)*
- Use system roads where access is needed for long-term management of an area or where control is needed in the location, design, or construction of the road to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources. *(Highly Effective – Entire Sale Area)*

- Consider placing roads in storage (Maintenance Level 1) when the time between intermittent uses exceeds 1 year and the costs of annual maintenance (both economic and potential disturbance) or potential failures due to lack of maintenance exceed the benefits of keeping the road open in the interim (See BMP Road-6 [Road Storage and Decommissioning]). *(Highly Effective – Entire Sale Area limited to current Level 1 roads)*

Road-4. Road Operations and Maintenance

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by controlling road use and operations and providing adequate and appropriate maintenance to minimize sediment production and other pollutants during the useful life of the road.

Practices: Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

Operations

- Designate season of use to avoid or restrict road use during periods when use would likely damage the roadway surface or road drainage features. *(Highly Effective –Entire Sale Area)*
- Use suitable measures to communicate and enforce road use restrictions. *(Highly Effective-Entire Sale Area)*
- Adjust maintenance to handle the traffic while minimizing excessive erosion and damage to the road surface. *Highly Effective-Entire Sale Area)*
  - Ensure that drainage features are fully functional on completion of seasonal operations.
  - Shape road surfaces to drain as designed.
  - Construct or reconstruct drainage control structures as needed.
  - Ensure that ditches and culverts are clean and functioning.
  - Remove berms unless specifically designed for erosion control purposes. *(Highly Effective – Entire Sale Area)*
- Use suitable road surface stabilization practices and dust abatement supplements on roads with high or heavy traffic use (See FSH 7709.56 and FSH 7709.59) *(Moderately Effective – Collector Roads)*

Inspections

- Periodically inspect system travel routes to evaluate condition and assist in setting maintenance and improvement priorities. *Highly Effective – Entire Sale Area)*
- Inspect roads frequently during all operations.
  - Restrict use if road damage such as unacceptable surface displacement or rutting is occurring. *(Highly Effective – Entire Sale Area)*

Maintenance Activities

- Maintain the road surface drainage system to intercept, collect, and remove water from the road surface and surrounding slopes in a manner that reduces concentrated flow in ditches, culverts, and over fill slopes and road surfaces. *(Highly Effective – Entire Sale Area where required)*
- Clean ditches and catch basins only as needed to keep them functioning. (*Highly Effective –Entire Sale Area where required)*
- Do not undercut the toe of the cut slope when cleaning ditches or catch basins. (*Highly Effective – Entire Sale Area where required)*

- Use suitable measures to avoid, to the extent practicable, or minimize direct discharges from road drainage structures to nearby water bodies. (*Highly Effective –Entire Sale Area where required)*
- Identify diversion potential on roads and prioritize for treatment.
  - Minimize diversion potential through installation and maintenance of dips, drains, or other suitable measures. *(Highly Effective – Entire Sale Area where required)*
- Maintain road surface treatments to stabilize the roadbed, reduce dust, and control erosion consistent with anticipated traffic and use. *(Moderately Effective – Entire Sale Area)*
- Grade road surfaces only as necessary to meet the smoothness requirements of the assigned operational maintenance level and to provide adequate surface drainage. *(Highly Effective – Entire Sale Area)*
- Do not undercut the toe of the cut slope when grading roads. *(Highly Effective – Entire Sale Area where required)*
- Do not permit side casting of maintenance-generated debris within the AMZ to avoid or minimize excavated materials entering water bodies or riparian areas. *(Highly Effective – Entire Sale Area where required)*
- Avoid over widening of roads due to repeated grading over time, especially where side cast material would encroach on water bodies. *(Highly Effective – Entire Sale Area where required)*
- Use potential side cast or other waste materials on the road surface where practicable. *(Highly Effective – Entire Sale Area)*
- Dispose of unusable waste materials in designated disposal sites. *(Highly Effective – Entire Sale Area where required)*
- Remove vegetation from swales, ditches, and shoulders, and cut and fill slopes only when it impedes adequate drainage, vehicle passage, or obstructs necessary sight distance to avoid or minimize unnecessary or excessive vegetation disturbance. *(Highly Effective – Entire Sale Area)*
- Maintain permanent stream crossings and associated fills and approaches to reduce the likelihood that water would be diverted onto the road or erode the fill if the structure becomes obstructed. *(Highly Effective – Entire Sale Area)*
- Use applicable practices of BMP Road-6 (Road Storage and Decommissioning) for maintenance and management of Maintenance Level 1 roads. *(Highly Effective – Entire Sale Area where required)*
- Ensure the necessary specifications concerning prevail maintenance, maintenance during haul, and post haul maintenance (putting the road back in storage) are in place when maintenance level 1 roads are opened for use on commercial resource management projects or other permitted activities. *(Highly Effective – Entire Sale Area)*
- Require the commercial operator or responsible party to leave roads in a satisfactory condition when project is completed. *(Highly Effective – Entire Sale Area)*

Road-5. Temporary Roads

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from the construction and use of temporary roads.

Practices: Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

- Schedule construction activities to avoid direct soil and water-disturbance during periods of the year when heavy precipitation and runoff are likely to occur. *(Highly Effective – Where Applicable)*
- Routinely inspect temporary roads to verify that erosion and storm water controls are implemented, functioning, and appropriately maintained. *(Highly Effective – Where Applicable)*

- Maintain erosion and storm water controls as necessary to ensure proper and effective functioning. *(Highly Effective – Where Applicable)*
- Use suitable measures in compliance with local direction to prevent and control invasive species. *(Highly Effective – Entire Sale Area)*
- Use temporary crossings suitable for the expected uses and timing of use (See BMP Road-7 [Stream Crossings]). *(Highly Effective – Entire Sale Area where required)*
- Use applicable practices of BMP Road-6 (Road Storage and Decommissioning) to obliterate the temporary road and return the area to resource production after the access is no longer needed. *(Highly Effective – Entire Sale Area where required)*

Road-6 Road Storage and Decommissioning

Objective: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by storing closed roads not needed for at least 1 year (Intermittent Stored Service) and decommissioning unneeded roads in a hydrologically stable manner to eliminate hydrologic connectivity, restore natural flow patterns, and minimize soil erosion.

Practice: Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

All Activities

Implement suitable measures to close and physically block the road entrance so that unauthorized motorized vehicles cannot access the road.

- Remove the road from the Motor Vehicle Use Map (MVUM) to include the change in the annual forest wide order associated with the MVUM. *(Moderately Effective – Only Roads Designated for Decommissioning)*
- Establish effective ground cover on disturbed sites to avoid or minimize accelerated erosion and soil loss. *(Highly Effective – Where Applicable)*

Road Storage

- Evaluate all stream and water body crossings for potential for failure or diversion of flow if left without treatment. *(Highly Effective – Where Applicable)*
- Use suitable measures to reduce the risk of flow diversion onto the road surface. *(Highly Effective – Where Applicable)*
- Consider leaving existing crossings in low-risk situations where the culvert is not undersized, does not present an undesired passage barrier to aquatic organisms, and is relatively stable. *(Highly Effective – Where Applicable)*
- Remove culverts, fill material, and other structures that present an unacceptable risk of failure or diversion. *(Highly Effective – Where Applicable)*
- Reshape the channel and stream banks at the crossing-site to pass expected flows without scouring or ponding, minimize potential for undercutting or slumping of stream banks, and maintain continuation of channel dimensions and longitudinal profile through the crossing site. *Highly Effective – Where Applicable)*
- Use suitable measures to avoid or minimize scour and down cutting. *(Highly Effective – Where Applicable)*
- Use suitable measures to ensure that the road surface drainage system will intercept, collect, and remove water from the road surface and surrounding slopes in a manner that reduces concentrated

flow in ditches, culverts, and over fill slopes and road surfaces without frequent maintenance. *(Highly Effective – Where Applicable)*
- Use suitable measures to stabilize unstable road segments, seeps, slumps, or cut or fill slopes where evidence of potential failure exists. *(Highly Effective – Where Applicable)*
- Close road by means of using natural resource materials such as down logs, boulders, and brush for the first 300' or line of site to its adjacent intersection, whichever is shortest. *(Highly Effective – Where Applicable)*

Road Decommissioning

- Use existing roads identified for decommissioning as skid roads in timber sales or land stewardship projects before closing the road, where practicable, as the opportunity arises. *(Highly Effective – Where Applicable)*
- Evaluate risks to soil, water quality, and riparian resources and use the most practicable, cost effective treatments to achieve long-term desired conditions and water quality management goals and objectives. *(Highly Effective – Where Applicable)*
- Implement suitable measures to re-establish stable slope contours and surface and subsurface hydrologic pathways where necessary to the extent practicable to avoid or minimize adverse effects to soil, water quality, and riparian resources. (Requires Evaluation)
- Remove drainage structures. *(Highly Effective – Where Applicable)*
- Recontour and stabilize cut slopes and fill material. *(Requires Evaluation)*
- Reshape the channel and stream banks at crossing sites to pass expected flows without scouring or ponding, minimize potential for undercutting or slumping of stream banks, and maintain continuation of channel dimensions and longitudinal profile through the crossing site. *(Requires Evaluation)*
- Restore or replace streambed materials to a particle size distribution suitable for the site. *(Requires Evaluation)*
- Restore floodplain function. *(Requires Evaluation)*
- Implement suitable measures to promote infiltration of runoff and intercepted flow and desired vegetation growth on the road prism and other compacted areas. *(Highly Effective – Where Applicable)*
- Use suitable measures in compliance with local direction to prevent and control invasive species. *(Highly Effective – Where Applicable)*
- Uncompact road bed soils using mechanical means to encourage natural vegetative growth and increase water infiltration. *(Highly Effective – Where Applicable)*

Road-7. Stream Crossings

Objectives: Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when constructing, reconstructing, or maintaining temporary and permanent waterbody crossings.

Practices: Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

All Crossings

- Plan and locate surface water crossings to limit the number and extent to those that are necessary to provide the level of access needed to meet resource management objectives as described in the RMOs. *(Highly Effective – Where Applicable)*

- Use crossing structures suitable for the site conditions, the RMOs and design and locate crossings to minimize disturbance to the waterbody. *(Highly Effective – Where Applicable)*
- Use suitable measures to locate, construct, and decommission or stabilize bypass roads to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources. *(Highly Effective – Where Applicable)*
- Use suitable surface drainage and roadway stabilization measures to disconnect the road from the waterbody to avoid or minimize water and sediment from being channeled into surface waters and to dissipate concentrated flows. *(Highly Effective – Where Applicable)*
- Use suitable measures to avoid, minimize, or mitigate damage to the waterbody and banks when transporting materials across the waterbody. *(Highly Effective – Where Applicable)*

Culverts

- Align the culvert with the natural stream channel and cover culvert with sufficient fill to avoid or minimize damage by traffic; construct at or near natural elevation of the streambed to avoid or minimize potential flooding upstream of the crossing and erosion below the outlet and install culverts long enough to extend beyond the toe of the fill slopes to minimize erosion. *(Highly Effective – Where Applicable)*
- Use suitable measures to avoid or minimize water from seeping around the culvert and to avoid or minimize culvert plugging from transported bedload and debris. *(Highly Effective – Where Applicable)*
- Regularly inspect culverts and clean as necessary. *(Highly Effective – Where Applicable)*

Low-Water Crossings

- Consider low-water crossings on roads with low traffic volume and slow speeds, and where water depth is safe for vehicle travel; consider low-water crossings to cross ephemeral streams, streams with relatively low base flow and shallow water depth or streams with highly variable flows or in areas prone to landslides or debris flows. *(Highly Effective – Where Applicable)*
- Locate low-water crossings where stream banks are low with gentle slopes and channels are not deeply incised and design low-water crossing structures to maintain the function and bedload movement of the natural stream channel; locate unimproved fords in stable reaches with a firm rock or gravel base that has sufficient load-bearing strength for the expected vehicle traffic. *(Highly Effective – Where Applicable)*
    - Construct the low-water crossing to conform to the site, channel shape, and original streambed elevation and to minimize flow restriction, site disturbance, and channel blockage to the extent practicable. *(Highly Effective – Where Applicable)*
    - Use suitable measures to stabilize or harden the streambed and approaches, including the entire bankfull width and sufficient freeboard, where necessary to support the design vehicle traffic; use vented fords with high vent area ratio to maintain stream function and aquatic organism passage. *(Highly Effective – Where Applicable)*
    - Construct the roadway-driving surface with material suitable to resist expected shear stress or lateral forces of water flow at the site. *(Highly Effective – Where Applicable)*
    - Consider using temporary crossings on roads that provide short-term or intermittent access to avoid, minimize, or mitigate erosion, damage to streambed or channel, and flooding. *(Highly Effective – Where Applicable)*
    - Design and install temporary crossings suitable for the expected users, loads, and timing of use and to pass a design storm determined based on local site conditions and requirements. *(Highly Effective – Where Applicable)*

- Install and remove temporary crossing structures in a timely manner as needed to provide access during use periods and minimize risk of washout. *(Highly Effective – Where Applicable)*
- Use suitable measures to stabilize temporary crossings that must remain in place during high runoff seasons; monitor temporary crossings regularly while installed to evaluate condition. *(Highly Effective – Where Applicable)*
- Remove temporary crossings and restore the waterbody profile and substrate when the need for the crossing no longer exists. *(Highly Effective – Where Applicable)*

Road-8. Snow Removal and Storage

Objectives: Avoid or minimize erosion, sedimentation, and chemical pollution that may result from snow removal and storage activities.

Practices: Develop site-specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment.

- Use existing standard contract language (C5.316# or similar) for snow removal during winter logging operations to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources. *(Highly Effective – Entire Sale Area)*
- Move snow in a manner that will avoid or minimize disturbance of or damage to road surfaces and drainage structures. *(Highly Effective – Entire Sale Area)*
- Conduct frequent inspections to ensure road drainage is not adversely affecting soil or water resources. *(Highly Effective – Entire Sale Area)*
- Control areas where snow removal equipment can operate to avoid or minimize damage to riparian areas, floodplains, and stream channels. *(Highly Effective – Entire Sale Area)*
- Install snow berms where such placement will preclude concentration of snowmelt runoff and will serve to dissipate melt water. *(Highly Effective – Entire Sale Area)*
- Provide frequent drainage through snow berms to avoid concentration of snowmelt runoff on fill slopes and other erosive areas, to dissipate melt water, and to avoid or minimize sediment delivery to water bodies. *(Highly Effective – Entire Sale Area)*

Fire and Fuels

Air Quality

- Reduce particulate emissions through utilization to the extent practical by considering biomass removal wherever feasible (*Highly Effective – Entire Sale Area*)

Fire and Fuels

- Reduce and maintain hazardous fuel loadings to levels conducive to low intensity fire behavior. Where hazardous fuels are being treated, retain a percentage of debris and larger dead material for soil protection, establishment of trees, and small mammal habitat. Coordinate with District Resource Specialists and refer to BMPs to determine appropriate thresholds. (*Highly Effective – Entire Sale Area*)

Air Quality

- All prescribed fire operations will adhere to the *Oregon Smoke Management Plan* to manage air quality. (*Highly Effective – Entire Sale Area*)

- Human-caused visual impacts to the Three Sisters Wilderness area, a federally mandated Class I airshed will be restricted during the period of July 1 – September 15 (*Highly Effective – Entire Sale Area*)
- Human-caused visual impacts to the city of Bend, a state of Oregon designated smoke sensitive receptor area, will be avoided. Prescribed burning operations would occur only when winds and atmospheric conditions are conducive to limiting smoke intrusions within city boundaries. (*Highly Effective – Entire Sale Area*)
- 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. *(Moderately Effective – Entire Sale Area)*
- Interested parties will be notified prior to burning season and on the day of planned prescribed burning operations to mitigate potential negative economic effects and health effects to sensitive populations. *((Moderately Effective – Entire Sale Area)*

Prescribed Fire

Conduct the prescribed fire in such a manner as to achieve the burn objectives outlined in the Prescribed Fire Burn Plan. *(Moderately Effective – Entire Sale Area)*

- Use applicable practices of Project Planning and Analysis and Aquatic Management Zone Planning when planning prescribed fire treatments.
- Consider prescription elements and ecosystem objectives at the appropriate watershed scale to determine the optimum and maximum burn unit size, total burn unit size, total burn area, burn intensity, disturbance thresholds for local downstream water resources, area or length of water resources to be affected, and contingency strategies.
    - Consider the extent, severity, and recovery of fire disturbance a watershed has experienced in the past to evaluate cumulative effects and re-entry intervals.
- Identify environmental conditions favorable for achieving desired condition or treatment objectives of the site while minimizing detrimental mechanical and heat disturbance to soil and water considering the following factors. *(Moderately Effective – Entire Sale Area)*
    - Existing and desired conditions for vegetation and fuel type, composition, structure, distribution, and density.
    - Short and long term site objectives.
    - Acceptable fire weather parameters.
    - Desirable soil, duff, and fuel moisture levels.
    - Existing duff and humus depths.
    - Site factors such as slope and soil conditions.
    - Expected fire behavior and burn severity based on past burn experience in vegetation types in the project are
    - Extent and condition of roads, fuel breaks, and other resource activities and values.
- Develop burn objectives that avoid or minimize creating water repellent soil conditions to the extent practicable considering fuel load, fuel and soil moisture levels, fire residence times, and burn intensity. *(Moderately Effective – Entire Sale Area)*
    - Use low-intensity prescribed fire on steep slopes or highly erodible soils when prescribed fire is the only practicable means to achieve project objectives in these areas.
- Set target levels for desired ground cover remaining after burning based on slope, soil type, and risk of soil and hillslope movement. *(Moderately Effective – Entire Sale Area)*
- Plan burn areas to use natural or in-place barriers that reduce or limit fire spread, such as roads, canals, utility rights-of-way, barren or low fuel hazard areas, streams, lakes, or wetland features,

where practicable, to minimize the need for fireline construction. *(Moderately Effective – Entire Sale Area)*
    - Identify the type, width, and location of firebreaks or firelines in the prescribed fire burn plan.
- Use fire initiation techniques, control methods, and access locations for ignition and control (hold versus escape conditions) that minimize potential effects to soil, water quality, and riparian resources. *(Moderately Effective – Entire Sale Area)*
- Use prescribed fire in the Aquatic Management Zone (AMZ) only when suitable to achieve long-term AMZ-desired conditions and management objectives *(Moderately Effective – Entire Sale Area)*
- Locate access and staging areas near the project site but outside of AMZ's, wetlands, and sensitive soil areas. *(Moderately Effective – Entire Sale Area)*
    - Keep staging areas as small as possible while allowing for safe and efficient operations.
    - Store fuel for ignition devices in areas away from surface water bodies and wetlands.
    - Install suitable measures to minimize and control concentrated water flow and sediment from staging areas.
    - Collect and properly dispose of trash and other solid waste.
    - Restore and stabilize staging areas after use (see BMP Veg-6 [Landings]).
- Conduct prescribed fires to minimize the residence time on the soil while meeting the burn objectives. *(Moderately Effective – Entire Sale Area)*
    - Manage fire intensity to maintain target levels of soil temperature and duff and residual vegetation cover within the limits and at locations described in the prescribed fire burn plan.
- Construct fire line to the minimum size and standard necessary to contain the prescribed fire and meet overall project objectives. *(Moderately Effective – Entire Sale Area)*
    - Locate and construct fireline in a manner that minimizes erosion and runoff from directly entering waterbodies by considering site slope and soil conditions, and using and maintaining suitable water and erosion control measures.
    - Consider alternatives to ground-disturbing fireline construction such as using wet lines, rock outcrops, or other suitable features for firelines.
    - Establish permanent fireline with suitable water and erosion control measures in areas where prescribed fire treatments are used on a recurring basis.
    - Maintain firebreaks in a manner that minimizes exposed soil to the extent practicable.
    - Rehabilitate or otherwise stabilize fireline in areas that pose risk to water quality.
- Alter prescribed fire prescriptions and control actions in the AMZs as needed to maintain ecosystem structure, function, and processes and onsite and downstream water quality. *(Moderately Effective – Entire Sale Area)*
    - Pretreat AMZ's and drainage ways to reduce excessive fuel loadings.
    - Avoid building firelines in or around riparian areas, wetlands, marshes, bogs, fens, or other sensitive water-dependent sites unless needed to protect life, property, or wetlands.
    - Construct any essential fireline in the AMZ in a manner that minimizes the amount of area and soil disturbed.
    - Keep high-intensity fire out of the AMZ unless suitable measures are used to avoid or minimize adverse effects to water quality.
    - Avoid or minimize complete removal of the organic layer when burning in riparian areas or wetlands to maintain soil productivity, infiltration capacity, and nutrient retention.
    - Rehabilitate fireline in the AMZ after prescribed fire treatment is complete.
    - Remove debris added to stream channels as a result of the prescribed burning unless debris is prescribed to improve fisheries habitat.

- Conduct prescribed fire treatments, including pile burning, for slash disposal in a manner that encourages efficient burning to minimize soil impacts while achieving treatment objectives. *(Moderately Effective – Entire Sale Area)*
    - Pile and burn only the slash that is necessary to be disposed of to achieve treatment objectives.
    - Locate slash piles in areas where the potential for soil effects is lessened (meadows, rock outcrops, etc.) and that do not interfere with natural drainage patterns.
    - Remove wood products such as firewood or fence posts before piling and burning to reduce the amount of slash to be burned.
    - Minimize the amount of dirt or other noncombustible material in slash piles to promote efficient burning.
    - Construct piles in such a manner as to promote efficient burning
    - Avoid burning large stumps and sections of logs in slash piles to reduce the amount of time that the pile burns.
    - Avoid burning when conditions will cause the fire to burn too hot and damage soil conditions.
    - Avoid piling and burning for slash removal in AMZs to the extent practicable.
    - Minimize effects on soil, water quality, and riparian resources by appropriately planning pile size, fuel piece size limits, spacing, and burn prescriptions in compliance with State or local laws and regulations if no practical alternatives for slash disposal in the AMZ are available.
- Evaluate the completed burn to identify sites that may need stabilization treatments or monitoring to minimize soil and site productivity loss and deterioration of water quality both on and off the site. *(Moderately Effective – Entire Sale Area)*
    - Provide for rapid revegetation of all denuded areas through natural processes supplemented by artificial revegetation where necessary.
    - Use suitable measures to promote water retention and infiltration or to augment soil cover where necessary.
    - Use suitable species and establish techniques to stabilize the site in compliance with local direction and requirements per FSM 2070 and FSM 2080 for vegetation ecology and prevention control of invasive species.
    - Clear streams and ditches of debris introduced by fire control equipment during the prescribed fire operation.
    - Consider long-term management of the site and nearby areas to promote project success.
    - Use suitable measures to limit human, vehicle, and livestock access to site as needed to allow for recovery of vegetation.

Mechanical Mowing and Mastication

Develop site specific BMP prescriptions for the following practices, as appropriate or when required, using State BMPs, Forest Service regional guidance, land management plan direction, BMP monitoring information, and professional judgment. *(Moderately Effective – Entire Sale Area)*

- Evaluate multiple site factors, including soil conditions, slope, topography, and weather, to prescribe the most suitable mechanical treatment and equipment to avoid or minimize unacceptable impacts to soil while achieving treatment objectives.
    - Consider the condition of the material and the site resulting from the treatment in comparison to desired conditions, goals, and objectives for the site when analyzing treatment options (e.g., a mastication treatment will result in a very different condition than a grapple pile and burn treatment).

  - Use land management plan direction, or other local guidance, to establish residual ground cover requirements and soil disturbance limits suitable to the site to minimize erosion.
  - Consider offsite use options for the biomass material to reduce onsite treatment and disposal.
- Use applicable practices of BMP Veg-3 (Aquatic Management Zones) when conducting mechanical treatments in the AMZ. *(Moderately Effective – Entire Sale Area)*
- Use applicable practices of BMP Veg-2 (Erosion Prevention and Control) to minimize and control erosion. *(Moderately Effective – Entire Sale Area)*
  - Conduct mechanical activities when soil conditions are such that unacceptable soil disturbance, compaction, displacement, and erosion would be avoided or minimized.
  - Consider using low ground-pressure equipment to minimize soil disturbance.
- Operate mechanical equipment so that furrows and soil indentations are aligned on the contour. *(Moderately Effective – Entire Sale Area)*
- Scarify the soil only to the extent necessary to meet reforestation objectives. *(Moderately Effective – Entire Sale Area)*
  - Use site-preparation equipment that produces irregular surfaces.
  - Avoid or minimize damage to surface soil horizons to the extent practicable.
- Conduct machine piling of slash in such a manner to leave topsoil in place and to avoid displacing soil into piles. *(Moderately Effective – Entire Sale Area)*
- Re-establish vegetation as quickly as possible. *(Moderately Effective – Entire Sale Area)*
  - Evaluate the need for active and natural revegetation of exposed and disturbed sites.
  - Use suitable species and establish techniques to revegetate the site in compliance with local direction and requirements per FSM2070 and FSM 2080 for vegetation ecology and prevention and control of invasive species.

COMPARISON OF ALTERNATIVES

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. Table 13 provides a summary of project effects by resource area.

Table 13 Comparison of the alternatives

Resource	Alternative 1	Alternative 2	Alternative 3
Timber Volume			
	No timber volume would be produced	6.6 MMBF 20,371 CCF	6.3 MMBF 19,274 CCF
Employment			
	No jobs would be created	64 jobs	60 jobs
Total Revenue			
	No revenue would be generated	$212,297	$79,386
Soils			
Identifying Soils that can Sustain Management. Objectives	No management actions would take place	Incorporates inherent soil capability into project design	Incorporates inherent soil capability into project design
Soils Disturbance	No management actions would take place. Natural erosional	Harvest operations would meet the Regional Standards for Acceptable	Same as Alternative 2.

Resource	Alternative 1	Alternative 2	Alternative 3
	processes are expected to continue	Soil Condition Soils	
Probable Success in Project Design and Implementation	No management actions would take place	BMPs/PDCs/Resource Protection Measures would avoid or minimize potential adverse impacts to the soil resource	Same as Alternative 2
Hydrology			
Streamflow	No management actions would take place	0 acres impacted in Riparian Reserves; 0 acres impacted in hydrologically connected areas. 14 miles of road closed and decommissioned	Same as Alternative 2
Sedimentation	No management actions would take place	0 acres impacted in Riparian Reserves; 0 acres impacted in hydrologically connected areas. 14 miles of road closed and decommissioned	Same as Alternative 2
Water Temperature	No management actions would take place	No effect on 303(d) listed streams. 0 acres impacted in Riparian Reserves	Same as Alternative 2
Waterbody Condition	No management actions would take place	0 acres impacted in floodplain; 0 acres harvested in Riparian Reserves; 0 acres alteration of stream/lake bank	Same as Alternative 2
Fisheries			
Columbia River Bull Trout	No management actions would take place	No effect	Same as Alternative 2
Bull Trout Critical Habitat	No management actions would take place	No effect	Same as Alternative 2
Interior Redband Trout	No management actions would take place	No Impact	Same as Alternative 2
Aquatic Conservation Strategy (ACS)	No management actions would take place	Complies with the ACS	Same as Alternative 2
Wildlife and Wildlife Survey and Manage Species			
Gray Wolf	No management actions would take place	No effect	Same as Alternative 2
Wolverine	No management actions would take place	No effect	Same as Alternative 2
Pacific Fischer	No management actions would take place	No effect	Same as Alternative 2
Northern Spotted Owl	No management actions would take place	No Effect	Same as Alternative 2
Northern Spotted Owl Critical Habitat	No management actions would take place	May effect but not likely to adversely effect	Same as Alternative 2
Great Gray Owl	No management actions would take place	No habitat in project area	Same as Alternative 2

Resource	Alternative 1	Alternative 2	Alternative 3
Oregon Spotted Frog	No management actions would take place	No effect	Same as Alternative 2
Oregon Spotted Frog Critical Habitat	No management actions would take place	No effect	Same as Alternative 2
Townsend's big-eared bat	No management actions would take place	No impact	Same as Alternative 2
Fringed and pallid bat	No management actions would take place	May impact but will not lead to a trend towards federal listing	Same as Alternative 2
White-headed woodpecker and Lewis' woodpecker	No management actions would take place	May impact but will not lead to a trend towards federal listing	Same as Alternative 2
Western bumblebee and Johnsons hairstreak	No management actions would take place	May impact but will not lead to a trend towards federal listing	Same as Alternative 2
Silver-bordered fritillary, Crater Lake tightcoil, Evening fieldslug, Columbia spotted frog, American peregrine falcon, bald eagle, greater sage grouse, bufflehead, northern water thrush, harlequin duck, horned grebe, tricolor blackbird, yellow rail, and tule white-fronted goose	No management actions would take place	No impact	Same as Alternative 2
Snags	No management actions would take place	Consistent with the Forest Plan; Deschutes Wildlife Tree and Snag Strategy; and Northwest Forest Plan. <1% reduction in overall snag habitat within the Whychus and Deep Creeks watersheds	Same as Alternative 2
Silviculture			
Stand Structure and Species Composition	Stand structure remains at high risk to stand replacement fires. Species composition remains high in fire intolerant trees species	Thinning and fuels treatments would moves stands towards the reference condition. The presence of early seral species (ponderosa pine) in improved on the number of acres treated	Same as Alternative 2
Stand Density	Density remains high and will increase over the next 30 years. Large pines would decrease across the area due to competition, mistletoe, and bark beetles	Thinning reduces the area above the upper management zone from 88% to 44% and improves forest health vis-à-vis insects and disease	Thinning reduces the area above the upper management zone from 88% to 48% and improves forest health vis-à-vis insects and disease

Resource	Alternative 1	Alternative 2	Alternative 3
Insects and Disease	88% of the area is above the upper management zone. Mortality from insects and disease are expected to increase	Stands are moved closer to the reference condition and improves tree resilience to bark beetle and dwarf mistletoe	Same as Alternative 2
Fire			
Fire Hazard	No management actions would take place: 45% of project area is rated high	With treatments: 7% of the project area is rated high	With treatments: 8% of the project area is rated high
PM Production	Wildfire Conditions: 6,204 tons of PM 2.5; 7,320 tons of PM10	Prescribed Fire Conditions: 2,868 tons of PM 2.5; 3,385 tons of PM 10	Same as Alternative 2
Botany			
Sensitive Plant Species	No known populations or potential habitat in the project area. No management actions would take place	No effect	Same as Alternative 2
Survey and Manage Species	No known populations or habitat in the project area. No management actions would take place	No effect. Pechman exemptions *a* and *d* are required	Same as Alternative 2
Invasive Plants	No management actions would take place	Risk is moderate for introduction or spread. Mitigation measures are required	Same as Alternative 2
Recreation			
Recreation use and Special Use Permit (SUP) Authorizations	No change in level of recreation use or SUPs. Greatest threat from wildfires	Some short-term effects to Sno-Parks, winter trails, and dispersed recreation use	Same as Alternative 2
Scenic Resources			
Scenic Views	No management actions would take place	Two site specific amendments the Forest Plan are necessary to meet the purpose and need for the project	Same as Alternative 2
Heritage			
Cultural Resources Sites	No management actions would take place	No effect. All known sites would be avoided during harvest operations	Same as Alternative 2
Potential Wilderness Areas			
PWA Polygon Inventory	No management actions would take place. About 7,395 acres of PWA are located in the *analysis area*	16 acres that meet the FSH 1909.12 Chapter 71 evaluation criteria would be affected by timber harvest	Same as Alternative 2
Citizen Unroaded Areas			
Oregon Wild GIS Inventory	No management actions would take place	46 acres would be affected by timber	Same as Alternative 2

Resource	Alternative 1	Alternative 2	Alternative 3
		harvest.	
Inventoried Roadless Areas			
Inventoried Roadless Areas Inventory	No management actions would take place	No IRA acres would be affected by timber harvest.	Same as Alternative 2
Climate Change			
Global Scale	No management actions would take place	Effects would be negligible; effects on greenhouse gases and climate change would be negligible.	Same as Alternative 2
Transportation			
Road Decommissioning	No roads would be decommissioned	7.71 miles would be decommissioned	Same as Alternative 2
Road Closures	No roads would be closed	5.58 miles would be closed	Same as Alternative 2
Temporary Road Construction	No temporary roads would be constructed	0.80 miles of temporary roads would be constructed	No temporary roads would be constructed

CHAPTER 3 ENVIRONMENTAL CONSEQUENCES

This section summarizes the physical, biological, social and economic environments of the affected project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in the chart above. The information presented in this chapter cites the specialist's reports found in the project analysis file (40 CFR 1502.21). The specialist's reports are incorporated by reference and are available at the Sisters Ranger District office, Sisters, Oregon.

CUMULATIVE EFFECTS OF PAST, PRESENT AND REASONABLY FORESEEABLE ACTIONS

The project IDT identified past, present, and reasonably foreseeable action that might have cumulative impacts with the proposed action early in the analysis process. These actions are listed in the table below. Each resource area considered different mixes of these actions, depending on the cumulative effects boundary for the resource area and the resources affected. Only those past, present and reasonably future foreseeable actions are considered, and only if those action are expected to have environmental effects that accumulate with the other project effects.

Table 14, Table 15 and Table 16 are merely a listing of past, present, and future foreseeable actions that have the potential to overlap the project area. Because a project appears in this table it does not necessarily mean it has an additive effect because it may not be applicable for all resources. If there is a past, present, or foreseeable effect, it is disclosed in the individual resource area in the environmental consequences section of this environmental assessment.

Table 14 Past actions and events that have contributed to the current conditions on the project area

Type of Action	General Description	Status/Timing
Past Vegetation and Fuels Management		
Numerous Timber Sales and Thinning	Many regeneration harvest (clear-cuts) and shelterwood cuttings and overstory removal of large trees. Management by thinning has dominated since the mid-1990s	1930s to present
Prescribed Fire	Associated with vegetation management projects as a fuels reduction treatment	Since 1990's
Fire Suppression	Suppression of fire starts from lightning and human caused fires (average 15 starts/year in the project area)	1910- to present
Pole Creek Fire Timber Salvage	About 962 acres of the 26,119 acre fire were salvaged for timber products. Sisters Ranger District	Ongoing. Decision signed November 19, 2013. Sale is completed.
Wildfires		
Pole Creek	26,119 acres	2012
Grazing		
Whychus (Squaw) Creek Cattle and Horse Allotment	A 25,050 acre allotment. Closed in the mid-1980s; formally closed in 2009	1920's to 1980s
Road Construction		
Road Network on National Forest System Lands	53 miles of road construction within the project area	Generally completed by the 1970's
Recreation Developments		
Upper Three Creeks Sno-Park	Used by skiers and snowmobiles and special uses	Created in the 1990s
Winter Trails	10.55 miles of groomed snowmobile and cross-country trails	Created in the 1990s
Dispersed Recreation Sites	No inventoried dispersed sites are located in the project area	Managed since 2004
Specials Uses		
Permits	Occasional use of trails, outfitters, recreation events, and group events	Permits currently within project area
Watershed Restoration		
Forest Road 16 Culvert replacement	A culvert was replaced adjacent to the Upper Sno-Park	Completed June 2014

Table 15 Ongoing or reasonably future foreseeable action in the project area and Deep Creek and Whychus 5th field watersheds

Type of Action	General Description	Status/Timing
Vegetation Management		
Timber sales- Orion KH Nova Quasar	Associated with the Sisters Area Fuels Reduction (SAFR) Project; thinning, mastication, and prescribed burning. About 2,955 acres are proposed for treatment. Sisters Ranger District	Ongoing. Decision signed November 29, 2008
Pole Creek Fire Danger Tree Abatement	Danger trees were felled along about 42 miles of roads in the Pole Creek fire area. Some trees were recovered as timber products. Sisters Ranger District	Ongoing. November 19, 2013
Pole Creek Fire Reforestation	About 6,000 acres would be reforested in the fire area over a five-year period	Ongoing. Decision signed December 16, 2012
Pole Creek Firewood Cutting	79 acre commercial firewood cutting area. Sisters Ranger District	Ongoing
Three Creeks Firewood Cutting	Public firewood cutting along Forest Road 16. Sisters Ranger District	Ongoing
Ursus	Thinning, mastication, and prescribed fire. About 5,900 acres are proposed for treatment. Located on the Bend-Ft. Rock Ranger District	Reasonably foreseeable
Bear Wallow Mastication	Mastication of downed fuels along portions of Forest Roads 4601 and 4602. About 11 miles of road are proposed for treatment. Located on the Bend-Ft. Rock Ranger District	Reasonably foreseeable. Decision not yet signed
BMW Fuel Break	Hazardous fuels reduction along 12 miles of Forest Road 370. Located on the Bend-Ft. Rock Ranger District	Reasonably foreseeable
Travel Management		
Travel Management Rule	Motorized travel on public lands is restricted to designated routes	Ongoing
Road Maintenance	*Whychus Creek Watershed*: Forest Service Roads: 670 miles State Roads: 30 miles County Roads: 29 miles *Deep Creek Watershed* Forest Service Roads: 197 miles State Roads: 10 miles County Roads: < 1 mile	Ongoing
Recreation Management		
Sno-Parks	Two Sno-parks	Maintenance is ongoing
Campgrounds	No developed campgrounds are located in the project area	Not applicable
Trails	Snowmobile: 9.53 miles Nordic Skiing: 4.05 miles	Maintenance is ongoing
Trailheads	None	Not applicable
Invasive Plant Control		
Deschutes and Ochoco NF Invasive Plant EIS	Would allow treatment of existing invasive plant sites and use the	Ongoing

	Rapid Detection Early Response method for new weed sites	
Special Uses		
Three Sisters Backcountry	Outfitter/Guide.	Ongoing
Snow Creek Irrigation Ditch	Ditch still exists but no longer in use. No valid water rights on file	
Watershed Restoration		
Three Creeks Dam Maintenance	The dams at Three Creeks and Little Three Creeks Lake would be maintained. Sisters Ranger District	Reasonably foreseeable

Table 16 Past wildfire occurrence by decade in the Deep Creek and Whychus Creek 5th field watersheds

Decade	Acres
1900-1909	66
1910-1919	468
1920-1929	0
1930-1939	22
1940-1949	1,270
1950-1959	833
1960-1969	657
1970-1979	453
1980-1989	110
1990-1999	4,950
2000-2009	12,883
2010-2012	33,289 (includes the 2012 Pole Creek fire)

EFFECTS ANALYSIS FOR THE MELVIN BUTTE VEGETATION MANAGEMENT PROJECT

The effects analysis section is organized by resource area.

SOILS

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Soils specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

The formation of different soil types are a result of five dominant, soil-forming processes, including climatic influences, soil and surface organisms, local topography/geomorphology, geology/parent materials, and time for soil development (Jenny 1941). The resulting soil characteristics uniquely integrate these local environmental influences and reflect the soil's inherent capacity for performing a variety of soil functions. These inherent soil qualities normally are not significantly altered by management activities and thus can be mapped and described in soil resource inventories. An understanding of the different inherent soil qualities, or soil potentials within a planning area, can be used to match different resource objectives to soils that have a high potential for achieving and sustaining those

objectives over time. This in turn assures that management actions and the desired vegetation responses are both achievable and sustainable over time.

Dynamic soil quality, on the other hand, reflects how the soils functional capacity may be altered in response to natural or human caused disturbances (Seybold et al. 1999). Unlike inherent soil attributes, the dynamic characteristics of the soil are more vulnerable to changes from management actions that disturb soils. The long term sustainability of forest ecosystems depends on the maintenance of soil productivity and soils proper hydrologic functioning. Ground disturbing management activities that result from timber harvest and the treatment of fuels can directly affect soil properties, and may adversely change the natural functioning capacity of soils and their potential responses to use and management.

This analysis focuses on both inherent soil potentials as they relate to management objectives identified in the Melvin Butte project file and dynamic soil changes that have the potential to result in undesirable changes in key soil functions following vegetation management operations.

Issue Statement

Different soils vary in their inherent capacity for performing a variety of soil functions. Identification of the different inherent qualities of different soils within the Melvin Butte planning area can be used to help assure that planed management actions such as different stocking densities and amounts of retention are matched to soils that have a high potential for achieving the desired ecosystem functions (Issue Measure 1).

Issue Measure:

1. Recognition of the inherent soil qualities of different soil types and the ability to match different resource objectives such as stocking density prescriptions, amount of wildlife retention area, and prescribed fuel treatment prescriptions to soils that have a high potential for achieving and sustaining those objectives over time.

Issue Statement: The proposed use of ground based harvest equipment can potentially increase the amount and distribution of soil disturbance within individual activity areas proposed for vegetation treatments. The resulting soil disturbance from ground-based equipment operations and prescribed fire in activity areas may have the potential to negatively affect key soil functions (Issue Measure 2 and 3).

Issue Measures:

2. Change in degree, extent, distribution and duration of soil disturbance following proposed timber harvest and fuel treatments within individual activity areas proposed for mechanical treatments and assessment of effects of those disturbances on key soil functions.

3. The probable success in project design, implementation of management requirements, and mitigation measures that would be applied to minimize adverse impacts that may alter the soils ability to function in a desirable manner.

Regulatory Framework / Management Direction

Deschutes Land and Resource Management Plan

The Deschutes Land and Resource Management Plan (LRMP) specifies that management activities are prescribed to promote maintenance or enhancement of soil productivity potential following land management activities (US Forest Service LRMP, 1990 page 4-70, SL-1 and SL-3). Forest-wide

standards and guidelines ensure that soils are managed to provide sustained yields of managed vegetation without impairment of the productivity of the land.

LRMP Standard and Guideline (SL-4) directs the use of rehabilitation measures when the cumulative impacts of management activities are expected to cause damage exceeding soil quality standards and guidelines on more than 20 percent of an activity area. LRMP Standard and Guideline (SL-5) limits the use of mechanical equipment in sensitive soil areas such as slopes greater than 30 percent. Operations would also be restricted to existing logging facilities (i.e., skid trails, landings) and roads whenever feasible.

Regional Soil Quality Standards and Guidelines

In addition to the LRMP Standards and Guidelines, the Pacific Northwest Region developed Regional Soil Quality Standards and Guidelines that limit detrimental soil disturbances associated with management activities (FSM 2520, R6 Supplement No. 2500-98-1). This Regional guidance supplements LRMP Standards and Guidelines and is designed to further protect or maintain soil productivity.

US Forest Service, Region 6, Regional Soil Quality Standards

When initiating new activities:

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

Detrimental soil impacts are defined as those that meet the criteria described in the Soil Quality Standards listed below.

- Detrimental Soil Compaction in volcanic ash/pumice soils is an increase in soil bulk density of 20 percent, or more, over the undisturbed level.
- Detrimental Soil Puddling occurs when the depth of ruts or imprints is six inches or more.
- Detrimental Soil Displacement is the removal of more than 50 percent of the A horizon from an area greater than 100 square feet, which is at least 5 feet in width.
- Severely Burned Soils are considered to be detrimentally disturbed when the mineral soil surface has been significantly changed in color, oxidized to a reddish color, and the next one half inch blackened from organic matter charring by heat conducted through the top layer.

The Regional supplement to the Forest Service Manual (FSM 2520, R6 Supplement No. 2500-98-1) also provides policy for planning and implementing management practices which maintain or improve soil quality. This Regional guidance is consistent with interpretations for LRMP Standards and Guidelines SL-3 and SL-4 that limit the extent of detrimental soil conditions within activity areas.

Analysis Methods

Method of analysis

Field observations and measurements of existing soil conditions within activity areas proposed for timber harvest and fuel treatments under this project were conducted during the fall field season of 2013.

Temporal scope of the analysis

The temporal scope of the analysis defines short term effects as being changes to soil properties that would generally revert to pre-existing conditions within 5 years or less. The analysis also considers the effectiveness and probable success of implementing project design criteria, mitigation measures, and Best Management Practices (BMPs) that are designed to avoid, minimize or reduce potentially adverse impacts to soil productivity.

Rational for geographic area of analysis

An activity area is defined as "the total area of ground impacted activity and its feasible unit for sampling and evaluating" (FSM 2520, R6 Supplement No. 2500-98-1 and Deschutes NF LRMP, page 4-71). For this analysis, activity area boundaries are considered to be the smallest identified area where the potential effects of different management practices would occur. Where appropriate and relevant, the effects discussion is expanded to the planning area to provide additional context and intensity.

Information sources used to support analysis

Quantitative analysis, literature reviews, and professional judgment were used to evaluate the issue measures by comparing existing conditions to the anticipated conditions that would result from implementing the proposed actions.

Measure #1: Identifying soils that have a high potential for achieving and sustaining different management objectives

Existing Condition

Soil types within the planning area are described and mapped in the Deschutes National Forest Soil Resource Inventory (Larsen 1976). A variety of different soils and landscapes occur within the planning area. These include limited areas of cinder cone buttes (SRI soil map units 80, 81, and 83). These buttes consist of very deep soils that developed in volcanic ash over cinder or fractured rock and occur on steep slopes (greater than 40%). The relatively high site productivity of these areas along with aspect changes result in a variety of vegetation types and different habitat potentials that are of limited extent in the planning area.

The remainder of the planning area consists of well drained soils derived from a moderately thick layer of volcanic ash over glacial till or bedrock. Surface soils are typically loamy sands, and subsoil's are cobbly to boulder sandy loams. A compact zone of glacial till is often encountered at a depth of 40 to 60 inches. These soils support a vegetation component of conifers including primarily white fir, ponderosa pine, and lodgepole pine. Understory shrubs and groundcover include snowbrush, manzanita, currant, snowberry, Oregon grape, sedges, pinegrass, and a variety of forbs (Figure 7).

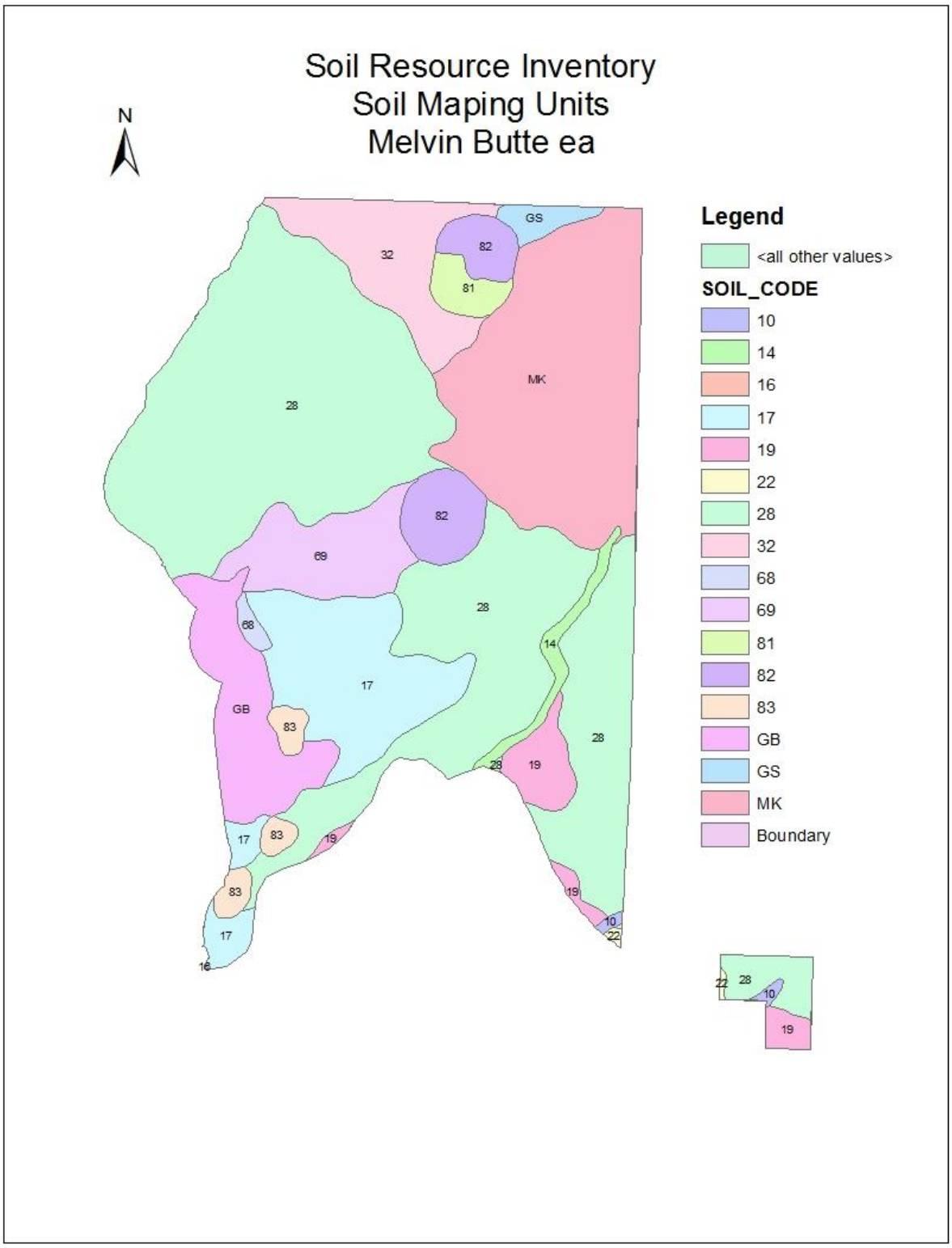


Figure 7 Soil types in the Melvin Butte planning referenced in the Deschutes National Forest soil resource inventory (Larsen 1976)

In areas of ponderosa pine and mixed conifer species site productivity is estimated at a cubic foot Site Class 4 to 5 (50 to 120 cubic foot/year) mean annual increment, and a Site Index of 70 to 100 for ponderosa pine (Larsen 1976; Barrett 1978). In these dry east side forest types, water is the most limiting site factor limiting site productivity and site index (Larsen 1976). Figure 8 shows the increase in site index as a function of precipitation for several SRI soil types in the planning area. Site productivity also generally increases with elevation due to increasing precipitation (Larsen 1976).

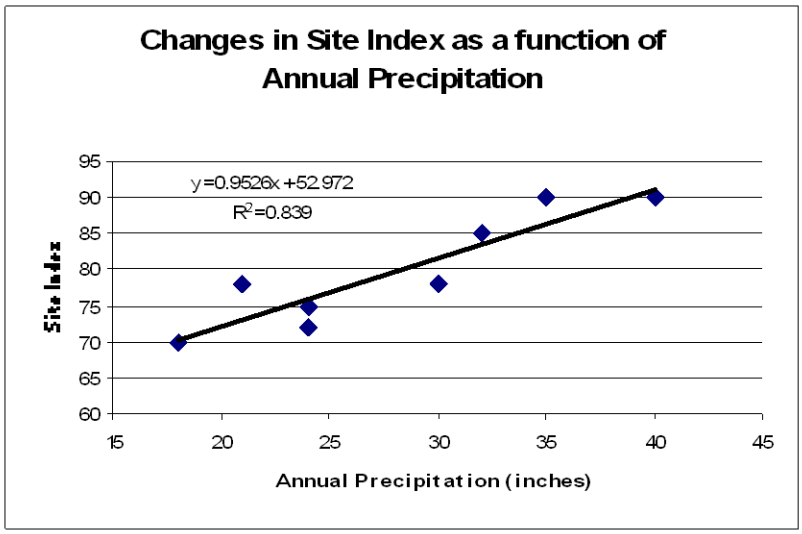


Figure 8 The relationship between mean annual precipitation and site index for selected SRI soil mapping units within the Melvin Butte planning area (Larsen 1976)

Lower Site Index Ponderosa pine Vegetation Potentials

Lower site index ponderosa pine soils include SRI soil map units 32,69, GS, MK, and 68 (Figure 9). These soils have a lower site index compared to other ponderosa pine soils in the planning area due to both lower precipitation in these areas and a lower soil water holding capacity of these soils. Soil mapping unit 32 is underlain by glacial till while soil units 69, GS, MK, and 68 are underlain by basalt bedrock. Areas with basalt bedrock have a highly variable in soil depths ranging from shallow to very deep. This variability in soil depth also has a strong influence on the pattern of tree clumps and gaps in these areas.

Higher Site Index Ponderosa pine Vegetation Potentials

SRI soil mapping unit 28 supports both ponderosa pine and mixed conifer vegetation types. These soils have a high site index due to a higher soil water holding capacity compared to other soils supporting ponderosa pine in the planning area. Productivity of areas of soil mapping unit 28 are also influenced by the increase in mean annual precipitation from north to south within the planning area. Higher precipitation in the southern portion of the planning area results in a higher productivity of soil type 28 compared to areas of soil type 28 in the northern portion of the planning area (Figure 9).

Frost Pocket Lodgepole pine Vegetation Potentials

SRI soil mapping units 17, 19, and GB occur in lower landscape positions compared to adjacent areas creating frost pockets that support lodgepole pine vegetation (Figure 9). Productivity is estimated to be a site index of 30 to 40 for lodgepole pine. Much of this area has been used for firewood cutting areas over the past couple of decades.

Applications to Project Planning

The different inherent soil productivities identified above were used to help in the design of the wildlife retention strategy for Melvin Butte planning area. This retention strategy is based upon increasing the amount of retention as site productivity increases. The planning strategy identifies ten percent retention in areas of lower ponderosa pine site index, fifteen percent retention in areas of high site index ponderosa pine, and 20 percent retention in areas of high site index ponderosa pine that also have higher precipitation.

During the project implementation phase silviculture prescriptions in treated areas and the resulting tree densities may also be adjusted slightly to reflect the above differences in inherent soil and site productivity.

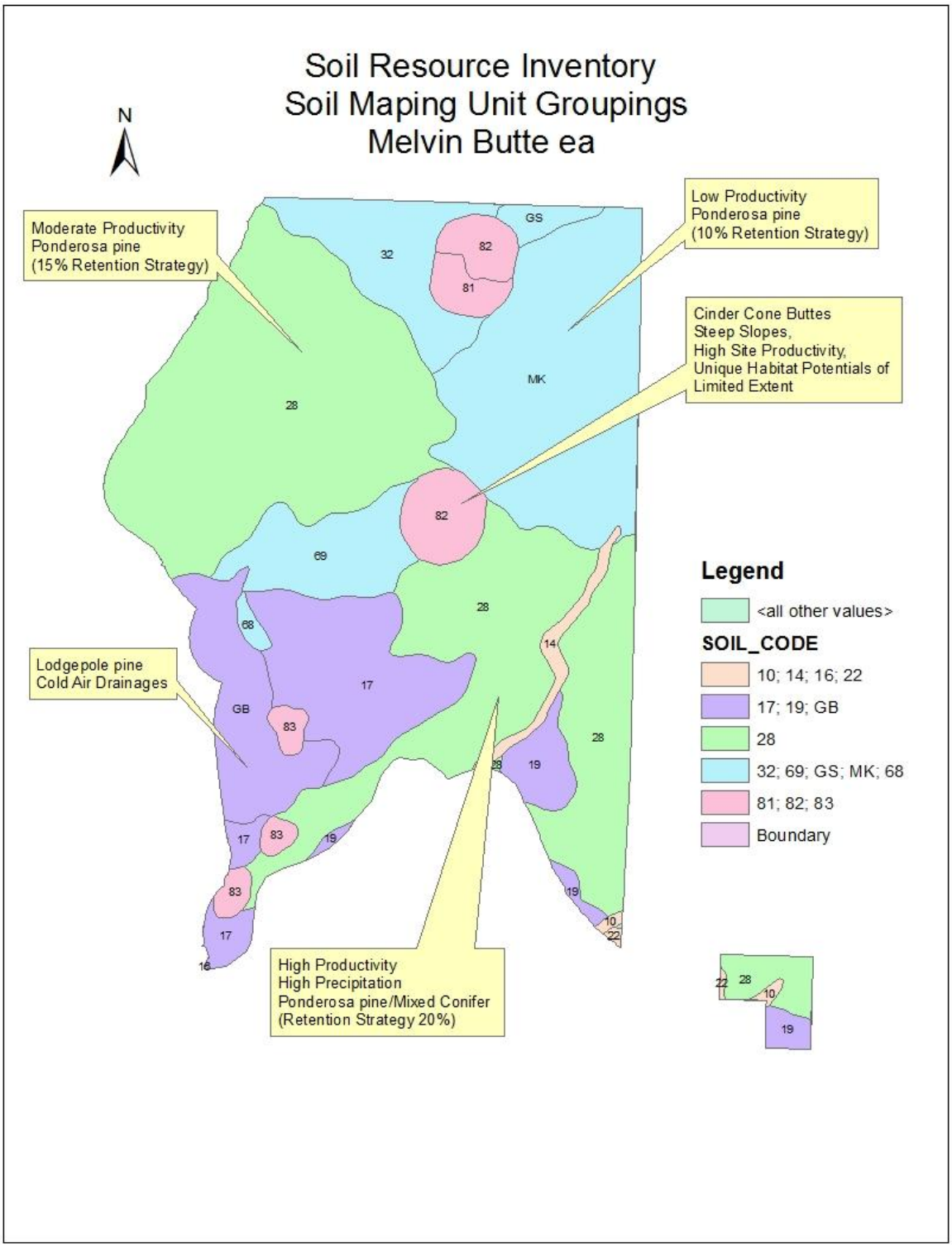


Figure 9 Deschutes National Forest soil resource inventory soil mapping unit groupings indicting differnt vegetation types and the wildlife retention strategy based on site carrying capacity (Larsen 1976)

Measure #2: Soil Disturbance

Existing Condition

The current condition of soils in the Melvin Butte planning are directly related to soil porosity, soil strength, and the quantity and quality of surface organic matter within the project area (Powers and Avery 1995). Ground-disturbing management activities (i.e., timber harvest, road building, recreation use and livestock grazing) have all caused some adverse changes to soil quality in previously managed areas, especially where mechanical disturbances removed vegetative cover, displaced organic surface layers, or compacted soils. The following measures were used to evaluate the existing and predicted amounts of detrimental soil conditions for each individual activity area planned for treatment.

Alternative 1 Ecological Trends

Natural Events: There is currently no evidence of detrimental soil conditions from natural disturbance events within the Melvin Butte planning area. In 2012 the Pole Creek fire burned adjacent to the Melvin Butte planning area; however, no recent large wildfires have occurred within the planning area. Although fires have occurred in the planning area in the past enough time has passed since their occurrence that existing vegetation and forest litter are providing adequate source of ground cover to protect mineral soil from water and wind erosion. There are no recent natural or management related landslides within the planning area. Therefore, natural soil disturbances were not included as existing sources of detrimental soil conditions within any of the activity areas proposed for this project.

Management Related Soil Disturbances: The degree, extent, distribution and duration of soil disturbance can vary with the size and type of equipment used for forest vegetation management, the volume and type of material being removed, frequency of entries, soil type and the soil conditions when the activity takes place (Froehlich 1976, Adams and Froehlich 1981, Gent et al. 1984, Snider and Miller 1985, Clayton et al. 1987, Miller et al. 1986, Page-Dumroese 1993). Soil monitoring on local land types and similar soils have shown that typically around 15 to 20 percent of an activity area can be detrimentally disturbed by ground-based harvest systems (Craigg, 2000).

The primary sources of existing detrimental soil conditions are associated with the transportation systems used for timber harvest and yarding activities. Temporary roads, log landings, and the primary skid trails that were constructed and used to access individual harvest units of past timber sales. Most project related impacts to soils occurred on and adjacent to these heavy use areas. Mechanical disturbances include the removal of vegetative cover, displacement of organic surface soils, or compaction of the soil. Research studies and local soil monitoring have shown that soil compaction and soil displacement account for the majority of detrimental soil conditions resulting from ground based logging operations (Page-Dumroese 1993, Geist 1989, Powers 1999).

While prescribed burning does remove some of the surface organic matter, this process is a natural part of these ecosystems that historically experienced low intensity fire (Busse et al. 2014). These types of treatments also help to reduce the risk of impacts to the soil resource that can result from a high intensity uncharacteristic fire that could occur as a result of lack of active management.

Important Interactions

Harvest Operations: The proposed management activities include commercial and non-commercial harvest of forest stands combined with fuel reduction treatments to reduce stand densities and hazardous fuels. Types of mechanical harvest equipment used in thinning operations vary with the different logging companies doing the work and by the types of materials being removed. Thinning would include predominately trees in the smaller diameter classes. This may be accomplished manually using chainsaws or with the use of specialized low ground pressure machinery. Low ground presser machinery

would only be allowed to make a limited number of equipment passes to transport material to roads or landings. In many cases created logging slash will be utilized as a source of biomass. In other cases created logging slash will be piled and burned. Management activities also include mechanical shrub and small tree treatments (mowing or mastication) and the use of prescribed fire to reduce fuel loadings and treat the shrub layer.

There would be no new construction of roads that would remain as classified system roads. Estimated distances of temporarily roads needed to allow access to some of the activity areas proposed for mechanical vegetation treatments are listed under the proposed action. Many of these spur roads would consist of reopening short segments (100-10,000 feet) of old access roads from previous entries. These roads would be closed and in some cases may be obliterated upon completion of the vegetation management activities.

The effects of ground based logging disturbances on soil productivity vary based on the soil type, types of silvicultural treatments, and the resulting amounts of ground disturbance. The cumulative amount of soil impacts also depends on the existing conditions prior to entry, the ability to reuse previously established landings and skid trail systems, types of equipment, amount of material removed from treatment areas, operator experience, and contract administration. Soil productivity monitoring on the forest has shown that detrimental soil conditions increase each time a stand is treated with mechanical equipment. Even with careful planning and implementation of project activities, the extent of soil disturbance has been shown to increase by 5 to 10 percent with each successive entry into a stand (Craigg, 2000).

Soil condition assessments for similar soils and types of harvest equipment, research references, local monitoring reports, planning area field surveys, and observation were used to predict the potential extent of detrimental soil disturbance associated with this project proposal (Craigg 2000; Craigg 2007). Estimates for predicted amounts of detrimental soil conditions account for the expected amount of volume removal, the type of logging equipment, the spacing of skid trails, and the number of log landings that would be needed to deck accumulated materials.

<u>Fuel Reduction Activities:</u> A combination of treatments including thinning trees from below, mechanical treatment of slash resulting from tree thinning operations, mechanical treatment of small trees and brush, biomass utilization, and prescribed burning would be used to reduce the fuel loading in the planning area.

Much of the slash generated from commercial harvest will be utilized for biomass. Common practices for removing biomass from harvest units include whole tree yarding and processing materials at the landing, and the removal of generated slash on forwarder trailers when harvester processers are used. If slash is not utilized for biomass it may be hand piled or machine piled and burned on log landings and/or main harvester trails. Machine piling on temporary roads or main harvest trails would not be expected to result in additional detrimental soil disturbance because equipment would operate on existing skid trails and landings.

Mechanical treatment of brush and small trees (mowing and mastication) is not expected to cause detrimental soil disturbances. The primary factors limiting soil compaction are the low ground pressure of the tractor and mowing heads, the limited amount of traffic (one equipment pass), and the cushioning effect of materials being treated. These types of activities have been monitored in the past, and results show that increases in soil displacement and soil compaction do not meet the criteria for detrimental soil conditions (Soil Monitoring Report, 1997).

Prescribed fire would be used to reduce fuel accumulations in some of the activity areas proposed for mechanical harvest and non-commercial thinning as well as other activity areas where prescribed burning would be used exclusively to treat the shrub layer and reduce natural fuels. Prescribed burning activities are conducted at times and under conditions that maximize benefits while reducing the risk of resource

damage (Busse et al. 2014). The degree of soil heating depends upon fuel type (grass, brush, trees), fuel density, nature of the litter and duff layers (thickness, moisture content), and burn conditions at the time of ignition. For the treatment areas proposed with this project, natural fuel accumulations consist mainly of fine fuels (i.e., decadent brush, tree branches, and needle cast litter) that typically do not burn for long duration and cause excessive soil heating. Therefore, it is expected that there would be no detrimental changes in soil properties from prescribed burning activities in timber stands because soil moisture guidelines would be included in burn plans to minimize the risk for intense ground-level heating.

Prescribed burn plans would comply with all applicable LRMP standards and guidelines and Best Management Practices (BMP's) prior to initiation of burn treatments. Soil heating during spring burns would be negligible because higher moisture levels at this time of year generally result in cooler burns with lower potential for causing severely burned soil. Fall burning would be conducted following brief periods of precipitation. Prescribed underburns in timber stands would be accomplished under carefully controlled conditions to minimize damage to standing trees. These activities are planned to meet fuel and visual management objectives without removing all of the protective surface cover. It is expected that adequate retention of coarse woody debris and fine organic matter (duff layer) would still exist for protecting mineral soil from erosion and supplying nutrients that support the growth of vegetation and populations of soil organisms. The successful implementation of these proposed activities would likely result in beneficial effects by reducing fuel loadings and wildfire potential as well as increasing soil moisture and nutrient availability in burned areas.

The extent of disturbed soil resulting from the construction of control lines would be limited to the minimum necessary to achieve prescribed burning objectives. In most cases existing roads and other existing fuel breaks would be used to effectively control the spread of prescribed fire within treatment units.

<u>Soil Restoration Treatments on Roads and Logging Facilities:</u> Although equipment traffic during harvest operations can cause decreases in soil porosity and increases in soil resistance to root penetration. Compacted sites can be mitigated physically by tillage with a winged subsoiler (Powers, 1999). Many of the soils within the project area are well suited for tillage treatments due to their naturally low bulk densities and the absence of rock fragments within soil profiles. These sandy-textured soils have little or no structural development within the principal root development zone (4 to 12 inches in depth) where changes in soil compaction (bulk density) are assessed according to Regional direction (FSM 2521.03).

Under the action alternatives soil restoration treatments may be applied with a self-drafting winged subsoiler to reclaim and stabilize detrimentally compacted soil on specific roads and some of the primary skid trails and log landings following post-harvest activities. Additional treatment options for improving soil quality on disturbed sites include redistributing topsoil in areas of soil displacement damage and pulling available logging slash and woody materials over the treated surface.

The winged subsoiling equipment used on the Deschutes National Forest has been shown to lift and shatter compacted soil layers in greater than 90 percent of the compacted zone with one equipment pass (Craigg, 2000). Subsoiling treatments have been implemented with good success due to the absence of rock fragments on the surface and within soil profiles. Although rock fragments can limit subsoiling opportunities on some land types, hydraulic tripping mechanisms on this specialized equipment help reduce the amount of subsurface rock that could potentially be brought to the surface by other tillage implements. Most of the surface organic matter remains in place because the equipment is designed to allow adequate clearance between the tool bar and the surface of the ground for allowing smaller logging slash to pass through without building up. Any mixing of soil and organic matter does not cause detrimental soil displacement because these materials are not removed off site. Since the winged subsoiler produces nearly complete loosening of compacted soil layers without causing substantial

displacement, subsoiled areas on this Forest are expected to reach full recovery within the short-term (less than 5 years) through natural recovery processes.

Although the biological significance of subsoiling is less certain, these restoration treatments likely improve subsurface habitat by restoring the soils ability to supply moisture, air, and nutrients that support soil microorganisms. Research studies on the Deschutes National Forest have shown that the composition of soil biota populations and distributions rebound back toward pre-impact conditions following subsoiling treatments on compacted skid trails and log landings (Moldenke et al., 2000).

Alternative 2 and 3 - Direct and Indirect Effects

The use of ground-based equipment for vegetation management treatments would increase the amount and distribution of soil disturbance within the proposed activity areas. However, through implementation of project design criteria intended to minimize soil disturbance and through the application of appropriate soil mitigation measures intended to protect soils, none of the activities areas are expected to exceed the Forest plan standard of 20% detrimental soil disturbance following proposed treatment (Appendix A). The development and use of temporary roads, log landings, and skid trail systems are the primary sources of new soil disturbance that would result in adverse changes to soil productivity. Most soil impacts would occur on and adjacent to these heavy-use areas where multiple equipment passes typically cause detrimental soil compaction. Mitigation and resource protection measures would be applied to avoid or minimize the extent of soil disturbance in random locations between main skid trails and away from log landings. Non-commercial thinning by hand felling small-diameter trees with chainsaws would not cause additional soil impacts because machinery would not be used for yarding activities.

Soil displacement from harvest activities occurs when soil organic layers are scraped or pushed away by equipment or gouged by logs during skidding operations. This type of soil disturbance is most likely to occur on the steeper portions of harvest units. In order to avoid soil displacement disturbance, activity area boundaries would be adjusted to prohibit equipment operations in portions of activity areas that contain extensive areas with slopes steeper than 30 percent (see project design criteria for description of operations within small areas of slopes greater than 30%). It is expected that many of these sensitive areas will be included as untreated patches within and adjacent to the proposed units to meet wildlife objectives. The majority of proposed activity areas are located on gentle to moderately sloping terrain where the maneuvering of equipment generally does not remove soil surface layers in areas that are at least 5 feet in width (FSM 2520). Smaller areas of soil displacement or the mixing of soil and organic matter would not constitute detrimental soil displacement. There would be no new construction of temporary roads or logging facilities on steep slopes or sensitive soils.

Mechanical shrub and slash treatments would be accomplished using low ground-pressure machinery and soil disturbance from these activities are not expected to qualify as a detrimental soil condition. The depth of compaction from only one or two equipment passes would not increase soil resistance and/or reduce soil porosity to levels that would require subsoiling mitigation to restore soil physical properties. The dominant sandy-textured soils within the project area are not susceptible to soil puddling damage due to their lack of plasticity and cohesion.

Prescribed burn plans would comply with all applicable LRMP standards and guidelines and Best Management Practices (BMPs) prior to initiation of burn treatments. Soil moisture guidelines would be included in burn plans to minimize the risk of intense ground-level heating. Duff moisture levels of approximately 50 percent are typical during light intensity underburns. Soil heating during spring burns would be negligible because higher moisture levels at this time of year generally result in cooler burns with lower potential for causing severely burned soil. Fall burning would be conducted following brief periods of precipitation. Prescribed underburns in timber stands would be accomplished under carefully controlled conditions to minimize damage to standing trees.

The amount of disturbed area associated with temporary roads and logging facilities would be limited to the minimum necessary to achieve management objectives. None of the temporary road locations would require excavation of cut-and-fill slopes because they are located on nearly level to gentle slopes. These temporary road segments would be closed and in some cases obliterated upon completion of the vegetation management activities.

Alternative 2 and 3 - Cumulative Effects

Cumulative levels of existing and predicted amounts of soil disturbance need to be considered to determine whether soil quality standards (DNF LRMP 1990; FSM 2520, R-6 Supplement No. 2500-98-1) were met following project implementation. Based on the proportionate extent of overlap of previously disturbed areas and areas proposed for treatments, percentages of existing and predicted detrimental soil conditions were determined and are displayed in Appendix A of the soils specialist report.

Implementation of Alternatives 2 or 3 would cause some new soil disturbances where ground-based equipment is used for mechanical harvest and yarding activities during the current entry. The combined effects of past and current disturbances and those anticipated from implementing the proposed actions were previously addressed under existing conditions and in the discussion of direct and indirect effects. The primary source of detrimental soil conditions from past management are associated with existing roads and ground-based logging facilities which were used for past harvest activities. Likewise, the majority of project-related soil impacts from this entry would also be confined to known locations in heavy use areas (such as roads, log landings, and main skid trails). The net change in detrimental soil conditions is associated with additional logging facilities that would be retained following harvest or post-harvest soil restoration treatments.

Mechanical shrub and slash treatments would be accomplished using low ground-pressure machinery and soil disturbances from these activities are not expected to qualify as a detrimental soil condition. Slash disposal by hand piling and burning would not cause a measurable increase in detrimental soil conditions because machinery would not be used and burning small concentrations of slash materials is not expected to cause severely burned soil. Fuel reductions achieved through prescribed underburning in timber stands are conducted at times and under conditions that result in low-to-moderate intensity burns that do not cause detrimental changes in soil properties. No other projects are on-going or planning in the reasonable foreseeable future that may contribute to additional cumulative effects to soils.

Measure #3: Probable Success in Project Design and Implementation

Resource Protection Measures Common to the Action Alternatives

Best Management practices (BMPs) apply to all ground disturbing management activities, as described in the National Core BMP Technical Guide (US Forest Service BMP, 2012). The Deschutes National Forest Land Resource Management Plan (US Forest Service LRMP, 1990) states that BMPs will be selected and incorporated into project design criteria in accordance with the Clean Water Act for protection of waters of the State of Oregon (LRMP 4-69). The following guidelines will be used during project design to develop site-specific BMP prescriptions for harvest operations as appropriate or when required. These BMPs are referenced to the Soil and Water Conservation Practices (SWCP) Handbook (US Forest Service FSH 2509.22), which contains conservation practices that have proven effective in protection and maintaining soil and water resource values. In addition, they are referenced to the LRMP direction, BMP monitoring information, and professional judgment.

Alternative 2 and 3 - Direct and Indirect Effects

Best management practices (BMPs), project design criteria (PCD), and resource protection measures common to the actions alternatives are all designed to avoid or minimize potentially adverse impacts to

the soil resource during the implementation of management actions. Compliance with LRMP Standard and Guideline SL-5 is addressed by excluding heavy equipment from driving on sensitive soils on steeper slopes (greater than 30 percent). BMPs 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 used during harvest operations. Soil disturbance resulting from proposed activities would be mitigated within the project area through the design of designated skid trails and limited off trail travel by equipment.

Alternative 2 and 3 - Cumulative Effects

Cumulative effects for soils have incorporated past actions in the existing condition description as evidenced by the soil disturbance table (Soils Appendix A). The zone of influence for cumulative effects is limited to the harvest units. Effects are expected to be within allowable limits set by US Forest Service Region 6 Soil quality Standard Guidelines (FSM 2520, R6 Supplement No. 2500-98-1) and the Deschutes National Forest LRMP Standards and Guidelines (US Forest Service LRMP, 1990) for protecting and maintaining soil productivity within each of the proposed salvage units. There are no reasonable foreseeable future actions that would occur within the harvest units (effects from reforestation are not measureable); therefore there are no future cumulative effects.

Project Design Criteria and Best Management Practices

Project design criteria provide operational guidelines for equipment use in vegetation management operations and other ground disturbing activities, including prescribed fire. These operation guidelines include options for limiting the amount of surface area covered by logging facilities and controlling equipment operations to locations and ground conditions that are less susceptible to soil impacts. During the design of this project, these guidelines were discussed with operations personnel help ensue feasibility for implementation and design effectiveness.

US Forest Service, Region 6 provides Regional Soil Quality Standards (US Forest Service, 1991) that limit allowable detrimental soil disturbances associated with management activities. This Regional guidance supplements LRMP Standards and Guidelines and is designed to further protect or maintain soil productivity. Implementation of the project design criteria listed below will help ensure these standards are met.

In addition, Best Management practices (BMPs) apply to all ground disturbing management activities, as described in the National Core BMP Technical Guide (US Forest Service BMP, 2012). The Deschutes National Forest Land Resource Management Plan (US Forest Service LRMP, 1990) states that BMPs will be selected and incorporated into project design criteria in accordance with the Clean Water Act for protection of waters of the State of Oregon (LRMP 4-69). The following guidelines will be used during project design to develop site-specific BMP prescriptions for harvest operations as appropriate or when required. These BMPs are tiered to the Soil and Water Conservation Practices (SWCP) Handbook (US Forest Service FSH 2509.22), which contains conservation practices that have proven effective in protecting and maintaining soil and water resource values. They are also tiered to the LRMP direction, BMP monitoring information, US Forest Service Region 6 Soil Quality Standards, and best available science.

See the section Resource Protection Measures Common to the Action Alternatives for the Soils best management practices.

HYDROLOGY

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Hydrology specialist report and other technical documentation used to support the analysis and conclusions of this

environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

The existing condition and environmental effects for the hydrology issues in the hydrology analysis area are described in this section of the environmental assessment. Project treatments are located within the Deep Canyon watershed in portions of three subwatershed (SWS): Three Creek, Deep Canyon Dam-Deep Creek, and Snow Creek Ditch (Table 17). Two recent fires occurred in the Three Creek subwatershed, the Pole Creek Fire (2012) and the Rooster Rock Fire (2010). A very small portion of the Pole Creek fire area west of Forest Road 16 is included in the Melvin Butte Vegetation Management Project area. The Deep Canyon watershed was analyzed in the Sisters/Whychus Watershed Analysis (USDA Forest Service 1998) and the Whychus Watershed Analysis Updates (USDA Forest Service 2009, 2013b).

Table 17 Acres by subwatershed (SWS) for subwatersheds that are in the Melvin Butte analysis area

SWS Name	SWS number	SWS Acres	Acres in Project Boundary	% of SWS in Project Area
Deep Canyon Dam – Deep Creek	170703010604	31,923	267	0.8
Snow Creek Ditch	170703010602	14,636	129	0.8
Three Creek	170703010601	18,790	4060	22

Action alternatives have the potential to affect the following hydrology resources in the project area: streamflow, sedimentation, water temperature, and channel condition. Specific parameters assessed for waterbody condition will be streamflow, sedimentation, riparian vegetation and large wood.

Regulatory Framework / Management Direction

All federal land management activities must follow standards and guidelines (S&Gs) listed in the Deschutes National Forest Land and Resource Management Plan (LRMP) (USDA Forest Service 1990), as amended by the Northwest Forest Plan (NWFP) (USDA Forest Service and USDI Bureau of Land Management 1994), and any applicable Wild and Scenic River Plans. Project treatments must comply with all applicable best management practices (BMPs) (USDA Forest Service 2012b) and the Clean Water Act. The majority of National Forest lands in the project are managed under NWFP and are located within the Matrix land allocation.

Deschutes National Forest Land and Resource Management Plan

The following standards and guidelines from the Deschutes LRMP are applicable to this project (USDA Forest Service 1990):

RP-3: Give preference to riparian area dependent resources

RP-8: Evaluate the cumulative effects of proposed projects on water quality, runoff, stream channel conditions fish habitat and adopt measures to avoid adverse effects to these resources.

RP-10: Manage woody debris and vegetation to: 1) maintain or enhance stream channel and bank structure.

RP-39: Large organic material which is beneficial to fish, wildlife or water quality will be preserved in riparian areas, stream or river channels and lakes adjacent to summer homes. Streambank erosion or

esthetic enhancements are not adequate reasons for its removal. The material may be altered if it creates a safety hazard, however its contribution to riparian resources will be preserved.

Northwest Forest Plan

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 (NWFP)) (USDA Forest Service and USDI Bureau of Land Management 1994). The Aquatic Conservation Strategy (ACS) is an essential part of the NWFP that "was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands" (USDA Forest Service and USDI Bureau of Land Management 1994). The Melvin Butte Vegetation Management Project is compliant with the ACS because only minimal activity would occur within Riparian Reserves and it would maintain or restore the ACS objectives. Compliance with the ACS is discussed in the Management Direction section of the Fisheries Report.

The NWFP provides standards and guidelines for Key Watersheds, Riparian Reserves and various management activities that prohibit or regulate activities that "Prevent further degradation of aquatic ecosystems and to restore and maintain habitat and ecological processes responsible for creating habitat over broad landscapes of public lands" (Reeves et al. 2006). Standards and guidelines for Key Watersheds, Riparian Reserves, and management activities associated with the Melvin Butte Vegetation Management Project are listed in the Management Direction section of the Fisheries Report. All proposed actions in the Melvin Butte Vegetation Management Project comply with standards and guidelines in the NWFP.

Within the project area, a portion of the Three Creek SWS is Tier 2 Key watershed under the NWFP. Tier 2 Key watersheds may not contain at risk fish stocks, but provide sources of high quality water. Three Creek subwatershed was designated a Tier 2 Key Watershed with long-toed salamander, cascade frog, and western toad as aquatic focal species in the Three Creek drainage (USDA Forest Service 2013; USDA Forest Service 1995; USDA Forest Service 2001). There are no Tier 1 Key watersheds in the project area.

Aquatic Conservation Strategy Compliance

The Melvin Butte Vegetation Management Project is compliant with the Aquatic Conservation Strategy (ACS) because very little activity would occur within Riparian Reserves. No vegetation treatments would occur in the Riparian Reserve and only haul of harvest trees would occur on existing roads. In addition, 0.14 miles of road would be decommissioned or closed in the outer edge of the Three Creek Riparian Reserves.

Restricting haul to existing roads and implementing Project Design Criteria (see Project Design Criteria section of this report) such as regular preventative road maintenance and restricting haul on hydrologically connected segments of road to drier periods would maintain ACS objectives. Decommissioning and closing 0.14 miles of road in the outer edge of the Riparian Reserve would allow the road surface to revegetate and down wood to accumulate. The revegetation of the road surface would help dissipate overland flow energy and reduce the risk of increasing peak flows and sedimentation; therefore, restoring the Aquatic Conservation Strategy objectives. See the Fisheries section of this environmental assessment for a comprehensive analysis of all nine objectives of the Aquatic Conservation Strategy. The project complies with all nine objectives of the Aquatic Conservation Strategy.

Based on the evaluation of the short-term, long-term, and cumulative impacts, the Melvin Butte Vegetation Management Project is designed to contribute to maintaining or restoring the fifth-field watershed over the long-term."

Riparian Reserve and Ephemeral Draw Buffer Widths

The Whychus Watershed Analysis refined Riparian Reserves as defined by the NWFP based on average maximum tree height, the 100-year floodplain, extent of riparian vegetation, and unstable and potentially unstable lands (USDA Forest Service 1998). Site specific assessment of ephemeral draws was used to prescribe additional buffers (which are not considered Riparian Reserves) where needed to reduce potential erosion and ground disturbance in the Melvin Butte Vegetation Management area. Riparian Reserve and ephemeral draw buffer widths for the project are shown in Table 18.

Ephemeral channel buffer widths were prescribed primarily as a means to preserve draw stability and keep potentially soil disturbing activities away from the channel. Ephemeral channels are not considred Riparian Reserves under the NWFP. Forested ephemeral channels act as sediment sinks during the dry season, and are potential sources of sediment during storm events (Daniels and Gilliam 1996). Ephemeral draw buffers are not designated as Riparian Reserves and are specific to the Melvin Butte Vegetation Management project only.

Table 18 Riparian reserve and ephemeral draw buffer widths for the Melvin Butte Vegetation Management Project

Category	Stream Class	Description	Riparian Reserve width (slope distance (ft) from edge of channel)	Buffer Width (slope distance (ft) from edge of draw)
1; 3	1 & 2; n/a	Fish-bearing streams; natural lakes and ponds	300 ft	See Riparian Reserve width column
2	3	Permanently flowing non-fish bearing streams	150 ft	See Riparian Reserve width column
3	n/a	Constructed ponds, reservoirs, and wetlands > 1 acre	150 ft	See Riparian Reserve width column
4	4	Seasonally flowing or intermittent streams, wetlands < 1 acre, unstable or potentially unstable areas, springs	150 ft	See Riparian Reserve width column
n/a	n/a	Hydrologically connected ephemeral draw features	n/a	30 ft

Clean Water Act

The Clean Water Act (CWA) is a federal law in the United States governing point and non-point source water pollution. In Oregon, the United States Environmental Protection Agency (EPA) has designated authority for compliance with the CWA to the Oregon Department of Environmental Quality (ODEQ). The CWA requires the development of water quality standards to protect beneficial uses of waters of the United States. Beneficial uses for the Deschutes River Basin include public, private, and industrial water supply, irrigation, livestock watering, anadromous fish spawning, salmon spawning, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, and aesthetic quality.

The Forest Service's responsibilities under the CWA are defined in a 2014 Memorandum of Understanding (MOU) with Oregon DEQ (ODEQ and USDA Forest Service 2014). The MOU

designates the Forest Service as the responsible agency for meeting the Clean Water Act on National Forest System (NFS) lands and recognizes best management practices (BMPs) as the primary mechanism for control of non-point source pollutants on NFS lands. It recognizes that BMPs are developed by the Forest Service as part of the planning process and includes a commitment by the Forest Service to meet or exceed standards. Hydrology BMPs that apply to the Project are discussed in the Project Design Criterial and BMP section of this report. To meet Clean Water Act responsibilities, the Forest Service developed a draft Water Quality Restoration Plan (USDA Forest Service 2004). The Melvin Butte Vegetation Management EA complies with both the draft Water Quality Restoration Plan and 2014 MOU.

303(d) Listed Streams

The State of Oregon is required under Section 303(d) of the Clean Water Act to identify waters that do not meet water quality standards. None of the streams in the Melvin Butte analysis area are on the Oregon 303(d) list. States are required to develop Total Maximum Daily Load allocations, which include Water Quality Management Plans for 303(d) listed waters. The Upper Deschutes River Subbasin Total Maximum Daily Load and Water Quality Management Plans are being planned and cover all the subwatersheds in the Melvin Butte Vegetation Management Project boundary.

Watershed Condition Framework

The Watershed Condition Framework (WCF) was developed as a nationally consistent, science-based approach to classify the condition of all National Forest System lands (Potyondy and Geier 2010) as a means to consistently prioritize watersheds for improvement and track condition change over time. The WCF is a 6-step process, step 1 of which includes the classification of watershed condition using 24 watershed condition "attributes" to rate 12 watershed "indicators" and produce an overall Watershed Condition Class Rating. Within this context, the three watershed condition classes are directly related to the degree or level of watershed functionality and are classified as follows: Class 1 = Functioning Properly; Class 2 = Functioning at Risk; and Class 3 = Impaired Function. Watersheds are classified using attributes that quantify aquatic physical, aquatic biological, terrestrial physical and terrestrial biological condition. Steps 2 and 3 of the WCF process include prioritization of watersheds for restoration and the development of watershed action plans outlining essential projects to improve watershed condition. Steps 4-6 include implementation of essential projects within priority watersheds, monitoring of watershed restoration efforts, and aggregation of program performance data for national reporting.

All SWSs that intersect the Deschutes National Forest were analyzed during the National Watershed Condition Framework process and ranked in 2011. Through this process, the Upper Whychus Creek SWS was identified as a priority for restoration. The 2011 Upper Whychus Creek Action Plan outlines essential projects to improve watershed condition from functioning at risk to functioning properly within the next 5 years (USDA Forest Service 2011b).

As part of the 2013 Whychus Watershed Analysis update, subwatersheds included in the analysis area were re-evaluated using the WCF process to include changes from the Pole Creek Fire, and other watershed changes that could affect condition. Watershed condition ratings from the 2011 and 2013 analyses for the subwatersheds in the Whychus Watershed Analysis area are shown in Table 19. The Melvin Butte Vegetation Management Project would not result in a change in watershed condition for any SWS within the Hydrologic Analysis Area; as discussed in the Effects Analysis of this report there would be no significant effect to hydrologic parameters from the project.

Table 19 SWS rating using the watershed condition framework. A portion of the subwatershed in bold is within the Melvin Butte Vegetation Management Project area

Subwatershed	2011 WCF rating	2013 WCF rating	Comments
Headwaters Whychus Creek	Functioning properly	Functioning at risk	Change in rating from Pole Creek fire effects
Lower Trout Creek	Functioning at risk	Functioning at risk	
Three Creek	**Functioning at risk**	**Functioning at risk**	
Upper Trout Creek	Functioning properly	Functioning properly	
Upper Whychus Creek	Functioning at risk	Functioning at risk	National Priority Subwatershed

Analysis Methods

The hydrologic analysis area for analysis of direct, indirect, and cumulative effects of the Melvin Butte Vegetation Management Project is the Three Creek SWS. Three Creek goes subsurface before exiting the SWS; therefore, SWSs downstream of the project area were not included in project analysis. The potential effects of the Project are no longer relevant or quantitatively or qualitatively meaningful at a scale larger than the SWSs where treatments are located because there are no treatments proposed near streams or within Riparian Reserves, and additional BMPs and project design criteria would avoid treatments in other hydrologically connected and sensitive areas. Although two intermittent streams (equaling 0.2 miles) within the Snow Creek Ditch SWS are within the Project area, only 129 acres of the SWS are within the Project area. Given that no treatment would occur in Riparian Reserves and very little of the SWS is within the Project area (less than 1%), Snow Creek Ditch SWS was not included in the hydrology analysis area; however, effects to the intermittent streams are discussed. Deep Canyon Dam SWS was not included in the hydrology analysis area because only 267 acres (less than 1% of the SWS) are in the Project area and there are no waterbodies near the Project area.

Activities in areas that contribute water, shade, or sediment to streams or wetlands can affect water quality or quantity; therefore, activities within Riparian Reserves and potentially hydrologically connected areas (roads and hydrologically connected ephemeral draws) are the focus of this analysis. Various federal plans identify riparian buffers in order to protect water quality, channel stability, and large wood debris recruitment (NWFP, DLRMP, INFISH). A compilation of studies on effectiveness of riparian buffers (Belt et al. 1992) concluded that non-channelized sediment rarely travels more than 300 feet, and that 200-300 foot riparian “filter strips” are generally effective at protecting streams from sediment from non-channelized flow (USDA Forest Service and USDI Bureau of Land Management 1995).

Treatment alternatives will be analyzed based on their potential effects to the hydrology issues of streamflow, sedimentation, water temperature, and waterbody condition. These hydrology issues will be analyzed through the measures outlined in Table 20. Past, present and reasonably foreseeable projects within the hydrology analysis area were evaluated to determine potential cumulative effects from the project. Activities in the cumulative effects analysis area for all resources are shown in Chapter 2 of this EA and individual activities in the hydrology cumulative analysis area discussed in the Cumulative Effects section of this report.

Table 20 Measures for evaluating the effects of these treatments on the aquatics resource are:

Issue	Measures
Streamflow	• Acres of soil detrimentally impacted in Riparian Reserves. • Acres of soil detrimentally impacted in potentially hydrologically connected areas (ephemeral draws). • Miles of hydrologically connected road closed or decommissioned. • Percent of project area with a high or moderate fire hazard rating.
Sedimentation	• Acres of soil detrimentally impacted in Riparian Reserves.

	• Acres of soil detrimentally impacted within 30 ft of potentially hydrologically connected areas (ephemeral draws). • Miles of hydrologically connected road closed or decommissioned. • Miles of hydrologically connected temporary road constructed or used. • Percent of project area with a high or moderate fire hazard rating.
Water Temperature	• Acres harvested in Riparian Reserves. • Percent of project area with a high or moderate fire hazard rating.
Waterbody Condition	• Alteration of stream/lake bank and bed stability measured by changes in sedimentation, and water yield using measures described above. • Acres treated in floodplain. • Acres harvested in potential large wood recruitment areas in Riparian Reserves. • Percent of project area with a high or moderate fire hazard rating.

Acres of treatment for the Action Alternatives within each SWS within the hydrology analysis area are shown in Table 21. For each hydrology measure, effects for Alternatives 2 and 3 are analyzed together because effects are not expected to differ between the two Alternatives. Although in Alternative 3 there are less acres treated than in Alternative 2, these acres all occur outside of Riparian Reserves and in the Snow Creek Ditch SWS and would not affect hydrology parameters. The other difference between Alternative 2 and 3 is that under Alternative 3 the mistletoe treatments change to thinning prescriptions and the mixed conifer treatments would not have small group openings. The effects of changing these treatment prescriptions do not change the effects to any hydrology measure; the same areas would be treated, and the same infrastructure including haul roads, skid trails, and landings would be needed for each Action Alternative.

Table 21 Watershed hierarch, and project and treatment acres for the Melvin Butte Vegetation Management Project.

SWS name	SWS acres	Alt. 2 Treatment acres	Alt. 2 Treatment acres	Road Decommissioning Alt. 2 & 3	Road Closures Alt. 2 & 3
Deep Canyon Dam – Deep Creek	31,923	267	267	0.3	0
Snow Creek Ditch	14,636	129	57	0	0
Three Creek	18,790	4060	4060	7.7	6
Total	N/A	4456	4384	8.0	6

No treatments, including prescribed burning, would occur in Riparian Reserves. The only activities that would occur in Riparian Reserves would be the closure and decommissioning of 0.14 miles of road in the outer extent of the Riparian Reserve and hauling on existing roads. Approximately 0.8 miles of temporary roads would be constructed in Alternative 2 but no new temporary roads would be constructed nor would any temporary roads be located in Riparian Reserves. Project Design Criteria and Best Management Practices designed to protect the hydrology resource are discussed in the next section.

Within the Melvin Butte Project Area about 8 miles of road would be decommissioned and about 6 miles would be closed under the Action Alternatives. All the roads proposed for decommissioning and closure would help reduce open road densities, which was addressed as an aquatic concern in the Whychus Watershed Analysis and Update (USDA Forest Service 1998, 2009). Approximately 2.3 miles of road proposed for decommissioning (Roads 1620-377, 1624-360, 1628-113, 626, 629) and 4.1 miles that are proposed for closure (Roads 1620-570, 1628-106, 107, 200, 500, 605) are within the Riparian Reserve or interact with an ephemeral channel. Decommissioned roads have no long term needs, are not planned to be used again and will be removed from the transportation system status. Treatment would involve "hydrologically closing" roads and could potentially include subsoiling/ripping or recontouring the road surface. Closed roads are inactivated or operational maintenance level 1 roads. While remaining on the

transportation system they are managed in a storage or closed category, and only non-motorized vehicles or USFS vehicles receiving special permission are allowed. A closed road is "hydrologically closed," even though the landscape is not restored to its original shape. Hydrologically closing a road is intended to leave the road in a "self-maintaining" state and would include repairing any drainage problems, potentially removing culverts from stream crossings, and installing a closure device (i.e. barricade, earth berm, logs, gates, etc.). Neither decommissioned roads nor closed roads would be on the Motorized Vehicle Use Map and motorized access would not be allowed on these roads.

Project Design Criteria and Best Management Practices - Aquatics

Best Management Practices (BMPs) and Project Design Criteria (PDC) were developed for the Melvin Butte Vegetation Management Project using the National Core BMP Technical Guide (USDA Forest Service 2012b) based on recommendations in the 2013 Whychus Watershed Analysis Update (USDA Forest Service 2013b), field verification, and the best available science. The BMP and PDC that provides the most protection for the hydrology resource in the Melvin Butte Project area is restricting ground disturbance within Riparian Reserves to road closure and decommissioning. Any springs, wetlands, or ephemeral channels found during Project implementation that were not originally mapped or identified should be protected by using the Riparian Reserve and ephemeral channel buffers (Table 21). BMPs and PDC were discussed with operations personnel to ensure feasibility for implementation effectiveness. BMPs and PDC are discussed throughout the effects analysis of this report and are the primary mechanism to mitigate potential hydrologic effects from the project.

BMP implementation and effectiveness has been systematically monitored across National Forest Lands in California since 1992. From 2008-2010, randomized monitoring showed 91% of BMPs were implemented, and 80% of implemented BMPs were rated effective. BMPs for timber harvests, fuels treatments, and vegetation management were consistently highly effective, while BMPs for other activities, including roads, range management, recreation, and mining, were less effective (USDA Forest Service 2013a). At sites where BMPs were not implemented or effective the monitoring program includes a strong feedback loop to take corrective action on non-compliance scenarios.

At the national scale, a consistent program to monitor BMP implementation and effectiveness has been in development for several years. Monitoring of BMP implementation and effectiveness using the national BMP protocols has taken place on the Deschutes National Forest since 2011. Monitoring results from vegetation management projects indicate that BMPs intended to minimize effects to water, aquatic and riparian resources were successfully implemented, and BMPs intended to minimize effects from landings and ground-based mechanical harvest were successfully implemented, including landing location, spacing of skid trails, and retention of cover (USDA Forest Service 2011a, 2012a). Select BMPs, PDC, and project design elements are shown in Table 22.

Table 22 Select project design considerations, BMPs, and PDC for the Melvin Butte Vegetation Management Project.

Practice	Initial Project Design Element	BMP/PDC
No harvest, mowing or prescribed fire in Riparian Reserves	X	X
Buffer ephemeral draws and limit designated crossings (see specifics below)		X
Buffer ditches according to Forest ditch guidance (see specifics below)		
No new road construction	X	X
No temporary road or landing construction or use in Riparian Reserves		X
No haul on hydrologically connected roads or roads within riparian reserves when conditions are wet and can cause sedimentation to reach Three Creek		X

(see specifics below)		
No haul across stream fords when streams are flowing		X
Improve drainage on unstable hydrologically connected roads before haul can occur and regular preventative maintenance (see specifics below)		X
Closure of 6.2 miles of road upon project completion	X	
Planned decommission of 6.4 miles of road	X	
Obliterate all temporary roads		X
Installation of water bars on skid trails where needed		X
Construction of new landings and skid trails would be minimized		X
No ground-based harvest on slopes over 30%	X	

Initial project design elements were included in the development of the Proposed Action. BMPs were developed using recommendations in the National Core BMP Technical Guide (USDA Forest Service 2012b), and site-specific analysis of the project area

Project Specific Design Criteria

Ephemeral Channels -

- The intent of this design element is to protect the integrity of the channel banks, provide for wood recruitment, reduce sedimentation, and dissipate stream energy.
- Mechanical treatment, including mowing, is not allowed within 30 ft. of ephemeral channels, unless approval is granted by a hydrologist or fish biologist to allow some treatment in low risk areas. Underburning is allowed.
- Hand-thinning or minimal reaching in with equipment is permitted but cutting any trees within the channel or on the banks is not allowed.
- Allow crossings of channel at designated areas during dry season or unless approval is granted by a hydrologist or fish biologist
- Do not locate slash or burn piles in swales, washes, or depressions.

Ditches

- The intent of this design element is to protect the integrity of the ditch and protect stream water quality.
- Ditches and channelized streams that are functioning as a stream should be buffered based on the class of stream for which they are functioning (i.e. Class 4 buffer if the ditch is intermittent, etc.).
- Ditches that do not connect back to a stream (i.e. they feed out into a pasture or irrigation device) should be buffered 30 ft. to protect the integrity of the channel. No mechanized equipment is allowed within the buffer. Hand-thinning or reaching in with equipment is permitted but do not cut any trees within the channel or on the banks. Do not fell or yard any trees across the channel in order to protect channel integrity.
- Abandoned ditches with no active water rights to use the water in the future do not need a buffer.

Haul Roads

The intent of this design element is to reduce sedimentation to Three Creek caused from hauling.

- Consult with a hydrologist or soil scientist to determine if roads are too wet for haul.
- Roads that may need maintenance or that should be monitored for excessive wetness in hydrologically connected areas are (other roads may be identified in the field):
    - 1620-377 – adjacent to ephemeral draw, decommission after use;

- 1620-570 – adjacent to ephemeral draw, close after use;
- 1620-880 – adjacent to ephemeral draw; decommission after use;
- 1624-360 – adjacent to ephemeral draw, decommissioning after use.

Streamflow

Existing Condition

Precipitation in the analysis area ranges from 50 inches a year near Three Creek Lake to 15 inches a year near Sisters, OR. However, the range in precipitation in the project area is only 40 in/yr. to 25 in/yr. with a mix of snow and rain. Elevations in the project area range from 4200 ft. to 6200 ft.; therefore, approximately 50% of the project area is within the rain-on-snow zone (approx. 3500-5000 ft.) which includes the lower 0.7 miles of the Three Creek Riparian Reserve. Although a portion of this subwatershed experiences a significant amount of precipitation and some high intensity storms, there is very little surface channel flow, as is seen by the low drainage density. Surface drainage in the hydrology analysis area is low because the predominately volcanic soils are highly permeable. Overland flow rarely occurs in soils within the hydrology analysis area because infiltration rates generally exceeded typical rainstorm rates by an order of magnitude (Litton 2006). Increases in overland flow can lead to increases in high flows which are the more erosive streamflows. The mechanisms with the potential to increase overland flow include reduction in canopy cover and attendant reduction in evapotranspiration and canopy interception of rain and snowfall. These mechanisms can increase the amount of precipitation available for runoff as streamflow. Within the hydrology analysis area, overland flow does not generally occur from a reduction in evapotranspiration when trees are harvested or killed by fire or insects and disease because infiltration and permeability rates often still exceed precipitation rates (Craigg 2009). However, overland flow can occur in areas where infiltration rates are reduced, such as rain-on-snow zones and road surfaces.

Roads in the project area continue to be a source for increasing overland flow in the project area. The Whychus Watershed Analysis 2013 Update analyzed road density and riparian road miles (USDA Forest Service 2013b). Overall road density (including known non-system roads) and road-stream crossings are high in Three Creek subwatershed. According to the document, “Determining Risk of Cumulative Watershed Effects Resulting from Multiple Activities”, road densities above 4.6 are considered high in relatively low relief subwatersheds (USDA Forest Service 1993). Although road density is high, mostly roads adjacent to streams, crossing streams, or hydrologically connected to streams via road ditches have an influence on streamflow or water quality.

Three Creek subwatershed was analyzed during the Forest Watershed Condition Framework (WCF) process. A component of the classification is the evaluation of the “terrestrial physical” condition and includes evaluation of open road density, road maintenance, proximity to water, mass wasting potential. Each of these are scored based on if they are functioning properly (good), functioning at risk (fair), or have impaired function (poor) and then averaged to give an overall roads indicator value. The Three Creek subwatershed was rated as fair for the roads indicator value; however, the rating may be worse because it assumed open road densities are low in these systems but many closed roads are still physically open and used by the public. The Travel Management Rule was implemented in October 2011 and it restricts motorized vehicle use to Level 2 or greater (i.e. open roads) roads, which, over time, may allow level 1 (closed roads) to actually function as closed roads.

Roads throughout the Pole Creek Fire area were damaged by increased runoff in two October storms following the Pole Creek Fire. Under the Pole Creek Burned Area Emergency Response (BAER) in 2012 and 2013 various road improvements were conducted to reduce streamflow and sedimentation effects caused by the fire (USDA Forest Service 2012c). In the Three Creek SWS a new culvert was installed under the 16 Road at an ephemeral draw that started flowing after the fire and the 1600-700 road was

reconstructed after it washed out. Both of these road improvements occurred within the Melvin Butte Project area in 2013.

Three Creek is the only perennial stream in the Project area and it becomes intermittent within a half a mile of the upstream boundary near the 1628-600 road. There are two intermittent unnamed streams in the southern tip of the project area (Snow Creek Ditch SWS) and a few ephemeral channels throughout the project area (Table 23). All channels flow southwest to northeast and infiltrate before connecting with a major stream network or the Deschutes River. Melvin Spring is outside the project area but within the analysis area on the west side. It is a perennial spring that historically drained into the Three Creek drainage downstream of the private land, but now flows a half mile then is ditched to the east for irrigation on private land. In addition, an intermittent tributary to Three Creek flows into Three Creek just upstream of the Project boundary.

The Pole Creek Fire (2012) occurred upstream of the Project area and only burned 8% of the Three Creek subwatershed and no land directly adjacent to Three Creek. The Rooster Rock Fire (2010) occurred downstream of the Project area mostly on private land and also only burned 8% of the subwatershed. Approximately 6.2 miles of Three Creek ran through the Rooster Rock fire area (5.5 mi on private land and 0.7 mi on USFS land) and adjacent lands experienced a mostly moderate severity burn.

Table 23 Streams and their flow regime in the Melvin Butte subwatershed analysis areas.

Subwatersheds	Perennial stream miles in SWS	Intermittent stream miles in SWS	Primary stream	Within Project Area	Flow Regime
Deep Canyon Dam-Deep Canyon	0	25	Intermittent streams	N	Snow-melt
Three Creek	6.6	9.4	Three Ck	Y	Snow-melt/lake controled
			Melvin Spring	N	Spring
			Intermittent trib	N	Snow-melt
Snow Creek Ditch	0	24.4	Intermittent streams	Y	Snow-melt
Total in Analysis Area	6.6	58.8			

Three Creek has a snow-melt flow regime but it is controlled by Three Creek Lake and Little Three Creek Lake in the headwaters (outside of the project area) and is influenced by numerous springs; therefore, it has a more stable flow regime. In the headwaters, Three Creek is low gradient with many small perennial tributaries. Downstream of the 16 Road and through the Project reach, Three Creek flows through a steep, confined canyon and becomes intermittent downstream of the 1628-600 road, near the abandoned Snow Creek Irrigation District Ditch. Based on the LiDAR image, it appears that historically Three Creek flowed, most likely intermittently, past Highway 20 and into McKenzie Canyon. It's unlikely that it ever reached the Deschutes River. Due to irrigation diversions that began as early as 1886, Three Creek only flowed to approximately the 1612 road (4 miles downstream of the Project boundary); however, in 2004 irrigation rights were cancelled and now Three Creek has been flowing all the way to the Mainline Rd (USFS 4606 rd), then down the Plainview Ditch (both ditches divert water from Whychus Creek) because there is no culvert under the Harrington Loop Road or Highway 20 to allow the flow to remain in the historic channel (Griffin 2011). Based on the Burned Area Emergency Response reports for both fires and the Whychus Watershed Analysis Update, increases in peak flows in Three Creek could occur because 16% of the subwatershed was burned, 11% of which occurred in the rain-on-snow zone (USDA Forest Service 2010, 2012c, 2013b).

The intermittent stream in the Snow Creek Ditch subwatershed originates from drainage off of Tam McArthur Rim. It flows intermittently through the southeast corner of the project area and is joined by two other small tributaries before leaving the project area. These streams begin flowing subterranean before they reach Highway 20 and never reach another larger surface connection.

Fire behavior modeling within the Melvin Butte Project area shows that under the existing condition 68% of the project area has a high or moderate fire hazard rating. Moderate and high hazard areas would require heavy equipment such as dozers, and/or aerial methods to effectively suppress a wildfire (NWCG 2006). As stated in the Fuels report for this project, "Moderate and high hazard areas also have an increased likelihood of negative resource and social effects from wildfire such as fire fighter safety, public safety concerns, resource damage, and smoke production." Acres with high or moderate fire hazard have a higher potential for stand mortality due to wildfire and would be more difficult to suppress than low hazard areas, however, this does not mean that low hazard areas are "fire-proof" or have a reduced likelihood of future fire occurrence (see Fire/Fuels report). Fires burning in the high and moderate fire hazard areas within Riparian Reserves or outside Riparian Reserves but within stream drainages could have impacts on stream flow, sedimentation, channel condition, and stream shade.

Alternative 1 – Direct and Indirect Effects

The effect to streamflow under the No Action Alternative would remain the same as described in the existing condition because no project activities would occur. Roads in poor condition would continue to intercept flow and could contribute to slight increases in peak flows. The hydrologic effects of roads and the interaction between road and fire effects would continue. Hydrologically connected roads that are not physically closed or hydrologically stable may continue to supply overland flow to streams because these road would not be decommissioned or closed under the Project. Effects of both the recent fires and tree mortality from insects and disease could increase peak flows. These effects are discussed in detail in greater detail in the Whychus Watershed Analysis Update (USDA Forest Service 2013b). Fire hazard modeling shows 68% of the project area and more than 80% of the area directly draining into Three Creek has a high or moderate fire hazard rating. Given that much of the drainage area of Three Creek has a high or moderate fire hazard rating, it's likely that much of the vegetation in the Three Creek drainage could be denuded and other destructive activities associated with fire suppression such as fireline construction, staging areas and safety zones could occur if a wildfire were to ignite. Therefore, effects from a moderate to high vegetation mortality fire in this drainage could temporarily increase high flows and sedimentation. Increased high flows could exacerbate the flooding issue downstream in the Plainview area. Issues and measures to assess effects to streamflow are shown in Table 24.

Table 24 Issues and measures to analyze effects to streamflow

Issue	Measures	No Action	Alternative 2 & 3
Streamflow	Acres of soil detrimentally impacted in Riparian Reserves.	0	0
	Acres of soil detrimentally impacted in potentially hydrologically connected areas.	0	0
	Miles of hydrologically connected road closed or decommissioned	0	6.4
	Percent of project area rated as a high or moderate fire hazard rating	(H) 45% (M) 23%	(H) 7% (M) 13%

Alterantive 2 and 3 - Direct and Indirect Effects

The Action Alternatives would not negatively affect streamflow because no treatments would occur in Riparian Reserves or hydrologically connected ephemeral channels. A potential beneficial effect to streamflow from the Action Alternatives includes closing or decommissioning 6.4 miles of road in

hydrologically connected areas. Also, reducing the percent of the project area threatened by wildfire ultimately results in a reduction of threat to the Riparian Reserves.

As mentioned earlier, overland flow in the project area does not generally occur from a reduction in evapotranspiration when trees are harvested because infiltration and permeability rates often exceed precipitation rates. In addition, the majority of vegetation treatments are understory removal in over-stocked stands; therefore, thinning would help move the stand toward more historic conditions. Vegetation treatments outside of the Riparian Reserves that could affect overland flow due to the amount of live vegetation removed are ponderosa pine dwarf mistletoe treatments and mixed conifer with group opening treatments. These treatments, which would only occur under Alternative 2 and would total 1051 acres, could create small openings between 1 and 3 acres which would reduce the amount of vegetation interception and evapotranspiration and may trap more snow. Although small openings would be created in the lodgepole pine treatment areas, these openings would occur in dead stands that are already more open and no longer evapotranspiring. The hydrologic processes of reduced interception and evapotranspiration and increased snow retention could increase overland flow and potentially more erosive high streamflows if these areas drain to streams.

Neither of these silvicultural treatments are located within 300 ft. of the perennial reach of Three Creek, 150 ft. of intermittent channels, or 30 ft. of ephemeral channels. In the dwarf mistletoe treatments (only Alt. 2) only infested trees would be killed and/or removed. In the mixed conifer with group openings treatments (only Alt. 2), openings would be scattered and less than 3 acres. Given that none of treatments are located within Riparian Reserves or hydrologically connected areas, overland flow effects from these treatments would not affect streamflow.

Closing and decommissioning 6.4 miles of road in hydrologically connected areas such as 0.1 miles in Riparian Reserves and 6.3 miles that parallel or cross ephemeral channels would reduce overland flow effects caused by compaction and lack of down wood or vegetation. Fracturing the road surface, installing water bars, and allowing the road to revegetate and maintain down wood would reduce overland flow contribution to stream channels during high flow periods.

Fire hazard modeling shows that the high and moderate fire hazard rating was reduced from 45% to 7% and 23% to 13%, respectively, under Alternatives 2 and 3 (Table 8). The likelihood that a wildfire could cause stand replacement mortality in the Three Creek drainage is estimated to be reduced and may not lead to significant streamflow changes if a wildfire were to occur under the Action Alternatives because fire suppression effectiveness would be increased.

Sedimentation

Existing Condition

The amount of fine sediment transported to or eroded within a stream channel can affect the beneficial uses of water and is frequently used as a measure of overall water quality. Oregon administrative rules addresses sediment through a turbidity standard that states, “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 340-041-0036; ODEQ 2011). For this report, sedimentation, including turbidity and fine sediment in substrate, will be analyzed because of the effects on channel morphology and aquatic species. The Sisters Ranger District has monitored turbidity, percent fine sediment in spawning gravels, cobble embeddedness, and bank stability, all of which are parameters associated with fine sediment.

Pebble counts performed in 2007 show that fine sediment in Three Creek is generally low with the highest concentration in the reaches downstream of the 16 road. The number of stream crossings is high in the Three Creek subwatershed and the higher concentration of fines may be a result of sediment

running off from the road. Fine sediment may have increased temporarily downstream of the Project area in the Rooster Rock fire area, but is likely close to pre-fire conditions since ground vegetation has been recovering for the last 4 years and down wood has been increasing. Due to generally low fine sediment concentration, substrate embeddedness is likely low. Streambank stability is high and is probably a result of a lake controlled flow regime, floodplain connection, and lack of roads in the steeper reaches of Three Creek (see Fisheries Report). Although the 16 road crosses Three Creek and parallels it in the upper reach, the stream and floodplain gradient is flat and there is a highly functioning riparian/wetland buffer. The culvert appears to the appropriately sized for the discharge and channel bankfull width. Sedimentation in Three Creek Lake and Little Three Creek Lake is likely elevated due to the intensive recreation impacts to the shore. Much of the ground has been compacted from vehicles and/or camping and riparian vegetation has been denuded in most high use areas.

Alternative 1 - Ecological Trends

The effect to sedimentation under the No Action Alternative would remain the same as described in the existing condition because no project activities would occur. Measures used to analyze the potential sedimentation effects and compare alternatives of the Melvin Butte Vegetation Management Project are shown in Table 25.

Hillslope erosion may increase from a reduction in live canopy and consumption of organic material on the forest floor from the recent fires, especially in stands that burned at high intensity. This could increase sedimentation in stream reaches adjacent to high intensity burned Riparian Reserves. Down wood from falling dead trees would increase over the next 3-7 years and provide surface roughness to help trap and store sediment.

The hydrologic effects of roads and the interaction between road and fire effects would continue. Roads in unstable condition would continue to deteriorate, and sediment delivery would continue to occur, especially on hydrologically connected roads that were impacted from increased runoff following the recent fires. In addition, hydrologically connected roads that are not physically closed or hydrologically stable may continue to supply sediment to streams when overland flow occurs because these road would not be decommissioned or closed under the Project.

Over 80% of the Three Creek drainage area has a high or moderate fire hazard rating. Given that much of the drainage area has a high or moderate fire hazard rating, it's likely that much of the vegetation in the Riparian Reserves could be denuded, even in the low hazard areas. Despite high to moderate vegetation mortality from wildfire, soil burn severities in these soil types are generally low to moderate, with approximately 2% in the high burn severity category based on data from the Black Crater, Lake George and GW Fires (see Soils Report). In addition, the soil types found in the project area tend to show an increase in infiltration after they've been burned despite burn severity and generally do not show increased signs of hydrophobicity from fire. Although infiltration generally increases in these soil types after a fire, during high intensity storms, erosion could increase because there is less ground cover. In addition, other destructive activities to ground vegetation associated with fire suppression such as fire line construction, staging areas and safety zones could occur if a wildfire were to ignite. Therefore, bare ground near Three Creek could be exposed, which increases the risk of sedimentation in Three Creek if a wildfire were to occur.

Table 25 Issues and measures to analyze effects to sedimentation.

Issue	Measures	No Action	Alternative 2 & 3
Erosion and Sedimentation	Acres of soil detrimentally impacted in Riparian Reserves.	0	0
	Acres of soil detrimentally impacted within 30 ft of	0	0

	potentially hydrologically connected areas (ephemeral draws).		
	Miles of hydrologically connected road closed or decommissioned	0	6.4
	Miles of hydrologically connected temporary road constructed or used.	0	0
	Percent of project area with a high or moderate fire hazard rating	(H) 45% (M) 23%	(H) 7% (M) 13%

Alternative 2 and 3 - Direct and Indirect Effects

Sedimentation from activities associated with the Action Alternatives in the streams in the project area would be negligible because no detrimental soil acres would occur in Riparian Reserves or hydrologically connected areas and project design elements would reduce sedimentation from haul roads.

Vegetation treatments outside of the Riparian Reserves that could affect sedimentation are the same as the ones discussed in the Streamflow Effects section of this report for overland flow. As discussed, the ponderosa pine dwarf mistletoe treatments and mixed conifer with group opening treatments (Alt. 2 only) would reduce the amount of vegetation interception and evapotranspiration and may trap more snow. All of these processes could increase overland flow, hillslope erosion, and potentially sedimentation and more erosive high streamflows if these areas drain to streams. Given that none of treatments are located within Riparian Reserves or hydrologically connected areas, overland flow effects from these treatments would not affect sedimentation. Any potential hillslope erosion caused from these activities would be trapped in the ground vegetated buffer between the treatments and the streams.

Project design elements would reduce sedimentation from log haul (see Project Design Criteria and BMP section). Sedimentation from haul would be minimal because no new roads would be constructed, no temporary roads would be used in Riparian Reserves, no haul roads would ford any creeks when they are flowing, no landings would be constructed in Riparian Reserves, haul would be restricted to drier conditions when sedimentation to streams would not occur, and regular drainage maintenance would be conducted.

Closing and decommissioning 6.4 miles of road in hydrologically connected areas such as 0.1 miles in Riparian Reserves and 6.3 miles that parallel or cross ephemeral channels would reduce overland flow effects that could cause erosion and subsequent sedimentation. Fracturing the road surface, installing water bars, and allowing the road to revegetate and maintain down wood would reduce sediment contribution to stream channels. Roads proposed for decommissioning maybe sub-soiled if physically possible to restore soil infiltration. Subsoiling or ripping could cause some localized, short-term sedimentation effects; however, sedimentation would not likely reach Three Creek because treatments are adjacent to ephemeral channels and not directly near Three Creek.

Fire hazard modeling shows that the high and moderate fire hazard rating was reduced from 45% to 7% and 23% to 13%, respectively, under Alternatives 2 and 3 (Table 25). Therefore, after vegetation treatments, the likelihood that much of the vegetation in the Riparian Reserves would be denuded from a wildfire would be reduced as would the risk of sedimentation in Three Creek.

Water Temperature

Existing Condition

No waterbodies in the Melvin Butte Vegetation Management Project area are listed on the Oregon 303(d) list for water temperature exceedances above the State standard. There is only a half mile of perennial channel within the Project area and it's located at the upstream project boundary in Three Creek. Water temperature has been measured in Three Creek during stream inventories and has ranged between 9 ^{o}C to

20 ^{o}C using a hand held thermometer, with highest temperatures in August. Water temperature is elevated because surface water from the Three Creek and Little Three Creek Lake is thermally heated and is the primary water sources during the summer months. The State temperature standard for Three Creek is the 7-day average maximum water temperature standard for salmon and trout rearing and migration which is 18° C (ODEQ 2011). It is unclear if Three Creek exceeds the water temperature standard. It's unlikely that the Pole Creek Fire or the Rooster Rock Fire affected stream temperature because the Pole Creek fire only burned a small portion of the Riparian Reserve that was not immediately adjacent to the perennial reach of Three Creek and the Rooster Rock Fire occurred along the intermittent reach of Three Creek that is already dry during the hot period. The intermittent tributaries in the Snow Creek Ditch subwatershed are dry during the hot season and are thought to not exceed State water temperature standards.

Alternative 1 - Ecological Trends

The effect to water temperature and 303(d) status under the No Action Alternative would remain the same as described in the existing condition because no project activities would occur. Over 80% of the Three Creek drainage area as well as the Riparian Reserves has a high or moderate fire hazard rating. Given that much of the Riparian Reserves along Three Creek has a high or moderate fire hazard rating, it's likely that much of the shade producing vegetation in the Riparian Reserves could be denuded, even in the low fire hazard areas, resulting in increased water temperature. Measures for analysis of temperature effects of the Melvin Butte Vegetation Management are shown in Table 26.

Table 26 Issues and measures analyzing effects to water temperature.

Issue	Measures	No Action	Alternative 2 and 3
Water Temperature/303(d) listings	Acres harvested in riparian reserves.	0	0
	Percent of project area with a high fire hazard	45%	7% and 8%

Alternative 2 - Direct and Indirect Effects

The Action Alternatives would not affect water temperature because no activities would occur within the Riparian Reserve of any streams. For the same reason, there would be no effect on the 303(d) listing status of streams listed for exceeding State temperature standards. Only activities within the shade producing area (usually within 50-100 ft. of a stream) of perennial streams, have the potential to affect shade and associated stream temperature. Intermittent streams in the project area do not contribute to high temperatures because they are dry during the hottest period of the year. Only a half mile of Three Creek is perennial in the Project area and no activities are planned within the shade producing area. In addition, no changes to channel condition are predicted; therefore, morphological channel changes which could affect stream temperature would not occur. Given that only a half mile of stream is perennial, any beneficial effects from reducing the fire hazard in the project area would not have an effect on stream temperature.

Channel Condition

Existing Condition

Riparian Reserves upstream of the Project area around Three Creek, tributaries and wetlands near the Forest Road 16, and Three Creek Lake are within the intensive recreation area, and vegetation is primarily composed of Lodgepole pine. Riparian vegetation is mostly confined to the first 10 to 20 ft. from the stream/lake bank or within the wetlands. Most of the lodgepole pine in this area is dead and very dense and jack-strawed as a result of the bug kill. Some regeneration of small lodgepole pine (approx. 6 ft. tall) is present especially along the Forest Road 16. As a result, small instream woody debris or future instream small woody debris loads are high but large and medium instream woody debris loads are low. The upper reach is in a wetland meadow and only a few trees are available for recruitment; therefore,

instream woody debris loads were low. In this area, approximately 60 acres of Riparian Reserve were burned during the Pole Creek fire, none of which were adjacent to the channel and half were only underburned.

Driftwood Campground is along the north shore of Three Creek Lake and there are numerous dispersed campsites along Little Three Creek Lake. Three Creek Meadow campground and numerous hiking and horse trails are located off the 1600-800 road and are adjacent to the wetlands surrounding Three Creek. The campsites have increased compaction around the lakes and wetland and have reduced lakeside vegetation in some areas. Also, many of the dead trees along the 16 road and in the campgrounds in the Riparian Reserves have been felled and left to mitigate the safety risk.

Downstream of the Forest Road 16 Corridor where Three Creek and its intermittent tributary become confined and higher gradient, hillslopes in the Riparian Reserve are still predominately lodgepole pine with very little riparian vegetation. The Project area lies within this landscape. The 2007 stream survey report stated that pieces of medium and large sized woody debris per mile in Three Creek were high only in reach 1 (intermittent reach in Project area) and 4 (perennial reach upstream of Project area near lake). This is most likely due to larger ponderosa pine and spruce in reach 1 and larger spruce and white fire in reach 4 (see Fisheries Report). Reaches 2 (perennial reach in Project area) and 3 (perennial reach upstream of Project area) were dominated by lodgepole pine and white fir. Approximately 80 acres of Riparian Reserve were burned during the Rooster Rock fire which burned 6.2 miles along the intermittent reach of Three Creek, most of which was mixed mortality (25-75% tree mortality) and most ground vegetation burned.

Riparian Reserves of the two intermittent streams in the Snow Creek Ditch subwatershed are composed of Lodgepole pine, much of which is dead. Down wood in-stream and in the Riparian Reserve is high but future recruitment is low until new vegetation establishes.

Alternative 1 - Ecological Trends

The effect to channel conditions under the No Action Alternative would remain the same as described in the existing condition because no project activities would occur. Within the analysis area, but outside the Project area, 140 acres of Riparian Reserves and 6.2 miles of stream were burned in recent fires. In-stream wood is expected to increase significantly as standing dead trees in riparian areas fall; however, long-term large wood recruitment would be reduced as riparian vegetation recovers. In-stream wood would help mitigate potential increases in peak flows and sedimentation from the Pole Creek Fire by dissipating stream energies, creating new pools, and trapping sediment.

Given that much of the Three Creek Riparian Reserve has a high or moderate fire hazard rating, effects of a wildfire could reduce bed and bank stability by increasing peak flow and sedimentation. In addition, Riparian Reserves would not be providing important shade, nutrients, and cover for many years. In-stream wood would increase in the short-term but long-term recruitment would be reduced, thus prolonging channel stability

Measures for analysis of channel condition effects of the Melvin Butte Vegetation Management Project are shown in Table 27.

Table 27 Issues and measures for channel condition.

Issue	Measures	No Action	Alternative 2 and 3
Channel Condition	Alteration of stream/lake bank and bed stability measured by changes in streamflow and sedimentation using measures shown in Tables 8 and 9.	0	0

	Acres treated in floodplain.	0	0
	Acres harvested in potential large wood recruitment areas in Riparian Reserves.	0	0
	Percent of project area with a high or moderate fire hazard rating.	(H) 45% (M) 23%	(H) 7% (M) 13%

Alternative 2 and 3 - Direct and Indirect Effects

The Action Alternatives would not negatively affect channel condition because no undesirable effects to streamflow, sedimentation, riparian vegetation, and large woody debris recruitment would occur within riparian protection areas (includes Riparian Reserves and ephemeral drainages) (Table 26). Channel stability would not be compromised by the proposed activities because no trees would be felled within 300 ft. of perennial water, 150 ft. of intermittent streams, or within or along the banks of ephemeral channels to protect the tree root influence area. Closing and decommissioning 6.4 miles of road in hydrologically connected areas would improve channel stability and near channel vegetation. Streamflow and sedimentation effects are not predicted because no activities besides haul on existing roads would occur under the Action Alternatives (see Streamflow and Sedimentation Effect sections in this report). Riparian vegetation would not be affected because no treatments would occur within the Riparian Reserve. However, ephemeral channel conditions may improve as a result of road closure and decommissioning and may help reduce the downstream streamflow and sedimentation effects. In addition, the likelihood that a wildfire could cause stand replacing mortality in the riparian Reserves would be reduced by the upland treatments under the Action Alternatives.

Large wood recruitment would not be negatively affected because no treatments would occur within the potential large wood recruitment area. Because there are no debris slide or landslide prone areas outside of Riparian Reserves within the Project area, the primary wood recruitment areas in the Melvin Butte project area are approximately 100 foot on each side of a channel (Benda et al. 2002). Haul on system roads in the Riparian Reserve would not affect streamflow, sedimentation, riparian vegetation, or large wood recruitment. This is because all haul would be on existing roads and would not reduce riparian vegetation or large wood recruitment.

Alternatives 2 and 3- Cumulative Effects

Hydrology effects from the activities proposed in the Melvin Butte Vegetation Management Project would not incrementally add to cumulative effects because no effects to any hydrology parameters are predicted. In addition, there is the potential that upland vegetation treatments could reduce undesirable effects to hydrology resources if a wildfire were to occur.

The hydrology cumulative effects analysis area for the Melvin Butte Project is the same as the analysis area used for existing condition and direct and indirect effects because it encompasses all the areas upstream and downstream of the Project area that are hydrologically connected to the Project area (see Analysis Methods section). Cumulative hydrology effects different from natural conditions would continue as a result of past or on-going activities or events such as fire suppression, roads in riparian areas, and compaction in riparian areas from past logging and recreation use (i.e. dispersed camping, off-road vehicle use). Cumulative effects from bug kill and recent fires would continue to have the greatest potential effect on hydrology. Cumulative hydrology effects from past activities would be the same as those discussed in the No Action Alternative. Although activities proposed in the Melvin Butte Project could occur in areas that have had past activities, the proposed activities are not predicted to cause any hydrology effects; therefore, the project would not incrementally add to cumulative effects. The only potential cumulative effect to the hydrology resource are beneficial effects from reducing hydrologically connected roads and the fire hazard rating in the project area.

The only on-going or future foreseeable activities in the Melvin Butte Project area are the Pole Creek Fire Salvage (20 ac of overlap), firewood cutting in the Three Creek Firewood cutting area (2834 ac of overlap), implementation of the Travel Management Rule, and management of invasive plants (Cumulative Effects Tables 13-14). No changes to the existing firewood cutting area would occur under this proposal. Travel management legally restricts motorized access to designated open roads but no physical road closures or decommissioning occur under this rule; therefore, no physical changes occur on the ground and roads that were already closed will remain closed. Management of invasive plants which includes pulling weeds and, potentially in the future, use of herbicide, will continue. Future herbicide treatments, if necessary, would be localized and would meet strict soil and water guidelines.

On-going or future foreseeable projects that overlap the Melvin Butte hydrology analysis area are the Pole Creek Salvage (55 ac of overlap), Sisters Area Fuels Reduction (SAFR) Project (2,126 ac of overlap), and infrastructure removal in the Three Creek Lake area (Cumulative Effects Tables 13-14). Salvage of burned timber from the Two Bulls Fire is proposed to occur on the private land of Skyline Forest to the east of the Project area. These activities would not affect hydrology resources in the Melvin Butte hydrology analysis area because the Two Bulls Fire area is outside of the hydrology analysis area. Environmental Analyses have been completed for the timber projects in the Melvin Butte hydrology analysis area and no negative hydrology effects were predicted. As a result of the Pole Creek Salvage, SAFR and the Melvin Butte Project up to 33 percent of the Three Creek subwatershed could receive vegetation treatments in the next 5 years. However, none of the projects would treat Riparian Habitat Conservation Areas or Riparian Reserves in the Three Creek drainage. Hydrology effects are not expected from the vegetation, salvage, and fuels projects because activities are focused outside of riparian protection areas, no new roads are proposed, harvest within the Three Creek subwatershed would focus on dead tree and small tree removal (i.e. thinning), and soils and precipitation patterns in these project areas do not usually result in overland flow. Although, evapotranspiration could be reduced in the watershed by the cutting of trees, it would not be at a magnitude or in a location that would have an effect on streamflow or sedimentation. Likewise, streamflow in these project areas is not highly sensitive to reduction in evapotranspiration due to high infiltration rates and low annual precipitation. All cutting or harvest of live trees would be for stand health and fuels reduction, thereby leaving the majority of trees.

Infrastructure removal would include removing the Three Creek Lake Dam, Little Three Creek Lake Dam, and obliterating the ditch that connects the Lakes and the ditch below Three Creek Lake. These activities are proposed to alleviate the risk of dam failure on structures that are no longer needed nor safe. Removal of these features would benefit aquatic resources by restoring natural channel flow and improving aquatic organism passage.

FISHERIES AND AQUATICS

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Fisheries and Aquatics specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

This section documents the review and findings of the Forest Service planned programs and activities for possible effects on species (1) listed or proposed for listing by the USDI Fish and Wildlife Service (USFWS) as Threatened or Endangered; or (2) designated by the Pacific Northwest Regional Forester as Sensitive; or (3) required consultation with the National Marine Fisheries Service (NMFS) under the Magnuson-Stevens Fishery Conservation Act (MSA). It 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 following analysis addresses the potential effects of the Melvin Butte Vegetation Management Project on threatened, endangered, and sensitive fish and other aquatic 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 in 2011. Sensitive aquatic invertebrate species were identified in the 2011 list on the Deschutes National Forest and are covered in this report.

Regulatory Framework/Management Direction

A number of Forest planning documents and assessments guide the development of the purpose and need and the proposed action. All federal land management activities in the Melvin Butte Vegetation Management Project area must follow standards and guidelines listed in the 1990 Deschutes National Forest Land and Resource Management Plan (USDA Forest Service 1990), as amended by the Northwest Forest Plan (NWFP) (USDA Forest Service and USDI Bureau of Land Management 1994), and in accordance with Best Management Practices (WT-5; USDA Forest Service 1998a) and the Clean Water Act (WT-1). All National Forest lands in the Melvin Butte Vegetation Management Project area fall under the guidance of the NWFP. Additional guidance is provided by the Whychus Watershed Analysis (USDA Forest Service 1998b), the Whychus Late Successional Reserve Assessment (USDA Forest Service 2001), and the Whychus Watershed Analysis Update (USDA Forest Service 2013b, Press 2009, Dachtler 2009). In addition, the Greater Sisters Country Community Wildfire Protection Plan was consulted in developing the proposed action.

Deschutes National Forest Land and Resource Management Plan

The following standards and guidelines from the Deschutes Land and Resource Management Plan are applicable to the project:

RP-3. Give preference to riparian area dependent resources.

RP- 8. Evaluate the cumulative effects of proposed projects on water quality, runoff, stream channel conditions and fish habitat and adopt measures to avoid adverse effects to these resources.

RP- 10. Manage woody debris and riparian vegetation to: 1) maintain or enhance stream channel and bank structure, and, 2) provide structural fish habitat to meet the objective for resident fish populations provided for in the Forest Plan.

RP-39. Large organic material which is beneficial to fish, wildlife or water quality will be preserved in riparian areas, stream or river channels and lakes adjacent to summer homes. Streambank erosion or esthetic enhancements are not adequate reasons for its removal. The material may be altered if it creates a safety hazard, however its contribution to the riparian resources will be preserved.

Northwest Forest Plan

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) (USDA Forest Service and USDI Bureau of Land Management 1994).

The entire Melvin Butte project area is managed under the direction of the Northwest Forest Plan.

The Riparian Reserve land allocation was established as a key element of the Aquatic Conservation Strategy where riparian-dependent resources receive primary emphasis. The Matrix land allocation consists of lands outside other designated areas; it was intended in the Northwest Forest Plan that most

timber harvest and other silvicultural activities would occur in the Matrix areas that have suitable forest lands.

The action alternatives meet all the applicable standards and guidelines in the Deschutes National Forest LRMP (USDA Forest Service 1990) (LRMP) as amended 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) (USDA Forest Service and USDI Bureau of Land Management 1994). All riparian areas within the project area are located within the Northwest Forest Plan Area. No acres in Riparian Reserves would be treated under any of the Action Alternatives.

The Melvin Butte Vegetation Management Project complies with the following four requirements for projects within Riparian Reserves as directed in the ROD (USDA Forest Service and USDI Bureau of Land Management 1994): "1) review projects against the ACS objectives at the project or site scale, rather than only at the watershed scale, 2) evaluate the immediate (short-term) impacts, as well as long-term impacts of an action, 3) provide a description of the existing condition, including the importation physical and biological components of the 5th field watershed; and 4) provide written evidence that the decision maker considered relevant findings of watershed analysis" (USDA Forest Service and USDI Bureau of Land Management 2007). There are no activities associated with the Melvin Butte Vegetation Management Project that are planned within Riparian Reserves. The Melvin Butte Vegetation Management Project meets the four requirements by: 1) providing an analysis of the ACS objectives in the Environmental Assessment, 2) discussing the effect of the proposed Melvin Butte Vegetation Management Project and other past, present and future foreseeable projects on the existing condition in the hydrology report, 3) referencing the Sisters/Whychus Watershed Analysis (USDA Forest Service 1998b), and the Whychus Watershed Analysis Update (USDA Forest Service 2013b) which describe the existing condition for the portion of Whychus watershed on the Sisters Ranger District.

The NWFP provides standards and guidelines for Key Watersheds and Riparian Reserves (RRs) that prohibit or regulate activities that retard or prevent attainment of the Aquatic Conservation Strategy (ACS) Objectives at the project-level and watershed scale. Key watersheds under the NWFP contribute directly to the conservation of the threatened bull trout and resident fish populations. They also have the highest priority for watershed restoration and watershed analysis is required to set priorities for restoration. Tier 1 Key watersheds under the NWFP contribute directly to the conservation of the threatened bull trout, anadromous fish populations and resident fish populations. Tier 2 Key Watersheds may not contain at risk fish stocks but are important sources of high quality water.

Currently only the Three Creek and Headwaters Whychus Subwatersheds are considered Tier 2 Key Watersheds. Three Creek subwatershed was designated a Tier 2 Key Watershed for the long-toed salamander population that lives in the pond off the 1600-370 road and other unique amphibian habitats in the Three Creek drainage. The Melvin Butte Project is within portions of that Tier 2 Key Watershed and also within areas that are not designated as Key Watersheds.

<u>Northwest Forest Plan Standards and Guidelines</u>

The NWFP (USDA Forest Service and USDI Bureau of Land Management 1994) provides standards and guidelines for Timber Management, Roads Management, Fire Fuels Management, Key Watersheds and Riparian Reserves (RRs) that prohibit or regulate activities that retard or prevent attainment of the Aquatic Conservation Strategy (ACS) Objectives at the watershed scale (see below). All proposed actions in the Melvin Butte Vegetation Management Project comply with the Key Watershed and Riparian Reserve standards and guidelines in the NWFP. The following NWFP standards and guidelines apply to the project:

Key Watersheds and Roadless Areas

- Inside Roadless Areas - No new roads will be built in remaining unroaded portions of inventoried (RARE II) roadless areas.
- 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 are highest priority for watershed restoration.
- Watershed analysis is required prior to management activities, except minor activities such as those Categorically Excluded under NEPA (and not including timber harvest). Watershed analysis is required prior to timber harvest.

Standards and Guidelines

Roads Management

RF-1. Federal, state, and county agencies should cooperate to achieve consistency in road design, operation, and maintenance necessary to attain Aquatic Conservation Strategy objectives.

RF-2. For each existing or planned road, meet Aquatic Conservation Strategy objectives by:

a. minimizing road and landing locations in Riparian Reserves.
b. completing watershed analyses (including appropriate geotechnical analyses) prior to construction of new roads or landings in Riparian Reserves.
c. preparing road design criteria, elements, and standards that govern construction and reconstruction.
d. preparing operation and maintenance criteria that govern road operation, maintenance, and management.
e. minimizing disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow.
f. restricting sidecasting as necessary to prevent the introduction of sediment to streams.
g. avoiding wetlands entirely when constructing new roads.

RF-5. Minimize sediment delivery to streams from roads. Outsloping of the roadway surface is preferred, except in cases where outsloping would increase sediment delivery to streams or where outsloping is unfeasible or unsafe. Route road drainage away from potentially unstable channels, fills, and hillslopes.

RF-7. Develop and implement a Road Management Plan or a Transportation Management Plan that will meet the Aquatic Conservation Strategy objectives. As a minimum, this plan shall include provisions for the following activities:

a. inspections and maintenance during storm events.
b. inspections and maintenance after storm events.
c. road operation and maintenance, giving high priority to identifying and correcting road drainage problems that contribute to degrading riparian resources.
d. traffic regulation during wet periods to prevent damage to riparian resources.
e. establish the purpose of each road by developing the Road Management Objective.

Fire/Fuels Management

FM-1. Design fuel treatment and fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuels management activities could be damaging to long-term ecosystem function.

FM-4. Design prescribed burn projects and prescriptions to contribute to attainment of Aquatic Conservation Strategy objectives.

FM-5. Immediately establish an emergency team to develop a rehabilitation treatment plan needed to attain Aquatic Conservation Strategy objectives whenever Riparian Reserves are significantly damaged by wildfire or a prescribed fire burning outside prescribed parameters.

Watershed and Habitat Restoration:

WR-2. Cooperate with federal, state, local, and tribal agencies, and private landowners to develop watershed-based Coordinated Resource Management Plans or other cooperative agreements to meet Aquatic Conservation Strategy objectives.

Whychus Watershed Analysis

The Whychus Watershed Analysis and the update include portions of the Deep Canyon Watershed that includes Three Creek and the Melvin Butte Vegetation Management Project area. Recommendations from the Whychus Watershed Analysis and update (USDA Forest Service1998, 2013b) that relate to Riparian Reserves and apply to this project are as follows:

- Restore Forest Habitats through Vegetation Management (page 227).
- Aggressively thin plantations to accelerate large tree development, especially next to Riparian Reserves.
- Promote large tree character in ponderosa pine, mixed conifer dry and wet areas along Riparian Reserves to enhance connectivity.
- Protect springs in the Three Creeks (formerly Melvin) subwatershed from vehicle and foot traffic.

Riparian Reserve Buffer Distances

The Sisters/Whychus Watershed Analysis refined Riparian Reserve widths under the Northwest Forest Plan (NWFP) based on average maximum tree height, 100 year floodplain, extent of riparian vegetation, and unstable and potentially unstable lands (USDA Forest Service 1998b) (Table 28). These distances meet those as defined by the NWFP. Ephemeral channels or draws are not defined and do not have established buffers under the NWFP.

Table 28 Riparian reserve (RR) widths in the Melvin Butte Vegetation Management Project area.

Category	*Stream Class*	*Description*	*RR width (slope distance (ft) from edge of channel)*
1	1 & 2	Fish-bearing streams	300 ft
2	3	Permanently flowing non-fish-bearing streams	150 ft
3	NA	Ponds, lakes, reservoirs, and wetlands > 1 ac	150 ft
4	4	Seasonally flowing or intermittent streams, wetlands < 1 ac, unstable or potentially unstable areas	150 ft

Site specific assessments should be applied by qualified personnel when delineating Riparian Reserves on the ground. As a minimum include these factors:

- Floodplains- In most cases narrow areas along stream margins and wetlands. However several locations within the watershed have broad floodplains and an intricate network of flood prone channels.

- Riparian vegetation- Connect wet meadows to nearby streams where not directly connected. Examples include Three Creek meadow.
- Stream terraces, benches, and the inner gorge- Should be included to the outer edge with adequate protection for the slopes leading to the waterbody.
- Unstable land- The majority of the area is not prone to slope failures. Areas with highly or moderately erodible soils will not be treated under the action alternatives (see Soils report). Also areas over 30% slope with seeps, example: near Rd 1514 on Whychus Creek, cinder slopes near Snow Creek, and Three Creek.
- Saturated soil and seeps- Provides areas for wetland vegetation to grow and serve as wildlife and amphibian habitat. Several riparian meadows exist in Upper Whychus Creek and Three Creek. Several of the meadows are of a fen peat nature and have unique wetland plant species (see Melvin Butte botany report)
- Rock outcrops- included because of their importance for amphibians and other species.
- Create Riparian Reserve complexes- Where Riparian Reserve boundaries are very close or overlapping consolidate into one large reserve. Consolidate complexes of meadows, intermittent streams, seeps, wetlands, ponds, rock outcrops, and other unique or special habitats.

Project Design Criteria and Best Management Practices – Aquatics

Best Management Practices (BMPs) and Project Design Criteria (PDC) were developed for the Melvin Butte Vegetation Management Project using the National Core BMP Technical Guide (USDA Forest Service 2012b) based on recommendations in the 2013 Whychus Watershed Analysis Update (USDA Forest Service 2013b), field verification, and the best available science. The BMP and PDC that provides the most protection for the hydrology resource in the Melvin Butte Project area is restricting treatment within Riparian Reserves to road closure and decommissioning. Any springs, wetlands, or ephemeral channels found during Project implementation that were not originally mapped or identified should be protected by using the Riparian Reserve and ephemeral channel buffers identified in this EA (Table 1). BMPs and PDC were discussed with operations personnel to ensure feasibility for implementation effectiveness. BMPs and PDC are discussed throughout the effects analysis of this report and are the primary mechanism to mitigate potential hydrologic effects from the project.

BMP implementation and effectiveness has been systematically monitored across National Forest Lands in California since 1992. From 2008-2010, randomized monitoring showed 91% of BMPs were implemented, and 80% of implemented BMPs were rated effective. BMPs for timber harvests, fuels treatments, and vegetation management were consistently highly effective, while BMPs for other activities, including roads, range management, recreation, and mining, were less effective (USDA Forest Service 2013a). At sites where BMPs were not implemented or effective the monitoring program includes a strong feedback loop to take corrective action on non-compliance scenarios.

At the national scale, a consistent program to monitor BMP implementation and effectiveness has been in development for several years. Monitoring of BMP implementation and effectiveness using the national BMP protocols has taken place on the Deschutes National Forest since 2011. Monitoring results from vegetation management projects indicate that BMPs intended to minimize effects to water, aquatic and riparian resources were successfully implemented, and BMPs intended to minimize effects from landings and ground-based mechanical harvest were successfully implemented, including landing location, spacing of skid trails, and retention of cover (USDA Forest Service 2011a, 2012a). Select BMPs, PDC, and project design elements are shown in Table 29.

Table 29 Select project design considerations, BMPs, and PDC for the Melvin Butte Vegetation Management Project.

Practice	Initial Project Design Element	BMP/PDC
No harvest, mowing or prescribed fire in Riparian Reserves	X	X
Buffer hydrologically connected ephemeral draws and limit designated crossings (see specifics below)		X
Buffer ditches according to Forest ditch guidance (see specifics below)	X	
No new road construction	X	X
No temporary road construction or use in Riparian Reserves		X
No haul on hydrologically connected roads or roads within riparian reserves when conditions are wet and can cause sedimentation to reach Three Creek (see specifics below)		X
No haul across stream fords when streams are flowing		X
Drainage improvement on unstable hydrologically connected roads before haul can occur and regular preventative maintenance (see specifics below)		X
Closure of 6.2 miles of road upon project completion	X	
Planned decommissioning of 6.4 miles of road.	X	
Decommission all temporary roads		X
Installation of waterbars on skid trails where needed		X
Construction of new landings and skid trails would be minimized		X
No ground-based harvest on slopes over 30%	X	

Initial project design elements were included in the development of the Proposed Action. BMPs were developed using recommendations in the National Core BMP Technical Guide (USDA Forest Service 2012b), and site-specific analysis of the project area

Project Specific Design Criteria

Ephemeral Channels -

- The intent of this design element is to protect the integrity of the channel banks, provide for wood recruitment, reduce sedimentation, and dissipate stream energy.
- Mechanical treatment, including mowing, is not allowed within 30 ft. of ephemeral channels, unless approval is granted by a hydrologist or fish biologist to allow some treatment in low risk areas. Underburning is allowed.
- Hand-thinning or minimal reaching in with equipment is permitted but cutting any trees within the channel or on the banks is not allowed.
- Allow crossings of channel at designated areas during dry season or unless approval is granted by a hydrologist or fish biologist
- Do not locate slash or burn piles in swales, washes, or depressions.

Ditches

- The intent of this design element is to protect the integrity of the ditch and protect stream water quality.
- Ditches and channelized streams that are functioning as a stream should be buffered based on the class of stream for which they are functioning (i.e. Class 4 buffer if the ditch is intermittent, etc.).

- Ditches that do not connect back to a stream (i.e. they feed out into a pasture or irrigation device) should be buffered 30 ft. to protect the integrity of the channel. No mechanized equipment is allowed within the buffer. Hand-thinning or reaching in with equipment is permitted but do not cut any trees within the channel or on the banks. Do not fell or yard any trees across the channel in order to protect channel integrity.
- Abandoned ditches with no active water rights to use the water in the future do not need a buffer.

Haul Roads

- The intent of this design element is to reduce sedimentation to Three Creek caused from hauling.
- Roads that may need maintenance or that should be monitored for excessive wetness in hydrologically connected areas are (other roads may be identified in the field):
    - 1620-377 – adjacent to ephemeral draw, decommission after use;
    - 1620-570 – adjacent to ephemeral draw, close after use;
    - 1620-880 – adjacent to ephemeral draw;
    - 1624-360 – adjacent to ephemeral draw, decommissioning after use.

Existing Condition

Within the project area, Three Creek and Three Creek Lake were historically fishless and now contain non-native brook trout and hatchery rainbow trout. Over two miles outside of the project area Whychus Creek has native redband trout, and chinook salmon and steelhead have recently been reintroduced up to the Three Sisters Irrigation District (TSID) diversion dam. There is no surface flow connection from the project area to Whychus Creek. Redband trout are on the USFS Region 6 sensitive species list. Steelhead and chinook populations being reintroduced are considered experimental populations. Figure 10 displays stream survey reaches for Trout Creek.

Bull trout and bull trout critical habitat are documented over 27 miles away in the lower 5 miles of Whychus Creek and no historical records exist of them farther upstream. It is possible some bull trout use once existed above Sisters but runs may have been lost during the early 1900's when major water diversions began to occur. The following sections describe general hydrology, flow regimes and current and historical fish populations for all major streams within and downstream of the project area.

Three Creek

Three Creek originates from Three Creeks Lake which has a small earthen dam built in the early 1900's to increase water storage. Three Creek Lake, Three Creek and Little Three Creek Lake were originally fishless with no surface connection to other waterbodies. Three Creek disappears and goes subsurface before reaching highway 20 near Plainview. Three Creek was historically almost entirely diverted for agricultural purposes approximately 3.8 miles downstream from the lake. Three Creek Lake receives additional flow via a ditch from Little Three Creek Lake. The channel from Little Three Creek Lake historically went back into Three Creek near the 16 road crossing but was diverted to Three Creek Lake for additional water storage. Three Creek goes dry on certain years even with additional storage provided by ditches that come from Little Three Creek Lake. Another ditch once carried water from Snow Creek to Three Creek Lake but this ditch has not been used for some time. Irrigation diversions and water rights from Three Creek appear to be no longer used. Restoration opportunities may exist for restoring flow to wetlands and streams that once flowed from Little Three Creeks Lake. The Three Creek Lake dam has been determined to be unstable and is no longer used to store water.

Habitat surveys were performed on Three Creek during 1992 and 2007. Data presented in this report is primarily from the 2007 habitat survey and reaches are displayed in Figure 10. Stocking of rainbow trout and brook trout began in the early 1900's. A self-sustaining population of brook trout exists and most

likely spawns wherever they can find suitable areas, which may include a few small tributaries and the shoreline. Brook trout have been observed spawning in Three Creek below the Lake and in the ditch that comes over from Little Three Creek Lake. Large numbers of catchable hatchery rainbow trout are still stocked on a yearly basis in Three Creek Lake.

Some small springs fed streams enter Three Creek Lake but most flow comes from snow melt in the spring. A lush riparian meadow with willows and sedges is located from the dam down to the 16 road. This section of stream is highly sinuous, has several side channels and some deeper pools with undercut banks. A flow of 1.4 cfs was recorded during the 2007 stream survey. Most of the streams brook trout population is located in this section of stream. Downstream of the 16 road the stream is more entrenched, higher gradient and has fewer pools. Several small waterfalls and cascade sections are also located in this area.

Other Unnamed Perennial and Intermittent Streams

One intermittent stream and several small spring fed streams occur within the project area that drains into Three Creek. Another intermittent stream flows out of the project area with no surface connection to waterbodies. This goes subsurface and disappears before reaching highway 20 near Plainview. There may be additional springs, perennial streams and intermittent streams that are not mapped within the project area. If these are discovered during the course of the project fisheries or hydrology specialists will evaluate them and determine appropriate protections for these areas.

Ephemeral channels are not defined under the Northwest Forest Plan. For this project ephemeral channels are defined as those that run water on occasion but do not run water on an annual basis during years with normal or average amounts of precipitation. Typically ephemeral channels lack evidence of scour for most of their length.

Water Temperature

Water temperature is a fundamental parameter affecting a waterbodies ecology (Minshall 1978, Vannote et al. 1980). As a stream moves from headwaters to mouth exposure to solar radiation increases and water warms to near the ambient air temperature (Bartholow 1989). Water temperature is used as a stimulus to salmonid migration, spawning and habitat selectivity.

Land management activities can significantly affect water temperature. Vegetation manipulation by overstory removal can affect the shade cover and the amount of solar radiation input into the water surface. The water table can be altered by allowing encroachment of upland vegetation into the riparian zone. Creating large openings within the riparian zone canopy along streams can lead to increased water temperatures.

Water temperatures in Three Creek vary depending on flow and time of year. Water temperatures are elevated because surface water from the lakes is the primary water sources during the summer months. Water temperatures in Three Creek during the 2007 stream inventory ranged from 9 ^{o}C to 20 ^{o}C using a hand held thermometer, with highest temperatures in August.

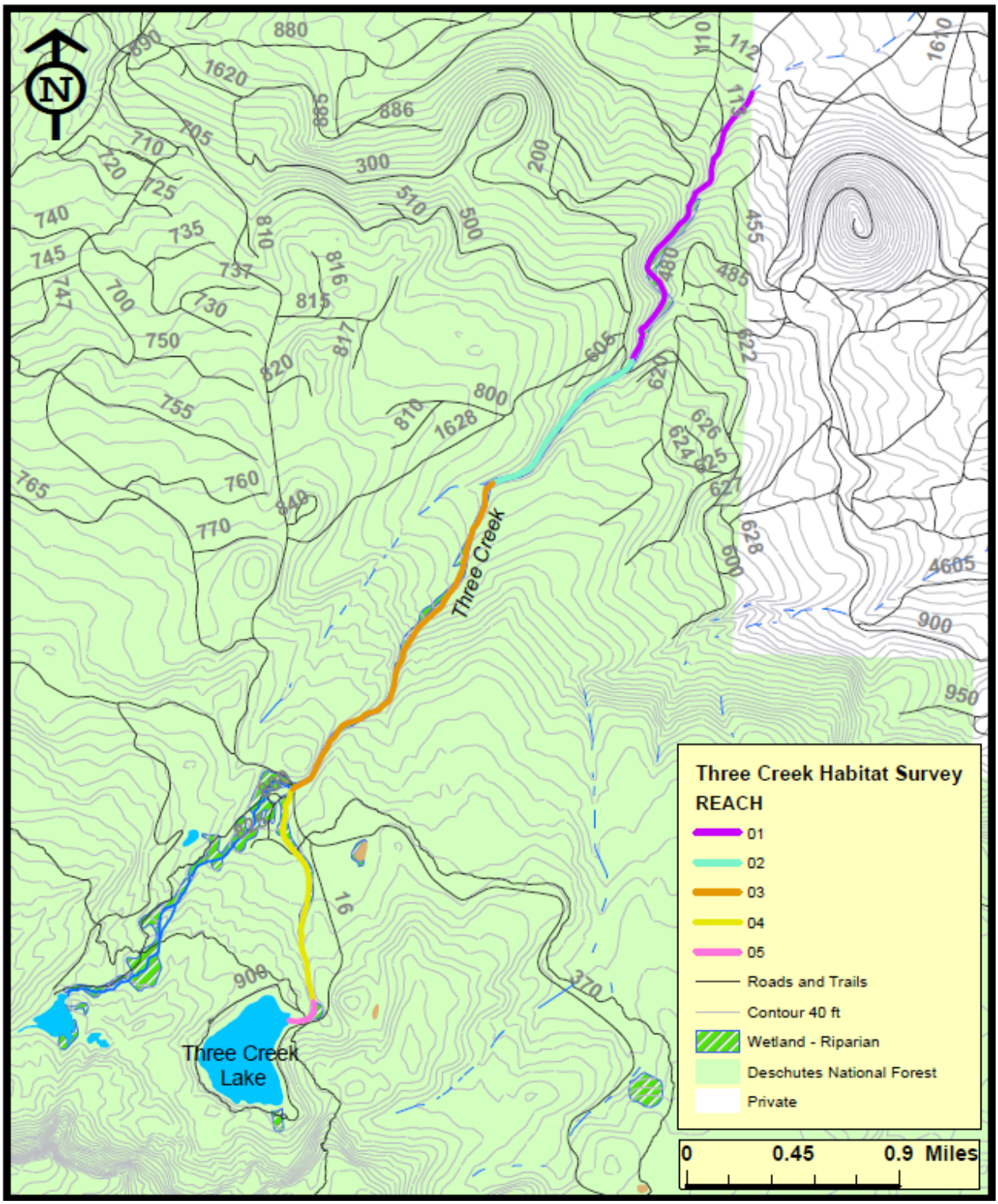


Figure 10 Steam habitat survey reaches for the Three Creek in 2007.

Streambed Embeddedness

High embeddedness can restrict winter rearing habitat for juvenile trout and salmon by filling in spaces between rocks in the streambed that could be used as cover for fish. Also, macroinvertebrates use the gravel for hiding and feeding and the more fine sediment the less habitat for macroinvertebrates.

Streams in the project area have not been sampled for embeddedness but during older stream surveys (previous to 1995) embeddedness was estimated as a yes or no if more than 35 % of the cobble or gravel substrate in a habitat unit was embedded with fine sediments. More recent stream surveys (post 1995) used pebble counts in riffles to sample surface substrate at two riffles approximately 1/3 and 2/3 through each reach. The pebble counts were done within the bankfull channel which often reflects more fine sediments than what are on the bottom of the wetted channel. This is because stream banks are often made up of mostly finer silt and sand sized particles. High embeddedness can restrict winter rearing habitat for juvenile trout and salmon by filling in spaces between rocks in the streambed that could be used as cover for fish. Also, macroinvertebrates use the gravel for hiding and feeding and in general, the more fine sediment the fewer habitats there is for macroinvertebrates.

Three Creek was not measured for embeddedness during the 2007 or 1992 stream inventories. Pebble counts performed in 2007 within the bankfull channel of riffle habitats found the highest amounts (23-31 %) of fine sediments (<2mm) in the upper half of reach 2 and reach 3. However, the other 8 pebble counts found amounts of fine sediments less than 20 % and this indicates that substrate embeddedness would be unlikely for Three Creek.

Large Wood

Large wood is an important habitat feature for bull trout, chinook salmon and other salmonids. Wood also has a great impact on channel morphology and hydrologic stability (Abbe and Montgomery 1996) and is important for pool formation and pool volume. Wood can also influence the contribution and retention of organic matter and sediment (Fausch and Northcote 1992; Angermeier and Karr 1984; Beechie and Sibely 1997). The importance of these functions enhances fish and invertebrate biomass and production (Dudley and Anderson1982; Bilby and Ward 1989; Fausch and Northcote 1992). Large wood is used as cover for all stages of fish and promotes a more complex environment that produces increased fisheries biomass (Fausch and Northcote 1992; Bisson et al. 1988) and greatly increases the resiliency and resistance of fish species to floods and droughts (Pearsons et al. 1992).

The primary wood recruitment zone for streams which gain most of their wood from tree mortality is within 100ft slope distance from the stream bank (Benda et al. 2002). Benda and others studied wood recruitment rates for streams based on dominant process (i.e. tree mortality, bank erosion or landslide). On a coastal stream in an old growth forest in Northern California, the primary source of wood was found to be bank erosion and mortality. Over 90% of the wood entered the channel from within 30 m slope distance of the stream edge. In the Three Creek subwatershed, the trees are much shorter and bank erosion is not active in many locations. Wood recruitment prediction for streams in which 100% of the wood is recruited to the channel in less than 100ft (Benda et al. 2002).

Pieces of medium and large sized woody debris per mile in Three Creek were high only in reach 1 and 4 and this is most likely due to larger ponderosa pine and spruce in reach 1 and larger spruce and white fire in reach 4 (Table 30). Reaches 2 and 3 were dominated by lodgepole pine and white fir. Lodgepole pine seldom grows to large or medium sizes. Reach 3 was noted as having a lot of blow down that was not countable because it was located across and above the bankfull channel. Reach 5 is in a wetland meadow and only a few lodgepole pine trees are available for recruitment. Management activities in this area have not significantly altered amounts of available wood for the stream. Amounts of small sized woody debris were moderate in all reaches except for reach 5 which had none due to the wet meadow.

Table 30 Three Creek large wood attributes from the 2007 stream inventory.

Stream	Reach	Pieces of Med. and Large LWD Per Mile	Pieces of Small LWD Per Mile	Frequency of Med. and Large LWD	Frequency of Small LWD
Three Creek	1	51.7	47.7	0.083	0.077
	2	2.2	31.1	0.006	0.084
	3	1.1	28.8	0.002	0.049
	4	31.5	12.6	0.033	0.013
	5	5.9	0.0	0.005	0.000

Pool Frequency/ Pool Quality

Pools provide rearing areas for both juvenile and adult fish. Spawning often occurs in the tail-outs of pools. Pool frequency is based on average bankfull width and not adjusted for channel type and local conditions. Pools per mile are also a good measure of pool habitat but do not take into account stream size as pool frequency does. In general larger streams have larger and deeper pools which account for fewer pools in a given mile of stream while small streams generally have more numerous smaller and shallower pools for a given mile of stream. Stream gradient, geology, and instream wood can all have a large effect on the formation and quality of pools. Pool quality for fish is described as large pools with greater than 3 ft. in depth and pools with abundant large wood.

Pools in Three Creek were generally shallow and only reach 3 had any pools over three feet deep (Table 31). This is most likely due to the small size of the stream which was 1.4 cfs (cubic feet per second) during the stream inventory.

Table 31 Three Creek pool habitat attributes from the 2007 stream inventory.

Stream	Reach	Pools Per Mile	Pool Residual Depth (feet)	Pools >3ft Deep Per Mile	# of Pools Frequency
Three Creek	1	71.8	1.0	0.0	0.116
	2	32.2	1.1	0.0	0.086
	3	24.5	1.1	0.5	0.042
	4	28.8	0.8	0.0	0.030
	5	17.7	0.6	0.0	0.016

Off-Channel Habitat

Backwaters and side channels provide important habitat for juvenile redband trout, steelhead and other salmonids in spawning tributaries. Streams with stable flow regimes provide alcove and backwater areas during all seasons. Natural recruitment of trees into unconfined stream sections will increase side channels. Log jams and the flooded areas that result can create side channels and provide important salmonid rearing habitat. Off channel habitat is also created during high flow events in the floodplain. Side channels were the only form of off-channel habitat inventoried through stream surveys.

Side channels were found in reaches 1, 3 and 4 of Three Creek during the 2007 stream inventory. Side channels accounted for 1.7 %, 2.0 % and 0.9 % of the habitat area in these three reaches, respectively. In reaches 1-3 side channel formation is restricted by a narrow flood plain and valley bottom.

Spawning Gravel Quality

Aquatic habitat is developed and persists around varieties of and scales of disturbances (Swanston 1991). These watershed disturbances recruit and remove a variety of material within the channel acting as resetting and recycling mechanisms. Fine sediment production is one type of respondent of watershed or channel disturbance such as wildfire (Beaty 1994; Minshall et. al 1997; Benda et al 2003; Wondzell and King 2003) floods (Houslet and Riehle 1998) and clear cutting (Hall and Lantz 1969). The amounts of fine sediments in spawning areas can affect the survival of salmonid eggs and alevins during incubation in redds.

Pebble counts in Three Creeks performed in 2007 within the bankfull channel of riffle habitats found the highest amounts (23-31 %) of fine sediments (<2mm) in the upper half of reach 2 and reach 3. However, the other 8 pebble counts found amounts of fine sediments less than 20 %. Amounts of gravel from pebble count data in all reaches ranged from 43 % to 77 % of the streambed substrate. Smaller sized gravel suitable for brook trout spawning exists in all reaches.

Fish Passage

Culverts on Three Creeks under the 1600-800 road 1600-900 roads are fish passage barriers under certain condition. The dam on Three Creeks Lake is a full time upstream barrier. Natural fish passage barriers also exist at several small falls and chutes in reaches 1-3 of Three Creek. The largest falls is located in reach 3 and is 15 to 20 feet tall.

Refugia

Refugia as it relates to fish are areas that provide high quality habitat or excellent water quality and often provide an area where fish can escape poor habitat or water quality conditions for part of the year. At a larger scale refugia relates to watersheds that contain high quality habitat and populations of TE listed fish species. These watersheds are often designated as Key watersheds under the Northwest Forest Plan.

In Three Creek the main area of refugia is in reach 5 up near the dam which usually has water flowing all year. This is where the self-sustaining brook trout population is located. Portions or all of reaches 1-3 go dry depending on the yearly precipitation and snowpack. Access to refugia is limited to areas upstream of fish barriers located in reach 3.

Streambank Condition and Floodplain Connectivity

Stream surveys after 1995 have measured feet of unstable stream bank located above bankfull. Floodplain connectivity is not measured with stream surveys but is the streams ability to access the floodplain and associated habitats during high flow events.

Three Creek had small amounts of instability in the lower and middle reach with none recorded in the last reach just below Three Creek Lake (Table 32).

Table 32 Percent bank instability for major fish bearing streams within and downstream of the Melvin Butte Vegetation Management Project.

Stream	Reach	Percent Bank Instability Above Bankfull
Three Creek (2007)	1	3.2 %
	2	0.7 %
	3	2.5 %
	4	0.4 %

	5	0.0 %

Effects Analysis Aquatic Species

The proposed project potential treatment would occur on 4,469 acres in the Whychus and Deep Canyon Watersheds. Only a small portion of the project is located in the Whychus Watershed and there is no surface water connection from the project to Whychus Creek. The Whychus Watershed has habitat for bull trout *Salvelinus confluentus*, a federally listed threatened species, and interior redband trout *Oncorhynchus mykiss*, which is on the Regional Forester's sensitive species list. Redband trout occur outside the project boundary and bull trout occur outside of the project area near the Whychus Creek confluence with the Deschutes River. Mid-Columbia steelhead trout (listed threatened below Pelton Round Butte Dams, were also native to Whychus Creek and reintroduction of fry below the TSID diversion dam started in 2007. A few adult returns have been confirmed in lower Whychus Creek. These species will be used to analyze the effects to aquatic fish habitats, including habitat of other native species associated with similar habitats. No native fish species exist within the project area.

Issues and Measures – Aquatics

No treatments are proposed in the Riparian Reserve to help protect riparian structure, terrestrial and aquatic habitat, and connectivity corridors in the watershed. Fuel levels are high in most of these areas due to fire suppression and/or disease. Actions proposed outside the Riparian Reserves are primarily hand thinning, mowing, piling burning, and underburning.

The following paragraph discusses potential detrimental effects from the proposed activities, however these effects are not expected from the Melvin Butte Vegetation Management Project: Hand thinning and underburning could affect the aquatic resource if shade producing trees or trees located near channels were felled or killed. Harming these trees could affect stream temperature or channel morphology. Mowing, pile burning, and underburning could cause some detrimental soil impact, and depending on the location, this could lead to sedimentation entering a waterbody. Pile burning and underburning could alter soil properties by reducing soil nutrients necessary for reestablishing vegetation where soil burn severity is high. Hydrophobicity from burning is not a concern because soils in the project area generally do not develop a hydrophobic layer from low intensity fire and generally become more porous after a burn.

Measures used to assess changes to fish populations and their habitats will assess changes to measures 1-7 (Table 33) and the magnitude, amount, duration and timing of these effects.

Table 33 Measures used for evaluating the effects of these treatments on the aquatic resources.

Measure Number	Parameters	Measures
1	Streamflow	Acres compacted in Riparian Reserve
2	Sedimentation	Acres of soil detrimentally impacted in Riparian Reserve
3	Stream Temperature	Number of trees felled in the primary shade zone
4	Waterbody Condition	Alteration of stream/lake and bed stability measured by changes in streamflow, sedimentation, riparian vegetation, and large wood recruitment
5	Wetland Condition	Acres compacted within the wetland; Acres of riparian vegetation converted to other species or no vegetation
6	Riparian vegetation	Trees killed along streambanks
7	Large wood recruitment	Acres of tree > 12"dbh harvested within primary wood recruitment area (100 ft. of a stream)
8	Fish populations	Distance to fish populations from project activities and hydrologic connections from those areas.
9	Fish habitat	Changes to instream habitat or riparian habitat that is in close enough in

		proximity to influence instream habitat. Parameters 1-7 would be used to determine these changes

Sensitive Species

General Trends

Alternative 1 –Ecological Trends -

Redband trout a USFS Region 6 Sensitive Species inhabit Snow Creek and Whychus Creek approximately 2 miles outside the project area and there is no surface water connection from the project area to Whychus Creek. Three Creek in the project area contains hatchery rainbow trout or non-native brook trout and was once fishless. Steelhead have been reintroduced in Whychus Creek outside of the project area and access is currently restricted by natural and manmade barriers but this may change in the future. Bull trout have been found over 25 miles away from the project near where Alder Springs enters Whychus Creek. Under the No Action Alternative there would be no direct impacts from vegetation or fuel treatments on redband trout, bull trout, bull trout critical habitat, steelhead or other fish species, though there could be a high risk of direct and indirect impacts should a severe wildfire occur.

The no action alternative would not cause any short-term impacts, however some areas could continue to contribute to long- term degradation. Without active restoration work, including inactivating/decommissioning roads, rehabilitating compacted sites, enhancing meadows and riparian areas, watershed recovery to a more “natural” condition may take many decades.

This alternative would not reduce the risk of catastrophic wildfire in large areas with excessive amounts of brush, unthinned stands of timber and stands of dead trees. Intense wildfires could remove all or most riparian and upland vegetation, which could contribute large amounts of sediment to stream systems, increase water yields, remove shading vegetation, and damage riparian function (Campbell and Morris 1988, Helvey 1972 as cited by Gresswell 1999). The effects of high severity wildfires on runoff and erosion are generally much more severe than the effects of prescribed fires (Robichaud et al. 2010). Furthermore, increased water yields and sediment delivery from wildfire could cause channel and streambank erosion. Increased stream temperature and sediment could adversely affect aquatic species should a large wildfire occur.

No action would maintain the habitat conditions that currently exist for fish and other aquatic species. The habitat of the Snow Creek and Whychus Creek would continue to provide good growing conditions for redband trout and future steelhead populations. Instream habitat would continue to develop in complexity from dense stands of ponderosa pine, Engelmann spruce, mountain hemlock, lodgepole pine and white fir. Certain roads in riparian area would continue to deliver low levels of fine sediment after heavy rains or rain on snow events. Amounts of sediment entering streams in runoff is predicted to be low because of the low density of ephemeral and intermittent channel that carry runoff all the way to fish bearing streams, primarily due to the high soil permeability and high infiltration rates.

The risk to long term shade, instream wood, streambank stability, and fine sediment loading increases with the increased risk of intense large scale wildfire. Without fuel treatments, the risk of stand replacement wildfire increases. The lack of upland treatments leaves the riparian areas at greater risk. Any increases in fine sediment from tributaries within a large intense wildfire may be stored in the bed of lower gradient or spring-fed reaches and may recover more slowly than higher gradient or snowmelt driven reaches with flashy flow regimes.

There are no 303(d) listed streams within the project area or in close enough proximity that they could be influenced by no action in the project area. As previously mentioned, the no action Alternative would not reduce the risk of catastrophic wildfire in large areas with excessive amounts of brush, unthinned stands

of timber and stands of dead trees. Consequently, catastrophic wildfire could reduce and eliminate riparian and upland vegetation, and result in degradation to watershed health (increased turbidity/sedimentation and temperature, and possibly decreased dissolved oxygen levels in streams. Without active restoration of upland forests and riparian reserves the risk of a large high intensity wildfire would continue to exist along streams in the project area. There would be no direct impacts to water temperatures or 303 (d) streams under Alternative 1.

The Whychus Creek Wild and Scenic area is located adjacent to the project area on Snow Creek and Whychus Creek. Fisheries and hydrology are both Outstandingly Remarkable Values (ORVs) for the Wild and Scenic Area. There would be no direct effect on the ORVs of the Whychus Creek Wild and Scenic Corridor under the No Action Alternative. Fisheries and fish habitat would be protected through current management of the corridor that protects large wood and riparian streambank conditions.

Alternatives 2 and 3 - Direct and Indirect Effects

All action alternatives will be analyzed for effects in one analysis because no treatments are proposed in Riparian Reserves (RRs). Treatments such as mistletoe treatments, thinning with group openings and temporary roads are eliminated in Alternatives 3, All analysis of upland treatments will tier to alternative 2 Alternative 2 has slightly more treatment acres (See Proposed Action for description of alternatives).

Bull trout, Bull Trout Critical habitat, redband trout and steelhead in the Whychus Creek Watershed will not be affected by the project because the majority of the project drains to Three Creek which is closed system and only has non-native fish. There is only a small portion of the project within the Whychus Watershed and there is no surface flow connection to Whychus Creek which is over two miles away. Impacts or effects to native fish species would not occur.

Forest management practices can potentially affect salmonid habitat. The following is a review of the potential effects from these types of management practices and how they are applicable to this project: Large woody debris in streams is a fundamental building block for creating and maintaining trout and salmon habitat in forested areas. Physical processes associated with debris in streams includes the formation of pools (important to both juvenile and adult salmonids) and other important rearing areas, control of sediment and organic matter storage, and modification of water quality. Biological properties of debris-created structures can include blockages to fish migration, protection from predators and high streamflow, and maintenance of organic matter processing sites within the benthic community (Bisson et al. 1987). Changes in the distribution and abundance of large woody debris in streams have resulted from timber harvest (Hicks et al. 1991). Timber harvest has reduced the amount and size of large woody debris compared to that in unharvested areas (Ralph *et al.* 1994). In the Melvin Butte Vegetation Management Project no large trees will be removed that could reach the stream and no instream wood will be removed and no effects are expected to current or future instream wood amounts.

The relative magnitude of forest practices on sediment delivery depends on factors such as soil type, topography, climate, vegetation, the aerial extent of the disturbance, the proximity of forestry activities to the stream channel, and the integrity of the riparian zone (Spence *et al.* 1996). Poor road location, construction, and maintenance, as well as inadequate culverts result in forest roads contributing more sediment to nearby streams than any other forest activities. Site disturbance and road construction can increase sediment delivered to streams through road stream interactions and surface erosion (Spence *et al.* 1996). This can elevate the level of fine sediments in spawning gravels and fill substrate interstices that provide habitat for aquatic invertebrates. Salmonid egg survival in both finer and coarser sediment types was found to be inversely related to the percentage of sediments within the incubation gravel with smaller sediments (<0.84mm) being the most detrimental to incubating eggs (Rieser and White 1988). Increases in fine sediments as a result of roads used for the Melvin Butte Vegetation Management Project is not

expected as no new roads will be constructed in the RRs, haul will only occur during the dry season, Intermittent stream crossing will only be used when dry and no temporary roads will be used in the RRs.

The removal of riparian canopy reduces shading and increases the amount of solar radiation reaching the streams. The result is higher maximum stream temperatures and increased daily stream temperature fluctuations (Beschta et al. 1987). Even small increases in temperature (1-2 ºC) can result in shifts in the timing of life history events such as spawning and incubation. The cumulative effects of stream temperature changes downstream of logged areas are not well documented. Increases in stream temperature are not expected as a result of the Melvin Butte Vegetation Management Project as no cut buffers will be used to protect waterbodies, all larger shade producing trees will be maintained in Riparian Reserves. Prescribed fires are not planned in the Riparian Reserve and they will be of low intensity which will not lead to significant mortality in the canopy.

Biological Effects Assessment

Redband Trout - USFS Region 6 Sensitive Species

Existing Condition

Three Creek is the main perennial stream within the project area and it is a closed system that was historically fishless. Today Three Creek contains naturally reproducing brook trout and stocked rainbow trout that find their way out of Three Creek Lake.

Outside the project area redband trout are found in Snow Creek up to River Mile 1.6 where a barrier falls exists. Steelhead or chinook were not historically documented in Snow Creek but it is potential habitat. Steelhead and chinook fry have been in released in Whychus Creek.

Alternative 1– Ecological Trends

There are no expected changes to a redband trout or their habitat from current conditions and they are not expected to be present except in perennial spring creek habitats. No in-stream work will be done and no individuals will be disturbed or harmed. No effects to water quality and streamflow flow would occur and habitats would remain unchanged for this species. Redband trout do not exist in the project area and the area waterbodies in the project area were historically fishless.

Alternatives 2 and 3 - Direct and Indirect Effects

No direct effect will occur because no in-channel work or work in Riparian Reserves will occur in areas known to contain redband trout or potential steelhead habitat. There is the potential for steelhead and chinook to someday utilize Whychus Creek and lower Snow Creek. There is also currently a natural fish barrier below the project on Whychus Creek at river mile 27.4 formed by a debris jam that has trapped bedload behind it and created a 12 ft. high waterfall (Photos on file 2011 Sisters R.D.). However this barrier has not always existed and could be washed out during a large flood event, which frequently occur on Whychus Creek.

Effects to instream flow or overland flows that could increase fine sediments are not expected because compaction and soil disturbances will not occur in Riparian Reserves. Overland flow from upland treatments which mostly consist of understory thinning is not expected as a majority of the forest canopy and down wood will remain.

Litschert and MacDonald (2009) found that timber harvest alone rarely initiated large amounts of runoff and surface erosion, particularly when newer harvest practices were utilized. Sediment delivery from timber harvest will be further reduced by locating skid trails away from streams, maintaining high surface

roughness downslope of water bars, and promptly decommissioning skid trails following harvest. The Melvin Butte Vegetation Management Project will utilize newer harvest practices, locate skid trails away from streams, maintain surface roughness downslope of waterbars and decommission skid trails following harvest. Roads within the project area used for harvest and haul activities are not expected to add measurable amounts of fine sediments to fish bearing streams by adhering to the following PDCs and mitigations: Vegetated buffers will be in place between roads and streams in most areas, no new temporary roads will be constructed in Riparian Reserves, stream fords on roads will not be crossed when water is flowing, log haul will occur during dry or frozen periods, landings will not be allowed in RRs, except in some already compacted areas near Three Creek, temporary roads will be obliterated and subsoiled (if needed) following harvest and drainage features and road maintenance will occur previous to use and when roads are obliterated following the project.

Buffers on all perennial intermittent and ephemeral streams in areas where ground disturbing activities take place will greatly reduce or eliminate fine sediment delivery to streams following falling, skidding and yarding activities. An assessment of surface erosion and sediment routing in Washington State by Rashin et al. (2006) done during the first two years following harvest indicated that a 10 m (33 ft.) setback for ground disturbance can be expected to prevent sediment delivery to streams from about 95 percent of harvest-related erosion features. A six year study by De Groot et al. (2007) in B.C. found that after carefully logging 27 % of the headwaters in a watershed no changes in fish numbers, fish condition or instream habitat were observed. In this study all riparian canopy trees were removed while leaving shrubs, keeping equipment 5 m (16 ft.) away from streams and falling trees away from streams. Habitat variables sampled by De Groot et al. (2007) in four streams following removal of the forest canopy included pool depth, fine sediment, channel exposure, undercut banks and bankfull width.

Mowing would not occur in the Riparian Reserves and effects from mowing in the uplands would be minimal because the equipment would be low impact and the ground would be mostly buffered because the equipment would drive over the brush (Sussmann 1995). Mowing would be restricted to areas outside the Riparian Reserve.

Burning will maintain current streamflow amounts and patterns as burns would be of primarily low intensity and would occur outside the Riparian Reserves(see Fuels report).

Robichaud (2000) found that initial infiltration rates in the areas burned at low severity fell within the upper end of the range from the areas left unburned and undisturbed. Several studies have documented the absence of any change in water yield when low severity burns are conducted that consume little of the duff and kill only a small portion of the live trees (Gottfried and DeBano 1990, Douglass and Van Lear 1983, Heard 2005). Experimental studies that looked at prescribed fire influences on riparian vegetation found no changes in composition of species in plots that were burned when compared to unburned plots (Bêche et al. 2005, Elliott et al. 1999). Another study that sampled a prescribed burn area found no detectable changes in periphyton, macroinvertebrates, amphibians, fish, and riparian and stream habitats compared to data collected over the same time period in four unburned reference streams (Arkle and Pilliod 2010). Prescribed fires at low intensity often do not have the same detrimental effects as wildfires. In Washington dry mixed conifer stands that were thinned and then prescribed burned had 73 % large tree survival following a wildfire compared to stands that were not treated which only had 29 % large tree survival (Pritchard et al. 2010).

Shade and instream wood will remain intact as larger trees and snags will be maintained with only the smaller trees (<12”) thinned in plantations and other limited areas in the Riparian Reserves. The large tree shade and instream wood providing component along all perennial streams will remain intact by retaining buffers along all streams. Groom et al. (2011) found that Oregon state forest practices maintained existing stream temperatures with a 52 m (171ft) buffer for clearcuts, which allowed limited harvest (thinning) within 30 m (98 ft.) and a no cut zone within 8 m (26 ft.) of fish bearing streams.

These buffer distances are less than what the NWFP requires and what will be used along the majority of stream miles in the Melvin Butte Vegetation Management Project area.

In prescribed burn areas buffers will be used to protect waterbodies and fires will be of low enough intensity that mortality of larger trees is not expected. No instream wood will be removed from streams and downed wood and riparian vegetation will be actively protected from being consumed during prescribed burns. No detrimental direct effects are expected as a result of the Melvin Butte Vegetation Management Project mainly because no treatment will occur in or near native fish bearing streams and protective buffers and mitigation measures will be used to eliminate detrimental effects to waterbodies and wetlands in the project area.

There will be no indirect effects to redband trout or potential steelhead habitat in Whychus Creek or Snow Creek. The project will not change stream temperature, instream wood, or sediment delivered to these streams. Since no measurable change in stream shade, sediment or instream wood will result from the project, there are no direct effects to redband trout steelhead or potential steelhead habitat. One study that sampled a prescribed burn area found no detectable changes in periphyton, macroinvertebrates, amphibians, fish, and riparian and stream habitats compared to data collected over the same time period in four unburned reference streams (Arkle and Pilliod 2010). Beche et al. (2005) found no prescribed fire effects on instream wood and V* (residual volume of a pool comprised of fine sediment), but did observe short-term effects on the concentrations of four ions and periphyton biomass. Beche et al. (2005) also observed an immediate (10–19 day) effect on macroinvertebrate community composition, but no effects on benthic macroinvertebrates thereafter. These effects would not be long lasting enough to affect fish food supply and most likely not have any impact on macroinvertebrates.

There will be no change to current composition and amounts of algae or macroinvertebrates in streams or waterbodies from this project. No detrimental indirect effects that could result in effects to native fish are expected as a result of the Melvin Butte Vegetation Management Project mainly because no treatment will occur in or near native fish bearing streams and protective buffers and mitigation measures will be used to eliminate effects in all Riparian Reserves.

Cumulative Effects

The cumulative effects analysis area includes all subwatersheds that streams in the project area drain into and the subwatersheds of tributaries that connect to these drainages via surface flow. The Melvin Butte Vegetation Management Project analysis area includes the subwatersheds associated with Whychus Creek but does not include subwatersheds associated with Trout Creek or Indian Ford Creek, both of which are tributaries to Whychus Creek. These subwatersheds were excluded because they only have a very ephemeral connection to Whychus Creek and are approximately 9 miles downstream of the project area. The Melvin Butte Vegetation Management Project analysis area also includes subwatersheds associated with the Three Creeks drainage. Other subwatersheds in the Deep Creek watershed are excluded because there is very little surface flow and these channels do not connect to any streams that drain out of the project area. The Melvin Butte fisheries analysis area includes portions of the following subwatersheds: Upper Whychus Creek, Middle Whychus Creek, Three Creek, Deep Canyon subwatersheds (See Hydrology Report for subwatershed acres).

No cumulative effects are expected that would detrimentally affect redband trout, potential steelhead habitat or EFH because no direct or indirect effects are resulting from the project. Past management actions in the project area and watershed may have had detrimental effects and many of those have recovered due to natural and planted revegetation growth over time. Some already existing roads or trails may contribute some sediment to streams but this amount is estimated to be very low. No major culvert or road issues were noted as contributing fine sediments to streams during the field reconnaissance for the Melvin Butte Vegetation Management Project which covered the majority of know areas with road and

stream interactions. The project will not cumulatively add to increases in flow, sediment or stream temperature or subtract from current and future instream wood at levels that would have adverse effects on fish habitat.

Determination

There will be **No Impact** to redband trout populations. The project will meet NWFP Standards and Guidelines, and/or all Project Design Criteria and minimization measures found in this document and the Melvin Butte Vegetation Management Project EA.

Effects Assessment - Bull Trout and Bull Trout Critical Habitat

USFWS Threatened Species

Existing Condition

The nearest documented bull trout populations and critical habitat are located in Whychus Creek over 27 miles away from the project. There is no surface flow connection between the subwatersheds in the project area to lower Whychus Creek where bull trout exist. Bull trout in Whychus Creek are part of the Metolius River/ Lake Billy Chinook Population. This population is considered on the healthiest in the state and in 2012 had a spawning population estimated at 1,251 adults (ODFW 2012).

Alternative 1 - Ecological Trends

There are no expected changes to bull trout or critical habitat from current conditions and they are not expected to be present in or near the project area. No in-stream work will be done and no individuals will be disturbed or harmed. No effects to water quality and streamflow would occur and habitats would remain unchanged for this species where they do exist.

Alternatives 2 and 3 - Direct and Indirect Effects

No direct effects to bull trout or critical habitat will occur as no in-channel work or work in Riparian Reserves will occur in areas known to contain bull trout. There will be no direct effects to bull trout from the project because there is no surface connection from stream in the project to those with bull trout and the nearest known bull trout population is over 27 miles away. Effects from the project itself on Riparian Reserves and streams within the project area are expected to be insignificant. Therefore there will be no detrimental effects that could carry downstream to where bull trout and critical habitat are located.

Indirect effects will not occur to bull trout as they are currently found only in the lower reaches of Whychus Creek, over 27 miles away from where work is expected to occur. Since no measurable or detectable changes in streamflow, shade, sediment or instream wood will result from the project. No impacts to algae or aquatic insect populations are expected to occur where bull trout reside or critical habitat is located. There are no anticipated indirect effects to bull trout or critical habitat.

Cumulative Effects

The cumulative effects analysis area includes all subwatersheds that streams in the project area drain into and the subwatersheds of tributaries that connect to these drainages via surface flow. The Melvin Butte Vegetation Management Project analysis area includes the subwatersheds associated with Whychus Creek but does not include subwatersheds associated with Trout Creek or Indian Ford Creek, both of which are tributaries to Whychus Creek. These subwatersheds were excluded because they only have a very ephemeral connection to Whychus Creek and are approximately 9 miles downstream of the project area. The Melvin Butte Vegetation Management Project analysis area also includes subwatersheds associated

with the Three Creeks drainage. Other subwatersheds in the Deep Creek watershed are excluded because there is very little surface flow and these channels do not connect to any streams that drain out of the project area. The Melvin Butte fisheries analysis area includes portions of the following subwatersheds: Upper Whychus Creek, Middle Whychus Creek, Three Creek, Deep Canyon subwatersheds (See Hydrology Report for subwatershed acres).

No cumulative effects are expected to occur to bull trout or critical habitat because no direct or indirect effects will occur as a result of the Melvin Butte Vegetation Management Project. This is mainly due to the far proximity of bull trout and critical habitat which is located over 27 miles from the project.

Determination

There will be **No Effect** to bull trout critical habitat or bull trout populations. The project will meet NWFP Standards and Guidelines, and/or all Project Design Criteria and minimization measures found in this document and the Melvin Butte Vegetation Management Project EA.

Biological Evaluation

Indian Ford Juga – Region Six Sensitive Species

The Indian Ford Juga is only known to exist in Indian Ford Creek located just to the north of Sisters, Oregon (Frest and Joannes 1995). There is no surface water connection between the project area and Indian Ford Creek. There would be **No Impact** to the Indian Ford Juga individuals or their habitat.

A Caddisfly – Region Six Sensitive Species

A caddisfly is thought to be a rare species that is very patchily distributed and apparently highly localized where it does occur (Wisseman pers. Comm. In USDA and USDI 2005). It is thought to be in the Cascade Mountains of Oregon and northern California. It is associated with very cold, larger spring-fed streams. There are no very large spring fed streams within the Melvin Butte project area or within close proximity of the project where this species could be effected. There will be **No Impact** to A caddisfly individuals or their habitat.

Aquatic Conservation Strategy

An essential piece of the Northwest Forest Plan is the ACS (Aquatic Conservation Strategy) which “was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands” (USDA Forest Service and USDI Bureau of Land Management 1994, B-9). Management activities proposed for watersheds must meet the nine ACS objectives as specified in the Northwest Forest Plan (pages C31-C38). Actions that could affect the ACS objectives are: vegetation treatments, haul on roads in hydrologically connected areas, and road closures and decommissioning in hydrologically connected areas. For each alternative no vegetation treatments are proposed in Riparian Reserves, so the ACS objective discussion will not address each alternative separately. Each ACS objective and how the project would maintain these objectives is discussed below (USDA Forest Service and USDI Bureau of Land Management 1994):

ACS Objective 1: Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

The Melvin Butte Project would not alter watershed or landscape scale features that could affect aquatic resources in the Deep Canyon Watershed. Proposed silvicultural treatments are located in areas outside of Riparian Reserves that would not cause landslides, increased overland flow and associated hillslope

erosion, or changes to channel morphology (see Hydrology Report). No new roads or temporary roads would be constructed that could alter watershed and landscape-scale features. Haul would occur on existing roads and Project Design Criteria would be implemented on haul roads in Riparian Reserves to reduce sedimentation effects. Under the Action Alternatives, 7.71 miles of road would be decommissioned and 5.85 miles would be closed under the Action Alternatives. Of these 12.6 miles, 0.1 miles are located in the outer extent of the Riparian Reserve and 6.3 miles parallel or cross hydrologically connected ephemeral channels. Closure and decommissioning of hydrologically connected roads would help restore the distribution, diversity, and complexity of watershed-scale ephemeral draws by allowing them to revegetation and accumulate downed wood. The Whychus Watershed analysis identified road closures and decommissioning as needed actions to help restore the watershed.

Fire behavior modeling indicates that upland treatments would reduce the threat of a wildfire that could cause stand mortality in the Project. Reducing the threat of wildfire and associated fire suppression effects would help maintain landscape-scale features. Hand thinning plantations would help restore this objective by increasing large trees over time. Thinning small trees, mowing, and burning would reduce vegetation competition and the risk of stand replacement wildfire. Large trees are an important ecosystem component that provide both terrestrial and instream wood habitat for riparian species. There has been a loss of the historic large trees in Melvin Butte Project area. Restoring large trees and associated habitats would help restore the distribution, diversity, and complexity of vegetation across the watershed. The Action Alternatives would maintain or slightly restore the distribution, diversity, and complexity of watershed and landscape-scale features.

ACS Objective 2: Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include flood plains, wetlands, upsweep areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

The Melvin Butte Project would maintain spatial and temporal connectivity within the Deep Canyon Watershed and between adjacent watersheds. Proposed silvicultural treatments are located in areas outside of Riparian Reserves and are not at a magnitude that would cause channel morphological effects or changes to the Riparian Reserve (see Hydrology Report). Fire behavior modeling indicates that upland treatments would reduce the threat of a wildfire that could cause stand mortality in the Project area. Reducing the threat of wildfire and associated fire suppression effects would help maintain vegetation in Riparian Reserves and other drainage network connections. Thinning small trees, mowing, and burning would reduce the threat of stand mortality from a wildfire. Stand mortality could affect cover in travel corridors for terrestrial and aquatic species. In addition it could reduce long-term large wood recruitment which is important for providing refugia in stream corridors. Therefore, vegetation treatments would maintain spatial and temporal connectivity within and between watersheds.

Hauling on existing road surfaces and using PDCs for haul in the Riparian Reserves would maintain spatial and temporal connectivity between watersheds. No temporary roads would be located in the Riparian Reserve and no new roads would be constructed because existing system roads would be used. By using existing roads in the Riparian Reserve of the project area and not crossing any live channels, there would be no effect to stream network connections from hauling.

Closure and decommissioning of hydrologically connected roads (0.1 miles of which are within the outer extent of the Three Creek Riparian Reserve) would help restore spatial connectivity within drainage networks by restricting use and allowing them to revegetation and accumulate downed wood. Connectivity would be restored for riparian-dependent species and aquatic species that use this riparian reserve or intermittent channel because the road in the Riparian Reserve, which may be an obstruction for some species, would be removed. The Whychus Watershed analysis, the 2015 Forest Travel

Management Plan, and the project level Roads Analysis identified road closures and decommissioning as needed actions to help restore the watershed. The Action Alternatives would maintain or slightly restore the spatial and temporal connectivity within the Deep Canyon Watershed and between adjacent watersheds.

ACS Objective 3: Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

The physical integrity of the aquatic system would be restored and/or maintained by the Action Alternatives under the Melvin Butte Project. The physical integrity of channels would be maintained by the proposed activities because no management activities would occur within 300 ft. of perennial streams, 150 ft. of intermittent streams, or within or along the banks of ephemeral channels to protect the tree root influence area. Large wood recruitment, which helps maintain the integrity of aquatic systems, would be maintained because no treatments would occur within the potential large wood recruitment area. Because there are no debris slide or landslide prone areas outside of Riparian Reserves within the Project area, the primary wood recruitment areas in the Melvin Butte project area are approximately 100 ft. on each side of a channel (Benda et al. 2002). Haul on system roads in the Riparian Reserve would not affect streamflow, sedimentation, riparian vegetation, or large wood recruitment, all parameters that can affect channel condition (see Hydrology Report). This is because all haul would be on existing roads and Project Design Criteria would be implemented on haul roads in hydrologically connected areas. Closure and decommissioning of hydrologically connected roads (0.1 miles of which are within the outer extent of the Three Creek Riparian Reserve) would help restore the physical integrity of the aquatic system removing roads in ephemeral draws and allowing them to revegetation and accumulate downed wood.

ACS Objective 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.

The two primary measures of water quality effects from the Melvin Butte Project are increases in fine sediment (or turbidty) and a reduction of shade to waterbodies within the project area. The reduction of shade is related to potential increases in water temperature while increased erosion and sedimentation are 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. Nutrients in streams can also change following a fire for a period of time.

Three Creek is currently not on the Oregon 303(d) for water quality exceedences above the State standards and the Action Alternatives would not affect it’s status. Neither water temperature or sedimentation would be affected by the Action Alternatives because ground-disturbing and shade disturbing activities would not occur near streams. No harvest activities would occur within Riparian Reserves; therefore, no shade producing vegetation would be removed.

Sedimentation effects are not predicted because ground-disturbing treatments are outside of vegetated riparian buffers that serve to filter any hillslope erosion before entering water ways. Reintroducing fire back into portions of the project area would help maintian this fire adapted ecosystem (See fuels report). The prescribed burn would help reduce fuel loading and reduce risk of future large-scale wildfires. Sedimentation effects from prescribed fire is not expected because consumption of ground fuels with fire would be patchy and of low intensity in most areas. Likewise, hydrophobic soils would not be expected as a result of the low intensity underburn. In addition, no firelines would be constructed within the Riparian Reserve which would limit soil distrubance. Some sedimentation and nutrients are not expected to reach the stream through runoff due to filtering by vegetation and downed woody debris in the Ripaian Reserve.

Activities such as road use and ground disturbance from timber harvest has been assesed for the potential to increase sedimentation and turbidity. The assesment found management activities as a result of the Melvin Butte Project would be indistinguishable from background levels (see Hydrology report). 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. Also, project design criteria such as preventative road maintenance and restricting haul times on haul roads in hydrologically connected areas, no new road construction, and locating landings outside of Riparian Reserves help prevent sedimentation to streams. In addition, over the long-term, proposed road decommissioning would help restore water quality by reducing sediment input to the stream from roads in the Riparian Reserve and uplands.

Detrimimental effects to riparian, aquatic, and wetland ecosystems are not expected to occur as a result of this project. Water quality would remain within the range that maintains the biological, physical, and chemical integrity of the Deep Canyon Watershed. The reproduction and migration of individuals composing aquatic and riparian communities would not be detrimentally effected by this project.

ACS Objective 5: Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

The proposed actions would maintain the sediment regime and may help restore it. Sedimentation in streams is not expected from harvest, mowing, burning, because these activities would not occur in Riparian Reserves and project BMPs and PDC will be followed. Very little erosion is expected from haul or road decommissioning and closure in the Riparian Reserve because road PDCs would be implemented and riparian buffers would allow sediment generated to be trapped in the vegetated area before reaching the stream. Underburning would occur outside Riparian Reserves and no fireline would be constructed in Riparian Reserves. Haul would occur on existing road surfaces and in areas adjacent to the stream and would be restricted to the dry season. In addition, haul across intermittent stream fords would be restricted to periods when the stream is dry.

Closure and decommissioning of hydrologically connected roads (0.1 miles of which are within the outer extent of the Three Creek Riparian Reserve) would help restore the sediment regime by reducing overland flow and fine sediment that is transported from the road to the streams by decompacting the road surface, restoring drainage, and/or adding roughness to the road bed.

ACS Objective 6: Maintain and restore in-stream flows sufficient to create and restore riparian, aquatic, and wetland habitats 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.

The Action Alternatives would not negatively affect streamflow because no treatments would occur in Riparian Reserves or hydrologically connected ephemeral channels. Harvest of trees outside the Riparian Reserve would not likely have an effect on streamflow because overland flow in the project area does not generally occur from a reduction in evapotranspiration when trees are harvested because infiltration and permeability rates often exceed precipitation rates. In addition, the majority of vegetation treatments are understory removal in over-stocked stands; therefore, thinning would help move the stand toward more historic conditions

Underburning would not affect streamflow because no new fire line would be constructed within Riparian Reserves, ignition would not be planned in Riparian Reserves and burn severity would not be at a level to cause hydrophobic soils (soils which repel water). In addition, mortality of brush and small trees from the

underburn would not alter streamflows because geology and soils are the primary influence of overland flow in the project area and not evapotranspiration.

Potentially the Action Alternatives could help restore the timing, magnitude, duration and spatial distribution of peak or high flows by reducing the acres threatened under the Fire Model in the Riparian Reserve. Closing and decommissioning of roads in hydrologically connected areas such as 0.1 miles in Riparian Reserves and roads that parallel or cross ephemeral channels would reduce overland flow effects caused by compaction and lack of downed wood or vegetation. Fracturing the road surface, installing water bars, and allowing the road to revegetate and maintain down wood would reduce overland flow contribution to stream channels during high flow periods.

ACS Objective 7: Maintain and restore timing, variability, and duration of flood plain inundation and water table elevation in meadows and wetlands.

The action alternatives would maintain variability and duration of floodplain inundation and may help restore timing of floodplain inundation. The project would maintain the floodplain inundation regime because it would not negatively affect streamflow. Compaction and/or hydrophobicity would not be significant and it would not occur in areas likely to flow to any streams (see Hydrology report). Underburning would not affect streamflow because no new fire line would be constructed within Riparian Reserves, ignition would not occur in Riparian Reserves and burn severity would not be at a level to cause hydrophobic soils (soils which repel water). In addition, mortality of brush and small trees from underburns would not alter streamflows because geology and soils are the primary influence of overland flow in the project area and not evapotranspiration (see Hydrology report).

A potential benefit to streamflow from the action alternatives include a reduction of acres threatened by wildfire in the Riparian Reserve. Large-scale wildfire in Riparian Reserves can lead to increases in erosive peak flows which could cause channel incision and a reduction of floodplain inundation. Vegetation treatments would reduce the possible severity of a wildfire. Therefore, after vegetation treatments, the threat of a wildfire that could cause stand mortality in the Riparian Reserves would be reduced and may not lead to streamflow changes if a wildfire were to occur.

Road decommissioning and closure would maintain this objective and possibly help restore the variability of floodplain inundation. Decommissioning and closure of roads in Riparian Reserve or hydrologically connected areas would not affect the timing or duration of floodplain inundation or wetland and meadow water tables because the flow regime would not significantly change. However, decompacting the road surface by subsoiling or natural revegetation of the road surface would help prevent floodwaters from being concentrated on the floodplain and causing erosion; thus, helping restore floodplain variability.

ACS Objective 8: Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distribution of coarse woody debris sufficient to sustain physical complexity and stability.

The action alternatives would not result in any significant detrimental changes to riparian habitats as buffers are being maintained on all stream channels. There are no planned project activities in Riparian Reserves.

Instream wood recruitment from lodgepole and white fir has been increasing in areas of high tree mortality. Areas dominated by Ponderosa Pine and other species have had normal rates of tree mortality with low amounts of mortalitly in plantations and second growth. Instream wood levels or future

recruitment would not be detrimentally effected by the project as no large trees or snags will be harvested that could reach streams and no wood will be removed from streams.

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.

The action alternatives would contribute to the restoration of Objective 8 at the project and watershed scale by restoring the composition and structural diversity of riparian vegetation by reducing fuels in the uplands and associated fire threat and decommissioning and closing hydrologically connected roads. Vegetation treatments would promote the maintenance and development of late-successional forest characteristics in second growth stands and old growth stands and road treatments would provide more area for vegetation to grow.

The action alternatives require no cut buffers along all riparian corridors and wetlands that are perennial or intermittent. These buffers encompass diverse plant communities, protect current shading levels for thermal regulation, protect stream banks from operational disturbances and ensure that soil disturbance does not get routed to waterbodies or wetlands. Designated no cut buffers along units in the planning area, would also protect channel migration processes. The proposed road decommissioning would initiate restoration in the uplands and to lesser extent in riparian corridors. The proposed thinning treatments are designed to accelerate the development of late-successional characteristics and to provide heterogeneity in the landscape by the retention of larger and healthier trees in a gappy, patchy, clumpy manner. The prescription provides retention of larger diameter trees such as ponderosa pine and mountain hemlock.

ACS Objective 9: Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

The action alternatives have 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 potential risk of large scale loss of forest vegetation.

This project contributes to maintaining this ACS objective through restoring habitat for riparian-dependent species by not treating areas within Riparian Reserves. Closing and decommissioning some existing roads in riparian areas and uplands will help to achieve this also. The closure of these roads would create areas free of motorized disturbance to wildlife species as they travel within the riparian corridor. The road decommissioning would not prevent the attainment of this objective and may in the long-term help restore habitat to support native species by removing vehicle use and associated disturbance within the Riparian Reserve. Native amphibians and aquatic invertebrates associated with the stream would benefit from restored natural runoff and sediment inputs.

There is no timber harvest proposed within the riparian zones in any of the action alternatives that would eliminate or retard the development of habitat to support well distributed populations of any native, invertebrate or vertebrate riparian dependent species. Requiring no-cut buffers along all waterbodies, restricting haul to existing road surfaces, and not allowing temporary roads in Riparian Reserves would protect riparian areas from disturbance and help maintain the existing riparian conditions. The no-cut buffers along riparian areas would help maintain the existing microclimates which are especially important for species that are extremely sensitive to changes in temperature and humidity, such as amphibians and certain types of vegetation, as well as for those animals that use the riparian areas as travel corridors. These riparian areas contribute to the landscape heterogeneity of both untreated and treated stands. The retention of riparian plant species and live and dead trees provides for different

stocking levels and species composition. This variety of stand conditions would create a diverse range of habitats that would continue to support a variety of species within the riparian areas and across the landscape.

The proposed action provides for the development of habitat conditions within the riparian areas and across the landscape to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species at the project and watershed scales. This is primarily due to the fact that no project activities except for a small amount of road decommissioning will occur in Riparian Reserves.

Statement of Consistency with ACS Objectives

Overall, the action alternatives would help restore riparian vegetation and aquatic conditions within the Deep Canyon fifth field watershed by promoting the development of late-successional forest characteristics in second growth and old growth stands outside of Riparian Reserves and by decommissioning and closing roads in Riparian Reserves and uplands. Fire would be reintroduced to areas that were historically maintained by fire. Because terrestrial vegetation and aquatic components and processes are so tightly inter-connected, meeting the desired future condition for these land allocations would also contribute to abundant, well dispersed, high quality habitat for riparian-dependent species.

The action alternatives would also help restore the natural sediment regime by decommissioning roads in Riparian Reserves and uplands which would restore the natural drainage pattern. Designating no-cut buffers along all waterbodies, restricting haul to existing road surfaces; and implementing Best Management Practices and PDCs would protect riparian areas and maintain the existing vegetation, connectivity, water flow, water quality, and habitat within the Deep Canyon Watershed.

The action alternatives would include some activities that could result in minimal short term increases in sediment production at individual sites. For example, haul on existing roads in Riparian Reserves has the potential to create short term (a couple of hours to a couple of days) sediment movement in small amounts that would mostly be filtered out by Riparian Reserve buffers before reaching stream channels. However, any negative water quality impacts that could occur from the Melvin Butte Project are anticipated to be small, short-term, and localized. Any short-term increases in sediment production or turbidity are expected to be well within the range of what would typically occur during high winter flows or as a result of typical storm runoff. At the watershed scale, changes in water quality, turbidity or sediment production would not be detectable.

In summary, the activities described above are consistent with the ACS objectives. The proposed road closures and decommissioning are consistent with the findings of the Whychus Watershed Analysis in that it would maintain stream function and a connectivity corridor for wildlife species. The Melvin Butte Project would maintain watershed and landscape scale features such as natural stream bankfull width and normal floodplain inundation. The proposed project contributes to ACS objectives by helping maintain and/or restore landscape diversity, connectivity, streambank integrity, water quality, the natural sediment regime, floodplain variability, plant communities, and habitat in the Deep Canyon Watershed. The physical integrity of nearby aquatic systems and water quality are likely to be maintained by the proposed activities. Based on the evaluation of the short-term, long-term, and cumulative impacts, the Melvin Butte Vegetation Management Project is designed to "contribute to maintaining or restoring the fifth-field watershed over the long-term." Therefore, the Melvin Butte Project is consistent with ASC objectives.

FOREST VEGETATION

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Forest Vegetation specialist report and other technical documentation used to support the analysis and conclusions of this

environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

The Melvin Butte Project includes 5,375 acres within the 97,508 acre Deep Canyon watershed. The project elevation ranges 2000 foot from 4240 foot to 6280 foot with elevation highest in the southwest and lowest towards the northeast. Two buttes alter the interior elevation trend of the project area and are Melvin Butte and an unnamed butte. Common to the region, precipitation trends follow elevation gradients with higher elevations receiving higher precipitation (20-40" year Avg. with most of lower elevations receiving this as rain).

This section describes the Purpose and Need, existing forested conditions[7], trends, effects of proposed vegetation treatments and past, present and foreseeable future actions. The project area was stratified into potential treatment and retention areas based on soils information, current dominant vegetation type, density[8], trajectory, presence of abundant mistletoe, past clearcuts (plantations), wildland urban interface (WUI) and visual corridor considerations.

This section also tiers to the larger scale Whychus Watershed Assessment which describes the recent disturbances and conditions present and the need for action on the watershed scale (revised in 2013[9]). The Whychus Watershed Assessment (USDA 2013) was used to shape the desired future conditions and the proposed action for active forest management within the Melvin Butte project area analysis boundary.

This section has four primary purposes:

1. To provide background information necessary to evaluate the goals and objectives of the Purpose and Need for action, and compare the effects of no action and alternatives to the proposed action on forest vegetation.
2. To disclose the existing condition of forest vegetation and fuels and likely trends relating to forest health.
3. To provide supporting evidence/analysis that the proposed action and alternatives are consistent with the Purpose and Need, Forest Plan, Watershed Analysis, laws, regulations, and policy.
4. To address key issues raised during scoping that are pertinent to active forest management.

Summary of Effects

Alternative 1 – Direct and Indirect Effects

There are no treatments under the no action alternative, and therefore no direct or indirect effects.

Forest Ecosystem Restoration

Stand Structures/Species Composition

[7] Presented as structural and seral state, fire hazard, density, dwarf mistletoe abundance, species composition, and more.
[8] Tree density measured as the number of tree per acre (TPA), cross sectional tree area (called basal area measured in square feet per acre (BA/acre)) or canopy cover (% vertical cover).

[9] The 1998 Whychus Watershed Assessment was revised twice (2009 and 2013), in part, to account for large scale-changes in the watershed due to fires and insect outbreaks.

Structures remain at a high risk for a large proportion of the area to have stand replacement fire. Species composition remains disproportionally askew to fire intolerant species (when compared to HRV) due to interactions of past management (fire suppression/exclusion and past timber practices). Plantations lack spatial heterogeneity and are beginning to show various levels of dwarf mistletoe.

The no action fails in moving structure or species composition within the project area towards the Forest Plan Standards/Guidelines (amended by Northwest Forest Plan), Watershed Analysis goals, or the desired future condition.

Stand Density

Stand densities would remain at high levels and generally increase over the next 30 years under No Action. Large old ponderosa pine would continue to attenuate with replacement challenged by interactions of inter-tree competition, dwarf mistletoe and bark beetles.

Insects and Disease

Current stand densities are at or above the upper limit of the desired range of percent of maximum SDI over 88% of the planning area. As stands remain at these high densities, mortality from insects and disease are expected to increase. Of particular concern, western dwarf mistletoe, in the planning area is expected to increase by expansion into plantations and other areas where levels are moderate to low. Large tree recruitment is expected to be reduced as infection levels rise in and effect height and diameter growth.

Fire Hazard

Summer precipitation and temperature play large roles in determining the effects of a given fire season. Reduced snow packs and warmer summers are expected to lead to longer fire seasons with increased severity and increases in area burned. Increased potential for type conversion and species conversion is expected as well. A two to three fold increase in area burned is projected in the eastern Cascades of Washington by 2080 (Littel et al. 2010). This threat is amplified by the observation that the entire western United States has experienced higher large-wildfire frequency, longer wildfire durations, and longer wildfire seasons since the mid-1980's (Westerling et al. 2006).

Current fire hazard analysis (herein and Fuels report) indicate a high fire hazard risk. Fuel accumulations, along the 16rd, private land, and within stands, indicate continuity and/or suppression (ease of control) challenges.

Alternative 2- Direct and Indirect Effects

Effects on Forest Ecosystem Restoration

Stand Structure and Species Composition

Alternative 2 thinning and fuels treatments would move stands towards reference conditions. All treatments would lead to a greater patchwork distribution of size/age classes rather than the current continuous vertical and horizontal distribution of trees. Early seral, fire climax ponderosa pine species composition is improved by the number of acres treated which includes areas where this is the focus strategy (i.e. mixed conifer group openings).

Stand Density

On the project (Melvin Butte landscape) level, SDI moves from 88% max SDI (pre-treatment) to 44% max SDI (after thinning). This proportion change represents movement to between the lower and upper

management zones for forest health. While specific areas within the project are still above the UMZ (60% Max SDI) (Table 21,22) and has sustained risk for insects/ disease and fire, other areas near or surrounding these are within the zone predicting these factors to be less likely. Plantation stands have received greatest release and are expected to develop into large trees more rapidly.

Insects and Disease

Variable thinning to lower SDI values and move stands towards reference conditions will have a positive effect on tree resilience against bark beetles and lightly (DMR1-3) infected dwarf mistletoe ponderosa pine. On the project level, dwarf mistletoe abundance is reduced by half and in 30 years levels are approaching the no action as mistletoe spread has impacted regeneration and other under/mid-story trees. However, on the fine-scale (stand level), it is expected that strategic removal, pruning and girdling of point source locations including select large trees will aid in size development of ponderosa pine in fine-scale locations especially plantations and areas at least 100 ft. from mistletoe infected trees.

Fire Hazard

Under the proposed action, the potential for crown fire is greatly reduced across the project as a whole (treated and untreated areas) as thinning, fuels work, underburning raises CBH and decreases CBD. These changes increase the CI and reduce the potential for crown fire in all PAGs. Although, no treatment and retention areas maintain high CBH, CBH, acres treated show a marked decrease in the likelihood for stand replacement fire. Active crown fire is predicted to occur on 10% of the project area which is primarily allocated to retention strategy and no treatment areas. Alternative 2 greatly reduces the predicted mortality within treated areas, by changing the majority of the potential fire type acres to surface and passive crown.

Alternative 3- Direct and Indirect Effects

Stand Structure and Species Composition

There would be little difference in stand structures between Alternative 3 and Alternative 2 as stands are variably thinned from below lowering stand densities and reducing competition to larger trees. Treatment acres designed to address the effects of past selective logging and fire suppression (species composition implied) in the mixed conifer PAG by improving fire-tolerant localized ponderosa pine growing areas would be dropped. As a result, and in order to maintain stocking, fire intolerant species proportions would be retained. About 30% of the 835acres (250 acres maximum) would be maintained under a fire intolerant dominated trajectory.

Stand Density

On the project (Melvin Butte landscape) level density measures for Alternative 3 are similar to Alternative 2, SDI moves from 88% max SDI (pre-treatment) to 48% max SDI (after thinning). The 4% increase (from Alt. 2) is a result of treatment acres being dropped and altered. As a result, 321 acres are kept at higher densities with more of a fire intolerant tree composition with 71 acres directly next to private land.

Insects and Disease

Thinning to lower SDI values and moving stands towards reference conditions will have a positive effect on tree resilience against bark beetles and lightly (DMR1-3) infected dwarf mistletoe ponderosa pine.

On the project level direct and indirect effects of dwarf mistletoe among Alternative 3 and Alternative 2 are similar (Table 23, 32). At the project level dwarf mistletoe rating is reduced by about 1/3rd from

existing levels and in 30 years those levels return to slightly below the no action for that year (Table 23, 32). On the stand-scale overstory influences into plantations and small medium small trees are maintained as large trees continue to provide mistletoe point source locations. Retaining any small trees underneath or adjacent to, highly infected ponderosa pine trees decreases the likelihood for large tree development (Eglitis et al. 2014). Overtime infestations will spread down, out and within infecting more and more of the plantations and adjacent area. Under this alternative managing for young ponderosa pine or replacement near highly infected trees, of any size, is challenged by reduced height/ diameter growth.

Fire Hazard

On the landscape as a whole, crown fire potential is reduced from no action though would be slightly higher than the Proposed Action. This difference from the proposed action is due to the reduction in treatment acres and type within the ponderosa pine and mixed conifer types. Access to about 70-90 acres of restoration units would be avoided with over much of this land directly interfacing with private land (2/3rd mile). As such, potential fire behavior and influences (egress) in these areas would be less predictable as current crowns have both horizontal and vertical fuel connectivity.

Overview of Issues Addressed

Past selective and clear cutting, altered fire regimes, recent fires and insect and disease agents are the major contributors to forest health issues and the need for action within the Melvin Butte project area (USDA 2013). These elements interact to affect the planning areas ability to be resistant and resilient to disturbances in the short- and long-term (Littel et al. 2010, Stine et al. 2014, DeRose and Long 2014, USDA 2013, Pole Creek Fire 2012).

Fire suppression/ exclusion has interrupted the low to mixed-severity fire regimes, leading to a change in forest structure, species composition, densities, fuel accumulation and increased insect and disease abundance. Past selective logging (circa 1950s and 60s) has removed a large proportion of the large tree ponderosa pine component from both the ponderosa and mixed conifer types. The recent past beetle outbreak (circa 2000s) and 2012 Pole Creek Fire has created abundant standing and down wood along the 16rd affecting visual experiences, off road travel for firewood utilization and potential fire suppression safety/challenges along a WUI escapement corridor. Regeneration cuts have created over a thousand acres in the planning area as small evenaged blocks dominated by pole-sized trees. About 2/3rd of the planning area has various fine- to broad-scale levels and locations of ponderosa pine dwarf mistletoe influencing the ability of these areas to develop large tree structures. As a whole, the project area contains a high density of ladder fuels from small trees and understory shrubs which contributes to stand replacement conditions in the event of a fire (Pole Creek Fire 2012). Species composition is a factor influencing the risk and stability of forests in the planning area.

The aforementioned items have recently (years 2002-2012) interacted (among other factors) on the landscape to influence the outcomes of the numerous fires within the watershed ((USDA 2013) (Table 34).

Table 34 Fires greater than 10 acres in the Whychus Watershed project area since the original watershed analysis of 1998.

Fire Name	Year	Total Size (acres)	Watershed Project Area (acres)
Cache Mountain	2002	4,358	43
Black Crater	2006	9,411	9,396
Lake George	2006	5,537	1,857
GW	2007	7,349	954

Steven Canyon	2008	173	76
Black Butte II	2009	578	559
Rooster Rock	2010	6,119	6,119
Alder Springs	2011	1,449	1,052
Pole Creek	2012	26,119	26,119
Total		61,093	46,175

Most of the plantations that were established after clear cutting beginning in the 1960's and 1980s, are now in need of stand tending to reduce dwarf mistletoe, improve growth and move them towards a stand structure in line with reference conditions.

High abundance of ponderosa pine western dwarf mistletoe threatens key structural components and future large ponderosa pine tree development. Lodgepole stands continue to fall apart creating large amounts of down wood and fuel continuity to adjacent stands. Outside of plantations, interruption of fire regimes has led to the dominance of late seral conditions (increased grand/white fir and/or ingrowth of ponderosa pine) with an increase of dwarf mistletoe and mountain pine beetles. Recent past regeneration (plantations) activities that were designed to reduce mistletoe levels have created reduced mistletoe "areas", but lateral spread from adjacent stands has infected into stand boundaries.

The need for forest restoration includes reducing the potential for severe wildfires, and promoting stand densities necessary to maintain desired forest conditions during drought. Restoring forest conditions in concert with ecosystem management principles would promote resistance and resilience of these areas thereby, improving their ability to recover, function and to develop in ways that were characteristic of the respective types following disturbances from fire, insects, and disease.

The need for active management will be evaluated in terms of current conceptual frameworks and historic reference conditions.

Purpose and Need Indicators

The purpose of this project is to maintain and restore resiliency and forest health in stands that provide habitat for interior forest wildlife species and present a potential hazard of large scale wildfires in the Melvin Butte area.

There is a need to reduce fuel loadings and forest vegetation density to lessen the risk of large wildfires to nearby communities and key ecosystem components, such as large old trees. Recent large wildfires have dramatically changed the landscape leaving the project area isolated and thereby increasing the urgency of protecting the remaining forest.

The project area is currently at risk of stand replacement wildfire associated with insects, disease, and overstocking and represents some of the remaining unburned forest in the area. This project would also meet a need to provide wood products to the local and regional economy as a byproduct of landscape level treatments.

This action responds to the goals and objectives outlined in the Deschutes National Forest Land and Resource Plan, and helps move the project area towards desired conditions described in that plan. The Whychus Watershed Analysis provides a framework to conduct vegetation management activities in the project area.

Objectives

- Create stand structures more consistent with reference conditions of species composition, structure, and age/size classes, and improve resistance and resilience to disturbances.
    - Indicators: Basal area per acre, percent of maximum stand density index (SDI), canopy base height, surface fuels, and species composition
- Reduce effects of insects and disease in order to increase longevity of mature and old forest and promote growth of younger age classes.
    - Indicators: percent of maximum stand density index (SDI), species composition, dwarf mistletoe rating

Methodology

Sources of Information

Vegetation Layer

The NRIS vegetation polygon layer was used as the base layer for classifying vegetation. There are 203 polygons within the planning area, with 23 acres representing non-forest types.

Stand Exams

A total of 26 formal stand exams were taken in the planning area from 1998 to 2008. The majority of the stand exams were conducted in 1998. For modeling, the FVS program grows all stands to a common starting year for simulation (see Analysis Methods, below).

Walk-through Surveys

District personnel conducted walk-through surveys of most stands from 2012-2015. These personnel included doing mistletoe assessments and mapping using Hawksworth rating system (1977, Figure 11) or stocking surveys in areas that overlapped with the Pole Creek Fire 2012. Items noted included species composition, live/dead, number of canopy layers, insects/disease, plant associations, tree density, and potential treatment options.

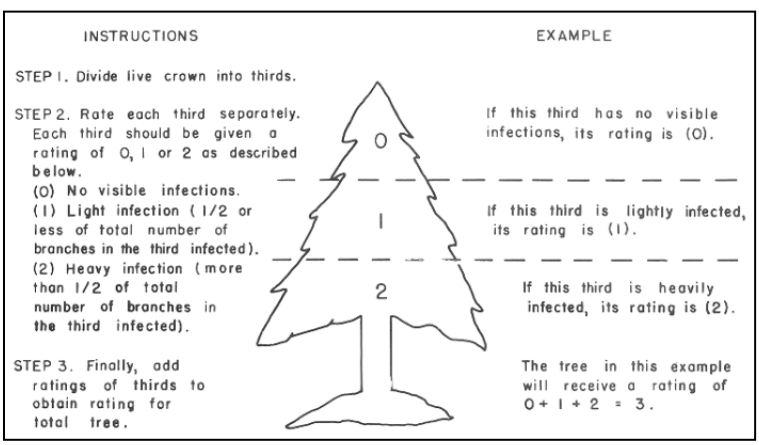


Figure 11 Determining dwarf mistletoe ratings (DMR) using the 6-class dwarf mistletoe rating system

GIS Layers

The following GIS layers were used in development of the existing condition, proposed action, and effects analysis: roads, streams, 2014 NAIP imagery, Lidar, GNN, Pole Creek BARC information and management areas.

Forest Health Protection Surveys

Formal site visits by Forest Health Protection area entomologists and pathologists occurred at different times over the summer of 2014. A report letter dated January 14th, 2015 by Andris Eglitis, Brent Oblinger and Helen Maffei can be found in the project record.

Development of Proposed Action Treatments

The stand reconnaissance information was used along with stand exam data summaries, Gradient Nearest Neighbor, GIS layers, and aerial photography to develop the proposed action treatment on a stand by stand basis. The proposed action maps (Alts 2 and 3) are the result of stands aggregated into general stand conditions and treatment types.

Analysis Methods

Nearest Neighbor/FSVeg Spatial Data Analyzer (SDA)

A computer program called Nearest Neighbor (NN) was used to assign stand exam data (reference stands) to the stands without stand exam data (Crookston et al. 2002). NN analysis uses satellite imagery (2014 LandSat TM data), spatial relationships, and topographic information to match target stands without data to the most similar reference stand with data. Tree data from the reference stand is then assigned to the target stand without data (imputation). Target stands with a statistically poor match to any reference stands were in the less well represented forest types and/or stand-types. One hundred and fifty-four reference stands were used to assign the missing data to non-examined stands. Table 35 displays the acres with adequate NN matches or reference data (NN-Ok or CSE) and the number of acres with a poor match (NN-Poor). Overall, the NN imputation quality very good at approximately 90 percent- out of 1466 imputations, 155 represented large differences between reference and target stands.

The SDA program is an ArcMap extension developed by the Forest Service that allows landscape simulations using data assigned by the NN program. The Forest Vegetation Simulator (FVS) was run within the SDA shell, and results can be viewed both visually and in summary output form.

Table 35 Data sources for forested polygons by PAG.

PAG	CSE Acres	NN-Ok Acres	NN-Poor Acres	Total Acres
Ponderosa pine wet	160	20	0	181
Ponderosa pine dry	510	433	0	942
Mixed conifer wet	319	1191	58	1568
Mixed conifer dry	729	1253	141	2123
Lodgepole pine dry	0	2	16	18
Lodgepole pine wet	0	378	134	512
Mountain Hemlock	0	0	8	8
Total Acres*	1718	3277	357**	5352

*Note 23 are in non-forest/ non-vegetated types
**A large part of poor imputed acres are a result from condition changes due to Pole Creek fire of 2012, pre-fire condition stand exams and a low number of lodgepole PAG reference stands. Stocking surveys or walk through surveys were used to fill in information that the model represented as erroneous.

Forest Vegetation Simulator

Stand Simulations

The South Central Oregon and Northeast California variant of the Forest Vegetation Simulator (FVS) (Keyser comp. 2014) was used to process stand exams to give the current stand conditions and to simulate thinning treatments and project alternatives for a 40 year time horizon. FVS is used here to compare treatment effects among alternatives and not for absolute results. The Fire and Fuels Extension (FVS-FFE) (Rebain 2010) was run to model potential fire metrics for current conditions and after thinning treatments. FVS-FFE was also used to simulate underburn fuels treatments associated with thinning as well as the stand-alone underburn treatments. Areas that did not have scheduled treatments (i.e. retention areas) were run without treatments to the end of the projection.

For modeling treatment areas, all thinning treatments (both Alts.) were scheduled in 2016 with underburning scheduled in 2018. Yardloss was scheduled with any thinning to simulate the removal of fuels (to occur by piling, lop scatter, etc.) associated with the thinning. Thinning outside of; plantations, burn only areas, lodgepole improvement area and scenic views enhancement used Thinpt keywords using a general 80 BA target. The point-thinning method (ThinPt keyword) thins each sample point in a stand to the residual target. This means that dense areas in the stand are thinned to the target density, while areas already below the target are not thinned. This method is more representative of how stands are actually thinned in practice. The end result is that since the denser sample points are thinned to the target density the overall stand average is usually below the residual target due to sample points falling in under-stocked areas and openings. Eighty basal area was used since it corresponded to the middle of the management zone at QMD. Alternative 3 modeling was developed to respond to key issues. Alternative 3 mimicked Alternative 2 in all aspects except having mixed conifer group openings and large tree removal for dwarf mistletoe removed from the model.

Stand Density/Stand Density Index (SDI)

Current and future estimates of stand density and SDI were computed from raw stand exam data entered into the FVS program. All plots were used, and there was no manipulation of the raw data. Maximum SDI values used to model tree growth and mortality are determined by plant association and are set by GBA or CVS plot analysis (Figure 12, Volland 1988, Simpson 2007, Keyser comp. 2014). Where more than one plant association crossed a stand boundary a majority rule was used to assign the MaxSDI values. The threshold to evaluate treatment was based on the lower and upper management zone (see below for discussion).

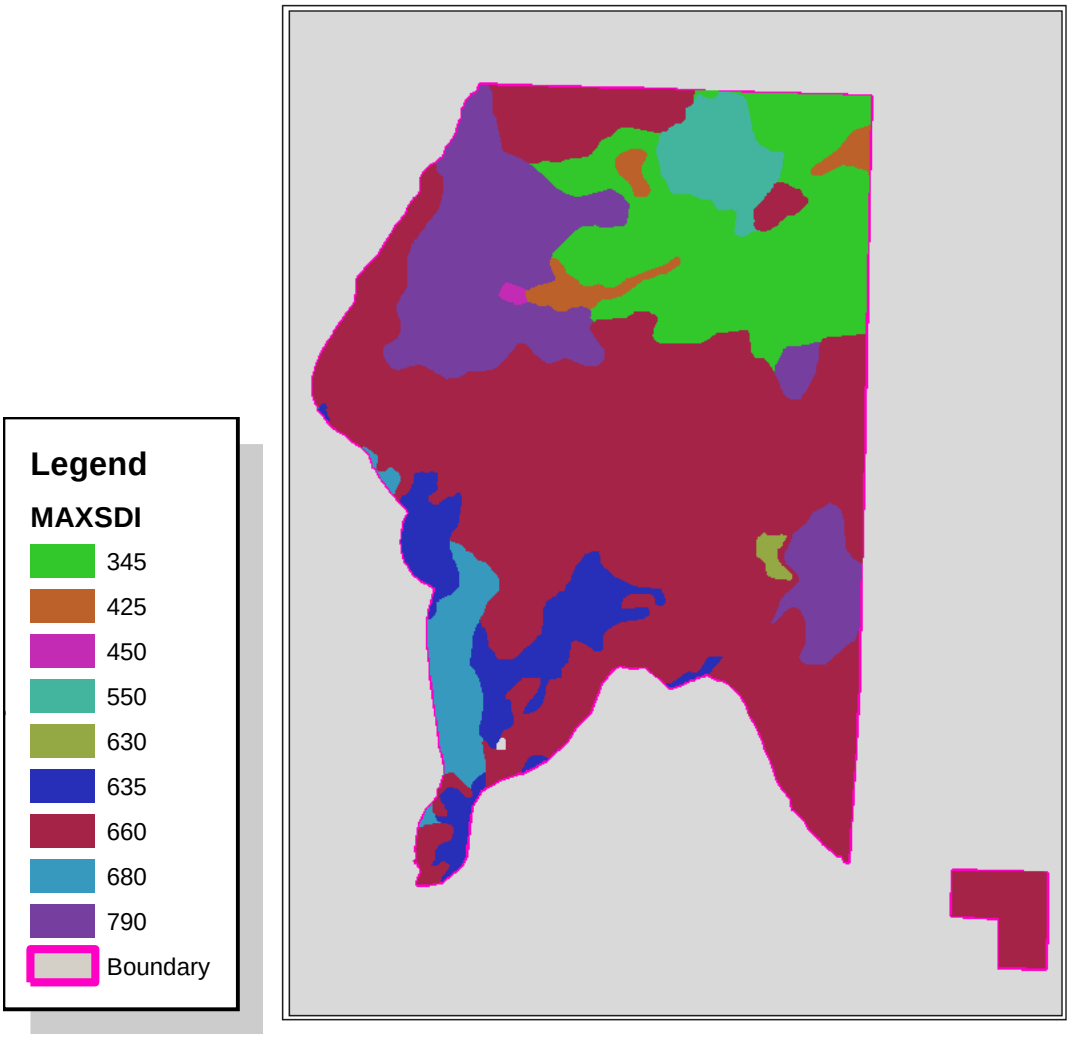


Figure 12 Map corresponding to MaxSDI values used with the forest vegetation simulator stands were adjusted to account for differing site potential and in general follows the precipitation gradient.

Fire Modeling

The Fire and Fuels Extension (FVS- FFE extension) was run using the potential fire keyword for severe (90th percentile) weather and fuel conditions (Table 36). Stand-alone underburning was scheduled in 2018. Fuel modifications were scheduled after thinning treatments in 2016.

Table 36 Fuel and weather parameters used in fire behavior modeling

Fuel Component	Percent Moisture Content	Weather Component	Value
1-hour Time lag	2	Temperature	87 Degrees F
10-hour Time lag	3	Rel. Humidity	13%
100-hour Time lag	6	Wind	14 mph
1000-hour Time lag	8		
Live woody Fuels	98		
Herbaceous	19		
Duff	20		

Output potential fire metrics from FFE included canopy bulk density, canopy base height, flame lengths, crowning index, fire type, and mortality.

Products

The following FVS output products were used in the analysis of alternatives:

1. Stand density metrics
2. Thinning results
3. Canopy height (CBH), canopy bulk density (CBD), and mortality under severe conditions (90th percentile)
4. Predicted fire type (active, crown conditional, passive, surface)

Limitations

Limitations of the FVS model in this instance include the following:

1. Limited ability to simulate desired stand conditions in terms of spatial heterogeneity
2. Modeling spatial dwarf mistletoe prescriptions, i.e. individual tree removal, in a non-spatial model.
3. Under-prediction of crowning potential versus empirical observations (Cruz and Alexander 2010)
4. Mortality[10] estimates from FVS-FFE are based on the potential fire type (surface, crown, conditional crown) and are best used as a means to compare the effects of alternatives rather than absolute values.

Forest Plant Associations and Plant Association Groups (PAGs)

Plant community classification in the Pacific Northwest Region follows guidelines established in FSH 2090.11 (USDA Forest Service 1991). It is founded on the concept of "Potential Natural Communities" (PNC) (Hall 1998). PNCs are "The biotic community that would be established if all successional sequences of its ecosystem were completed without additional human-caused disturbance under present environmental conditions. Grazing by native fauna, natural disturbances such as drought, floods, wildfire, insects and diseases, are inherent in the development of potential natural communities which may include naturalized non-native species." (FSH 2090.11, USDA Forest Service, 1991).

In the Pacific Northwest Region, the term used for potential natural communities is "plant associations" (Hall 1998). Plant associations for the Pacific Northwest Region are described without considering disturbance caused by natural elements (as well as human-caused disturbances), including historic fire regimes/ processes (Hall 1998). Consequently, a plant association is composed of species that will be most competitive over time (climax species) and these species will prevent the establishment of less competitive species (seral species) under current climate and site conditions (Hall 1998, Volland 1988, Simpson 2007). Indicator grasses, forbs, shrubs, trees are used to evaluate the area of the plant associations. Plant associations within the Melvin Butte project area were determined through field and GIS mapping.

The associations were then grouped by their climax species, soil, site potential, temperature and moisture similarities into Plant Association Groups (PAGs), using categories listed in the Deschutes Watershed Evaluation and Analysis for Viable Ecosystems (USDA1994, Volland 1988, Powell 2007, Simpson

[10] In the context of FVS, tree mortality is derived from two main sources: exogenous (external) agents such as insects, diseases, and fire, and endogenous (internal) mortality. Endogenous mortality has two sources: background mortality and density-dependent mortality (Dixon 2009, Powell 2014).

2007). This information also provides broad-based comparison to historical range of variability (see HRV below).

Forest Size/Structural and Seral Stages

A Viable Ecosystems analysis was conducted to determine the size/structure and seral status of the project area. The process used GNN vegetation data on a 30meter pixel and categorized and cross referenced the pixel to a match (nearest neighbor process) from Forest Inventory and Analysis data. Tree information, species dominance and density are evaluated and assigned. The pixels are stratified by plant association group and run through a filter based on species, size and density thresholds. The result is a seral and structural relationship for each pixel. This information was used to inform/ compare the project to the broad-scale HRV watershed condition (USDA 2013).

Historic Range of Variability

Historic Range of Variability (HRV) is a term used to describe the natural fluctuation in pattern of components of ecosystems over time (Stine et al. 2014). HRV serves as a framework of understanding the ecological system in question and serves as a general reference point useful for setting management goals (Landres et al. 1999). The assumption is that past conditions and processes can provide context and information (today) and that these disturbances drove variability in all ecological systems.

In this project, HRV is used as reference framework for historical estimates of forest size-classes (structure) and seral stages, tree species (or lack of) proportion dominance, that may have been present at any given point in the past 100-300 years (Oliver and Larson 1996, O'Hara 2001, Franklin et al. 2013). Active forest management described herein includes knowledge-use of historic disturbance processes to evaluate the project area. The Whychus Watershed analysis (USDA 2013) provides range estimates of structure and seral status by plant association group. The Whychus Watershed Analysis (USDA 2013) determined that recent disturbances (i.e. bark beetle outbreak, wildfires) have created changes to size/structure, composition (seral status), fire hazard of the watershed outside of HRV ranges.

On the Deschutes National Forest the "Viable Ecosystems" approach is used to categorize both size/structure and seral status by plant association group useful in comparing to HRV ranges (USDA1994).

Existing Condition

Landscape Overview

The historic conditions of the vegetation in the Melvin Butte project area and surrounding landscape is described in the Sisters/Whychus Watershed Analysis and can be found on file at the Sisters Ranger District (USDA 2013). An objective identified in the Whychus Watershed Assessment is to keep species within a historic range of variability (HRV) depending on the plant association, specifically referring to the amount of fire intolerant species such as western juniper and grand/white fir in ponderosa pine and mixed conifer plant associations. HRV used within the watershed is used to assess broad forest health conditions. The watershed analysis also identified density and insect and diseases as factors to larger watershed health. Table 37 shows distribution of plant association groups in the project area compared to the Whychus watershed. Figure 13 shows the distribution of plant association groups in the project area.

Plant Association Groups (PAG)

Ponderosa Pine Plant Association Group (21% of area): In this plant association group, ponderosa pine is the main seral and climax species, growing in small, even-age groups or as fairly uniform second growth. Minor amounts of western juniper, lodgepole pine, grand/white fir and Douglas-fir may be present.

These plant associations tend to have a limited grand/white fir component and tend to be ponderosa pine dominated throughout development (Volland 1988, Johnson 1990, Powell 1999, Simpson 2007). On a broad-scale, fire clearly was an important part of large ponderosa pine tree development and played an important role in retaining low densities. Ponderosa pine plant associations were historically dominated by large ponderosa pine, which are more resistant to fire, disease, and insects than western juniper, grand/white fir and incense cedar. A reduction of western juniper, grand/white fir in this project area can help move toward species composition more within the historical range of variability.

The effects of the alternatives on species composition are difficult to quantify, but in general, the more acres treated the greater the shift will be toward fire-tolerant/adapted ponderosa pine.

Mixed Conifer Plant Association Group (69% of area): In this plant association group, ponderosa pine is the major early seral species, with grand/white fir as the main climax species. Minor amounts of lodgepole pine, Engelmann spruce may be present. Mixed conifer plant associations were historically dominated by ponderosa pine with minor amounts of grand/white fir, lodgepole pine and Douglas-fir[11]. The structure of mixed conifer patches was formed by a mixture of disturbance severities (Hessburg et.al. 2007, Stein et al 2014). Ponderosa pine is more resistant to fire, disease and insects than grand/white fir and lodgepole pine. A reduction of grand/white fir and lodgepole pine in the project area can help move toward species composition more within the historical range of variability.

The effects of the alternatives on species composition are difficult to quantify, but in general, the more acres treated the greater the shift will be toward fire tolerant/adapted ponderosa pine.

Lodgepole Pine Plant Association Group (10% of area): Lodgepole pine plant associations are found over a minor portion of the project area. This vegetation type is found mostly along Forest Road 16. The areas where lodgepole pine is climax tend to have poor cold air drainage, or soil or moisture conditions that other species can't tolerate. Generally, in the lodgepole pine plant associations, lodgepole pine is the early and late seral species replacing itself on a boom and bust cycle of insects and fire. Currently, lodgepole pine is the dominant species on most acres, however, there are some stands that have a component of grand/white fir and mountain hemlock. Most of the area has either been burned over by the Pole Creek Fire or has a large portion attacked by mountain beetles during the 2000s. These areas coincide with visual- and/or designated wildland urban interface (WUI) escapement corridor (16rd).

The effects of the alternatives on species composition within the lodgepole pine plant associations will be minimal since the early and late seral species is lodgepole pine.

Mountain Hemlock Plant Association Group (approximately <1%): Mountain hemlock plant associations are found over a small portion of the project area at the higher elevations. In this plant association, lodgepole pine is the major early seral species and sub-alpine fir, whitebark pine, and western white pine are minor early seral species. This minor inclusion overlaps with the boundary of the Pole Creek Fire 2012 and is currently in in the grass/forb stage with high accumulations of standing and down wood along a visual and escapement corridor. These areas coincide with visual- and/or designated wildland urban interface (WUI) escapement corridor (Forest Road 16).

Meadow Plant Association Group: Meadow plant associations are found on approximately <1% of the project area and are associated with Three Creeks creek in the southern portion of the project area. The

[11] Douglas-fir is not a major component to the current species mixture (<0.001% of all trees). This is attributed to inherent soil properties (Pers. comm Terry Craig- soil scientist DNF).

plant associations found within this type are described in Kovalchik (1987) and are grass dominated seasonally wet/dry meadows. No treatments are proposed in this association.

Table 37 Plant association groups within Melvin Butte and comparison to Whychus Watershed.

Plant Association Group (PAG)			Comparison to Whychus watershed analysis
Name	**Acres**	**% Acres**	**% Acres**
Mixed Conifer Dry	2,123	40%	6.5%
Mixed Conifer Wet	1,571	29%	10.0%
Ponderosa Pine (Wet and Dry)	1,123	21%	1.4%
Lodgepole Pine	531	10%	3.2%
Mountain Hemlock Dry	8	<1%	<0.1%
Non-forest (Meadow)	18	<1%	1.3%
Non-forest (Cinder, Rock, Water)	2	<1%	<0.0%

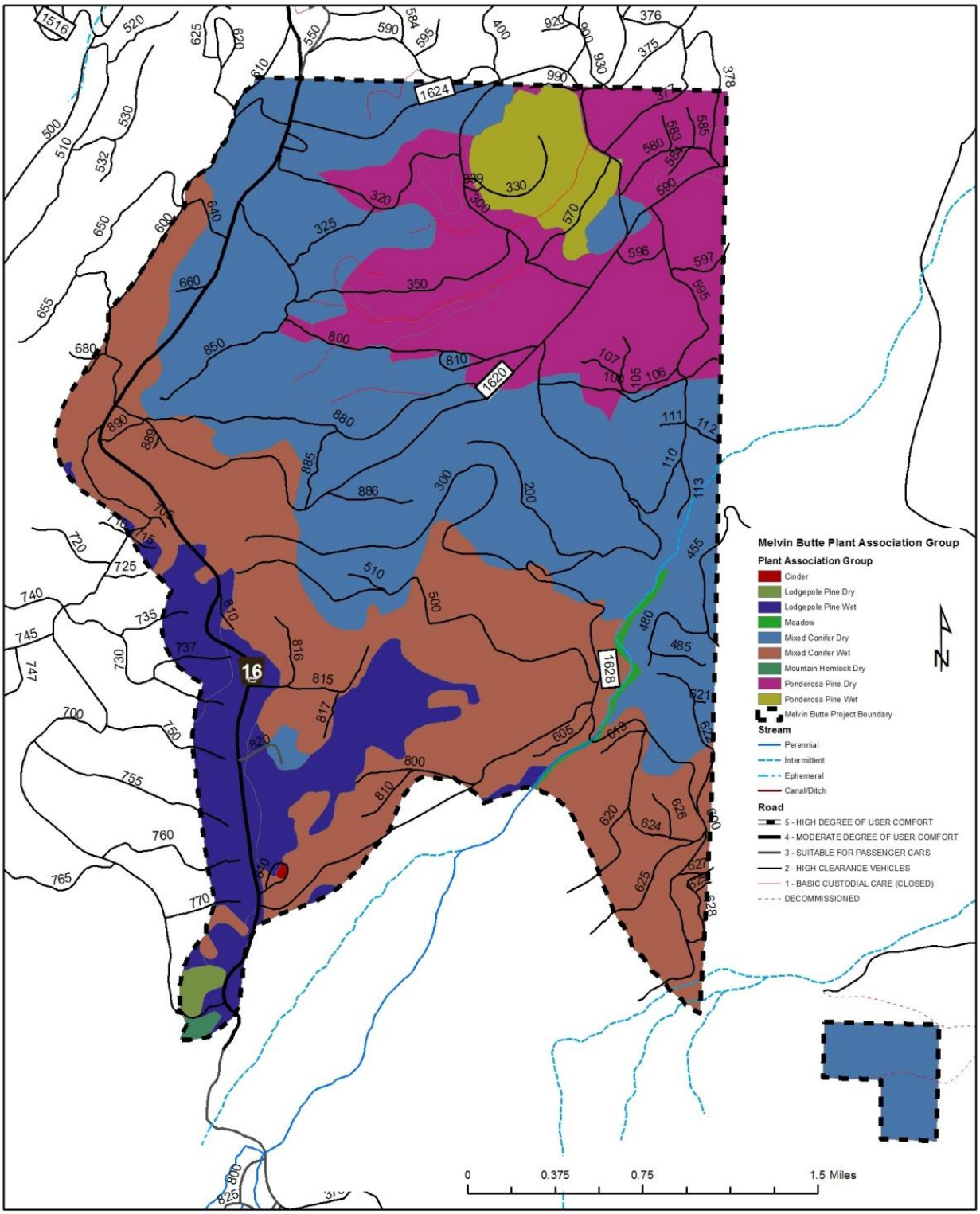


Figure 13 Plant association groups located in the Melvin Butte Project area.

Figure 14 Mixed conifer stand indicating ingrowth of under and midstory grand/white fir canopy layers.

Influences of Disturbance on Forest Vegetation

Disturbances contribute to ecosystem resilience and are an important process in continuing the cycle of forest renewal. Disturbances are a "double-edged sword" in that they can be both positive and negative on forest ecosystems processes and therefore affect resistance and resiliency. Disturbances in central Oregon include but are not limited to; fire, insects, disease and wind. These biotic and abiotic elements interact on the forest to influence size, severity, intensity and patterns of disturbances and thus relate to the sustainability of forest vegetation cover over the long-term. Generally, disturbance severity increases when forest conditions are outside the historic range of variability. Figure 14 shows the ingrowth of grand/white fir in a mixed conifer stand in the project area.

Mortality from disturbances is desirable, particularly in providing roosting, nesting, foraging and hiding cover for species that are directly or indirectly associated with snags (Bull et al. 1997). However, there have been alterations in the scale of mortality inducing disturbances, and potential thereof, that are currently affecting this watershed, other adjacent watersheds and more specifically, the Melvin Butte planning area (USDA 2013).

The greater primary historic disturbance in the project area was frequent, low to mixed severity fire that helped maintain lower stand densities that maintained higher canopy base heights. Due to intrinsic species adaptations, this process contributed to stable ecosystem functions that promoted old growth development of fire resistant ponderosa pine (USDA 2013). Other important historic disturbance agents in the project area included mountain pine beetle, western pine beetle, and western dwarf mistletoe. In general, historical disturbances in the watershed and within the Melvin Butte project area caused mortality in single trees, small groups of trees, and less frequently, larger patches (ex. lodgepole PAG). These disturbances created fine-to mid-scale structural elements of diseased, dead, damaged and down trees. Many local species (wildlife, plant, insect, fungi, microorganisms, etc.) evolved with these historic disturbance cycles (Stine et al. 2014).

Currently, the primary types of disturbances on the Sisters Ranger District are uncharacteristically large, and moderately to highly severe wildfires, and larger scale insect and disease infestations (USDA 2013). These changes result in habitat condition fluctuations more extreme than historically experienced with potential loss of important habitat elements of larger old trees, canopy cover, large snags and down wood (Graham et al. 1999, Hessburg and Agee 2003, Hessburg et al 2005, Hessburg et al 2007). In addition, there may be a trend of slower recovery of the system, partly due to the effect of high intensity wildfires on soil productivity, invasive species, tree regeneration success and warming and drying trends (Littel et al. 2010, Spies et al. 2010, see Climate Change Report). The result is a greater impact on interior forest species which depend on the continuity of forested habitat (see Wildlife Report).

The scale of severe impacts from current and future disturbances can be reduced by maintaining and enhancing more resistant species (i.e., ponderosa pine), increasing the distribution of single or two storied-stands, reducing fuel continuity, improving or maintaining vigor, and making treatment units as large as possible (Wickman 1992, Peterson et al 2005).

Structural and Seral Stages

Both structural and seral stage information provides broad-based canopy layer information for determining forested conditions within an area. Frequently, these are used to identify habitat suitability of different interior forest species (avian, mammalian, botanical, etc.); fire hazard; insect and disease susceptibility; and inference to historic range of variability.

Structural stage information provides vertical and horizontal canopy information among tree layers while seral stage provides information about specific species occupying those canopies. Both interact on the landscape based on past, present and future influences (planned and unplanned).

Past management (planned and unplanned) has altered the historic proportion of structural stages within the project area in two general ways 1) by allowing fire suppression/ exclusion to favor in-growth and 2) the regeneration harvests (plantations) creating a younger ((stand replacement) Oliver and Larsen 1996)) stage of development[12].

More than 75% of the project area consists of areas dominated with less than trees < 20”dbh (Figure 15). Much of this acreage occurs as small blocks of plantations; second growth stands; regenerated stands from wildfire; lodgepole stands; or other areas dominated by small trees. Approximately 22% of the project area is composed of plantations (installed from 1981-1993) installed to reduce or remove the abundant mistletoe in the area (Big Buck, Black Pine, Walla Bear and Melvin Butte Timber Sales). Within portions of the lodgepole PAG, structural stages have been altered by the recent past beetle outbreaks and Pole Creek fire 2012.

A study looking at historical structure and composition of ponderosa pine and mixed conifer forests in south-central Oregon stated stand densities have more than tripled over the past 90 years in these sites, while basal area has declined by greater than 50% and the abundance of large trees as a proportion of the total number of trees has decreased by more than a factor of five (Hagmann et.al. 2013).

[12] Past selective logging was not listed here since structural changes have been offset by the time since logging and ingrowth of large grand/white fir into the mid/ overstory layers. Under similar growing conditions grand/white fir are well recognized for growing at faster rates than ponderosa pine.

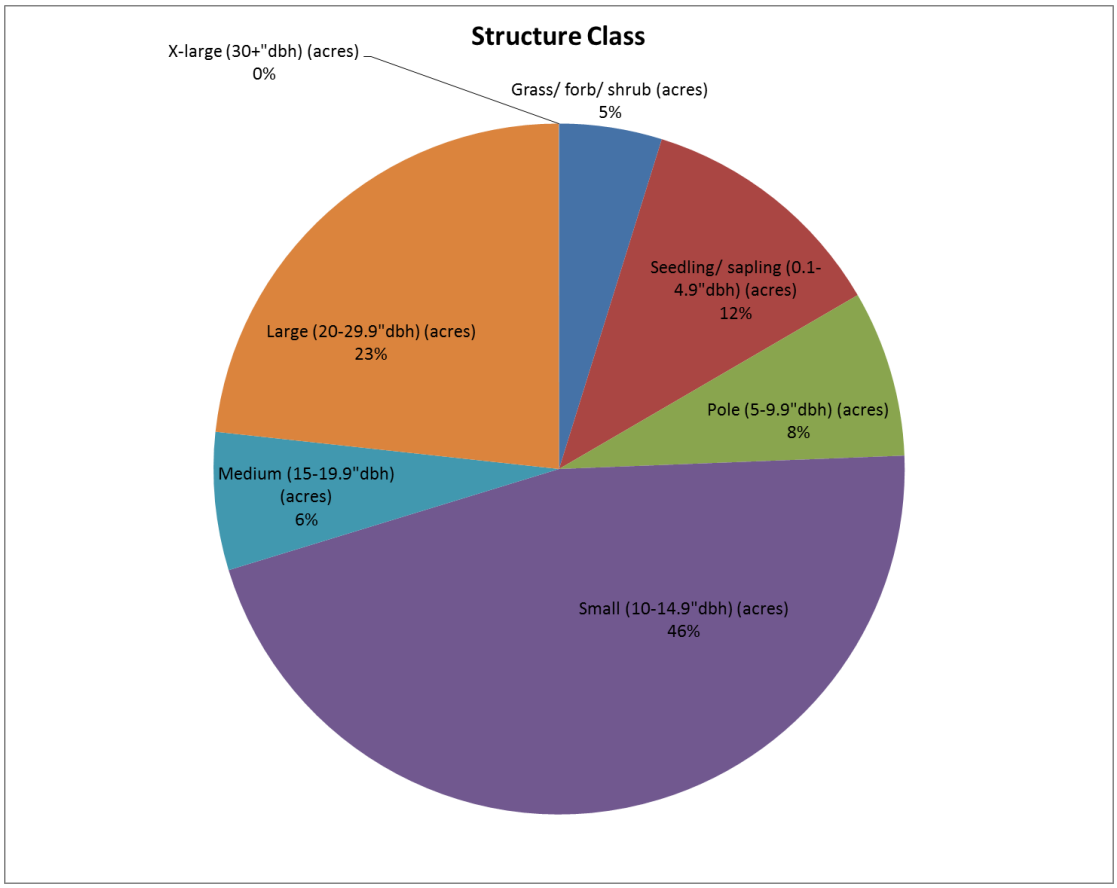


Figure 15 Structure classes of Melvin Butte as determined by Lidar.

Past management (planned and unplanned) has altered seral stage in two general ways 1) by interrupting fire regimes allowing ingrowth of grand/white fir (succession process) 2) by selective logging[13] of overstory ponderosa pine and altering species proportion (assumed more ponderosa pine = more pine seed mast).

Tree Species Composition

Major conifer trees species in the project area include ponderosa pine, grand/white fir, lodgepole pine and western juniper. Other species that are present but comprise <0.001% of all trees include Engelmann spruce, mountain hemlock, pacific silver fir, and white bark pine. These minor species occur as individuals very sporadically at >5000ft elevation. Douglas-fir may be present, but not a single observation was noted within the planning area (managed and unmanaged stands). Douglas fir may be present within the Three Creek drainage, but restoration work is excluded from riparian reserve areas.

Approximately 90% of the project area is composed of plant associations groups (PAGs) dominated by ponderosa pine which includes mixed conifer plant associations dominated by ponderosa pine during historic fire regimes (Volland 1985, Simpson 2007, Franklin 2013, Hagmann et al. 2014). Low-density and pine-dominated forests historically occupied essentially all of the forested landscape within the

[13] Selective logging changed the proportion of overstory pine about 30-60 years ago in much of the Melvin Butte project area.

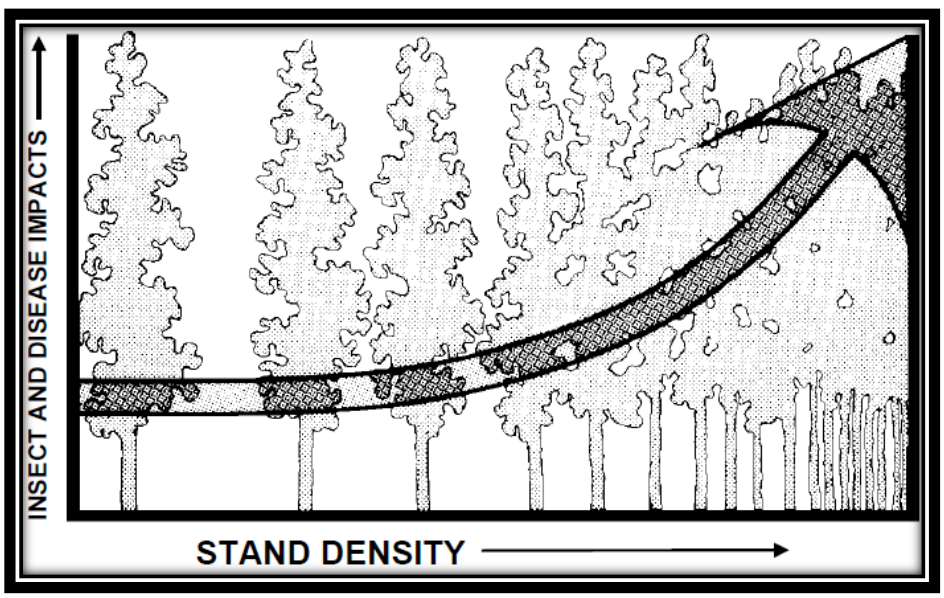
ponderosa pine and mixed conifer sites of the eastern slopes of the Cascade Mountains (Herschel et al. 2014, Hagmann et.al. 2013, Hagmann et al. 2014).

Species Composition Changes

The most dramatic changes in species composition (proportions) have occurred in the mixed conifer (dry and wet) plant association stands that have had selective overstory removal and fire suppression/exclusion (Camp 1999, Merschel 2012, Franklin 2013, Merschel et al 2014). These two mechanisms have interacted to advance grand/white fir persistence and abundance. In these stands, the trees per acre of ponderosa pine have decreased while grand/white fir has increased. In the mixed conifer types, the interactions of the two former conditions have resulted in dramatic pine to grand/white fir species shift when compared to reference conditions (Herschel et al. 2014, Hagmann et.al. 2013, Hagmann et al. 2014, Merschel et al 2014). As a result, the grand/white fir series in the project area (outside of plantations) has effectively had accelerated succession (increases of grand/white fir) due to these planned and unplanned management activities. In areas that have had their entire overstory removed (plantations in any PAG) follow up reforestation activities largely included ponderosa pine. As a result plantation stands have a significant cohort of fire adapted ponderosa pine and at this time are not threatened from grand/white fir stand succession.

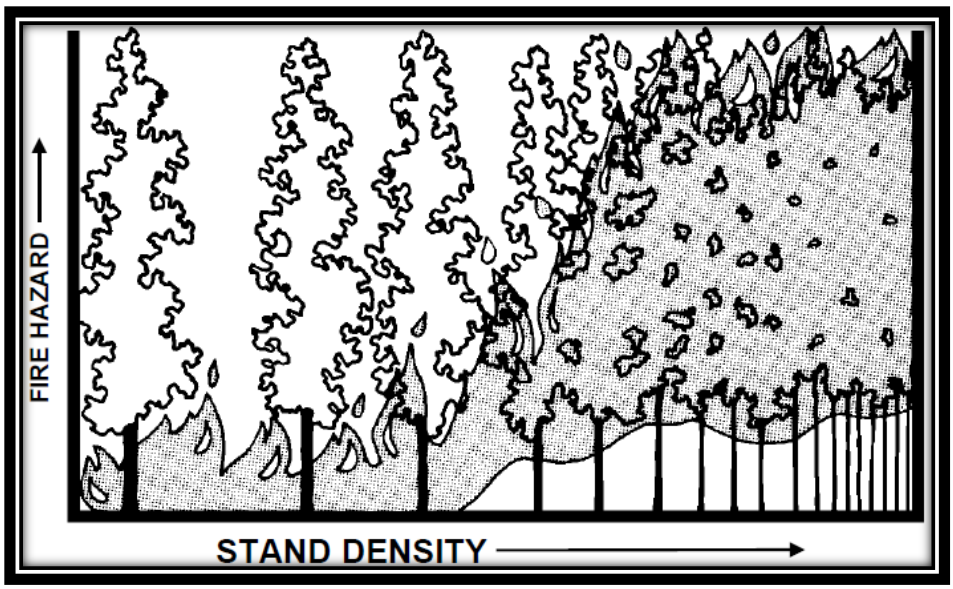
Stand Density

Different biophysical environments can support different levels of tree densities (e.g. wetter, richer soils tend to be able to support more trees per acre). Tree growth, insect and disease resistance, fire behavior, habitat, snag recruitment and more are all affected by tree densities. Stand density is a primary factor affecting growth and vigor of forest vegetation, and resilience to disturbances. Measuring stand density provides forest managers information about what can be expected to forested conditions in the face of planned or unplanned events/actions (Figure 16 and Figure 17).



Insect and disease impacts can vary with stand density (from Powell 1994). Because open stands generally have higher vigor levels than dense stands, they tend to be more resistant to insect and disease impacts. Maintaining a wide stand spacing results in a condition where the trees are not experiencing significant competition. Although not universally true, vigorous trees are better able to withstand attack from insects, pathogens and parasites (Safranyik and others 1998).

Figure 16 Insect and disease impacts and stand density.



Fire intensity can vary with stand density (from Powell 1994). When a fire moves through an open stand with widely-spaced trees, it generally stays on the ground as a low-intensity burn. But when it encounters a dense, closely-spaced stand, fire is much more likely to leave the ground and begin moving through the intermingled tree crowns as a lethal, high-severity burn.

Figure 17 Fire intensity and stand density.

Stand density index (SDI) is a measure of density and provides as an indice of forest health concerns including and not limited to; competition, fire hazard, habitat hang-time, beetles and diseases (Reineke 1933, Cochran et al.1994, Powell 1999, Jain et al. 2002, Powell 2010, Franklin et al. 2013). SDI is broken up into "zones" to assess relative growth and inter-tree competition. Full stocking (also called normal) is a zone where tree vigor is slowed to the point where trees are self-thinning and have an increased likelihood of mortality agents. This onset induces stand differentiation and facilitates structural stage alterations (Oliver and Larson 1996). Below full stocking, are the lower and upper management zones (LMZ and UMZ) where partial to full competition occurs and inter-tree competition and mortality agents are less likely. To add, different tree species respond differentially to inter-tree competition and, as such, different SDI values are calculated (Cochran 1994, Powell 1999). Managing for species with lowest SDI values on a site ensures all other trees species are accounted for. Ponderosa pine is more sensitive to high stand densities than other tree species in the project area. The longer a ponderosa pine remains in overcrowded conditions, the less it is likely to reach 21" or greater diameter. Stump analysis on the Sisters Ranger District revealed that large ponderosa pine trees initially had rapid growth rates (due to little competition) for the first 50 to 100 years and less growth over time as density increased and trees aged.

The upper management zone is a site-specific density threshold, above which forest health conditions and large tree health are likely to deteriorate. When these limits are reached, plant competition results in loss of plant growth and/or mortality. Increased tree stress reduces tree vigor and the ability to resist insects and disease. Reduced tree vigor also decreases the tree's ability to compartmentalize fire damage and recover from lost foliage, cambium damage and bud loss. Different parts of the project area can support different stand densities, depending, in part, on available water, light and nutrients. As such, it is necessary to adjust SDI maximum values for the particular biophysical location to better optimize growth and predictions (Figure 17).

With forecasted climate change, drought conditions are expected to become more common which in turn is expected to create favorable mortality conditions in the old, large trees (Spies et al. 2010, Little et al. 2010).

Old Growth Structure and Stand Density: All growing sites have a fixed quantity of resources and growing space, and as inter-tree competition increases it is usually the large trees that die first (Dolph et.al. 1995, Fitzgerald et.al. 2000).

Current mortality across the Melvin Butte Project area is generally occurring as individuals and groups of trees. Of particular importance, the largest proportion of mortality is occurring from large and old ponderosa pines and is due to effects of inter-tree competition (density), bark beetles and western dwarf mistletoe. Large old trees are the key structural component of old-growth forests both for their habitat functions as living trees, and because they contribute to the large snag and down wood component of these forests. In most cases these trees occur amongst an under- and midstory of ponderosa pine and grand/white fir (Figure 14). Under current conditions these high value trees[14] are declining, and will eventually become rare with replacement delayed (Eglitis et al. 2015).

Recent studies have shown that ability of old growth trees to respond to reductions in density from thinning treatments, indicating an improvement in tree vigor and increased resistance to insects and pathogens (McDowell et al. 2003). Latham and Tappeiner (2002) measured diameter growth increments of old-growth ponderosa pine, Douglas-fir, and sugar pine in the southern Cascades of SW Oregon. Ponderosa pine basal area growth was significantly greater in the treated stands than in the control stands. Fitzgerald and colleagues (2000) are testing the hypothesis that managed old-growth stands, where density and composition are maintained at historic levels, remain viable longer as old-growth habitat (Genesis Research and Demonstration Area). Stands were treated with thinning followed by underburning. Preliminary results, after 3 years of measurement, indicate that vigor of residual old-growth trees is increasing. A similar study has been initiated in the Whitehorse area of the Lolo National Forest (Hillis, et.al. 2001). The authors anticipate increased growth response of the residual old-growth trees, based on nearby research showing response of 800 year old pine to release from competition by fire. Based on this research, it is assumed that reducing stand densities would help maintain existing large trees, and provide better conditions for the growth of future large trees. Table 38 and Table 39 display stand density by PAG and stand density by structure in the project area.

Table 38 Stand density by PAG

PAG	Avg. BA weighted DBH (inches)	Avg. Tree per acre	Avg. BA per acre	Avg. SDI	%MaxSDI	Acres
Ponderosa pine	15.7	856	149	336	88	1123
Mixed conifer	15.5	1697	207	499	74	3693
Lodgepole	14.3	1804	208	500	77	531

Table 39 Stand density by structure

Structure	Avg. BA weighted DBH (inches)	Avg. Tree per acre	Avg. BA per acre	Avg. SDI	%MaxSDI	Acres
Plantations (pole sized)	7.2	752	125	444	75	1174
Medium to large trees areas (including old	15.9	1633	209	499	82	2509

[14] Numerous publications and Deschutes County Forest Collaborative group meetings have identified old growth ponderosa pine as both a social and ecological value. See Franklin et al. 2013.

growth)						

Reducing forest densities, simplifying stand structure and reducing fuels to resemble conditions within the natural or historic range of variability is expected to reduce the risk of severe stand-replacing wildfires and widespread insect and disease outbreaks, as well as reduce the intensity of effects when disturbances occur. Forest conditions comparable to those found in historical records, such as the timber cruise from the Warm Springs Reservation, have demonstrated that open, low density stand conditions promoted resilience and resistance to fire and drought related stressors (Hagmann et.al. 2014). Reducing stand densities could also help maintain old-growth ponderosa pine longer on the landscape by reducing competition stressors. The Whychus Watershed Assessment (USDA 2013) states "maintaining stand densities at manageable levels is essential for promoting forest health and maintaining or creating large tree character and habitat in dry areas (pg. 58).

Fire

Fire was historically the most influential disturbance agent in forests east of the Cascade Crest, with low- to mid-elevation sites dominated by a frequent/low-severity fire regime (Hessburg et al. 2005, Hessburg et al 2007). Frequent fires in ponderosa pine maintained surface fuels at fairly low levels, kept understory vegetation and tree densities low and at low heights, preventing the formation of ladder fuels that could carry fire into the upper canopy. However, fire regimes in the dry forests have undergone a dramatic change to a less frequent, more severe regime (Everett et al. 2000). Hessburg et al. (2005) estimated that the area in the Columbia Basin with potential for low severity fire has decreased by 53 percent, while the area with potential for high severity fire has doubled.

Fire suppression/exclusion and selective logging of large, fire-resistant trees has led to the condition where high-severity fire is now common in forests such as these (Merschel 2012, Merschel et al 2014, Stein 2014, USDA 2013). Alteration of disturbance processes has resulted in increased fuel loadings and connectivity (both vertically and horizontally), and increased susceptibility to insects and disease (Hessburg et al. 2005).

Fire suppression/exclusion has allowed the establishment and dominance of grand/white fir in the grand/white fir series, where ponderosa pine was historically maintained as the dominant species by frequent low to mixed severity fires. The stands originating after partial overstory removal cutting are dominated by grand/white fir due to lack of a remaining pine seed source and altered fire regimes. This has had the effect of perpetuating the dominance of this late seral species.

The historical fire regime for the ponderosa pine and dry mixed conifer series was frequent, low severity surface fires (broad- and mid-scale) (Franklin et al. 2013, Stine et al. 2014). Studies have shown that fire return intervals were very short pre-settlement and were dominated by large ponderosa pine (Everett et.al. 2000, Hessburg et al. 2005, Hagmann et al. 2014, Merschel et al. 2014, Stine et al. 2014). On a fine-scale, however, individual and group tree torching diversified stand structure into mosaic and allowed for recruitment of snags. The high live crowns and thick bark of mature trees protected them from the low-intensity wildfires common in the ponderosa pine and dry mixed conifer types. The frequent low-severity fire regime of ponderosa pine led to the most stable[15] landscape pattern of all the eastside forest vegetation types. These predominant surface fires maintained low and variable tree densities, light and patchy ground fuels, simplified broad-scale forest structure, favored fire-tolerant trees, such as ponderosa pine, and a low and patchy cover of associated fire-tolerant shrubs and herbs (Hessburg et.al. 2005). The

[15] Stable here referring to consistent high proportion of ponderosa pine/time

historic landscape pattern in ponderosa/ dry mixed conifer was uneven-aged at the landscape scale but even-aged at the stand or group scale, resulting in a landscape of open park-like stands of trees with the understory dominated by herbaceous vegetation. The even-aged patches within the landscape pattern were created when individual trees or small groups of trees died, creating gaps in which new even-aged clumps could develop.

Relative to pine/ dry mixed conifer forests, mesic forest types exhibited a wider range in fire severities with a larger area burned at mixed to high severities (Wright et.al. 2004, Hagmann et al. 2014, Stine et al. 2014). High severity fire effects were documented in historic timber cruise data at the upper elevation boundary of moist mixed conifer habitat adjacent to colder, wetter habitat types (Hagmann et.al. 2014). Lower elevation mixed conifer sites where historically dominated by ponderosa pine and experienced lower severity, frequent fire (Merschel et al 2014, Hagman et al 2014).

Lodgepole pine has a longer fire return interval with higher severity fires resulting in more stand replacement. The historic landscape pattern in the lodgepole pine type was even-aged with large patches of even-aged stands of lodgepole pine regenerating after a stand replacing disturbance event, such as fire or a bark beetle outbreak.

Fire Regimes

Fire regimes have been identified for all plant associations occurring across the Deschutes National Forest (Volland 1988, Simpson 2007). Fire regimes are influenced by biotic and abiotic conditions including; stand conditions, fuels, weather. See Fire and Fuels report for more information on fire regimes.

Fire Hazard

Fire hazard is defined by the fuel complex, as determined by the volume, type, condition, arrangement, and location which determine the ease of ignition and resistance to control. Fire hazard expresses the potential fire behavior for a fuel type, regardless of its weather-influenced fuel moisture content (Hardy 2005). Fire hazard is discussed below in terms of the fuel profile and potential fire behavior. The Fire and Fuels Report includes additional information on fire hazard.

Fuels

Surface Fuels

Estimates of surface fuel loadings are based on existing fuels information taken during stand exams and inputted into the FVS-FFE model. Surface fuels in the project area consist mainly of shrubs (i.e. green leaf manzanita, bitterbrush), litter and duff, down logs, branches and twigs. The shrub component is variable but where it is present tends to form a continuous component of the fuel bed. Surface fuel loadings are presented in Table 40.

Table 40 Surface fuel loadings (tons/acre) and predicted flame lenghts (ft) for PAG

PAG	Acres	Avg. Surface fuel loading Total	Avg. Surface Flame Severe
Ponderosa pine	1123	17	5
Mixed conifer (dry and wet combined)	3693	21	5

Lodgepole[16]	531	22	6

Canopy Fuels

Canopy base height (CBH) is the lowest height above the ground where there is sufficient amount of canopy fuel to transition a fire from the surface fuels into the tree crowns (Scott and Reinhardt 2001), and canopy base heights are a critical factor in determining crown fire potential due to the effect of understory trees carrying fire into tree crowns via torching. Canopy base heights were determined for the project area from the Forest Vegetation Simulator (FVS-FFE) using stand exam data. The structure and species composition of the stands, with dominance by grand/white fir with low growing crowns, as well as dense understory trees, and the numerous plantations are contributing to the low canopy base heights observed (Table 41). CBH should be considerably higher than the height of expected flame lengths (Table 40) in order to avoid torching and potential crown fire initiation. The fuels continuity from the surface fuels to the crown fuels, as indicated by the CBH values in Table 42, has created the potential for surface fire to reach the crowns of the overstory trees.

Canopy bulk density (CBD) is the mass of available fuel in the form of needles, branches and twigs per unit of canopy volume (kg/m3), and is an important characteristic needed to predict crown fire potential and spread. Canopy bulk densities were estimated from FVS-FFE within the project area (Table Table 41 and Table 42). CBD affects the critical spread rate needed to sustain active crown fire. The lower the canopy bulk density, the lower the potential for active crown fire. The threshold CBD for reducing the likelihood of active crown fire depends on fire weather and rate of spread and is not well defined, but may be less than 0.10 kg/m3 (Agee 1996, Peterson et al. 2005). Across PAGs and structure types, CBD is currently above this threshold or is approaching it (Table 41 and Table 42).

Table 41 Fire metrics related to canopy fuels by PAG.

PAG	Acres	Avg. CC %	Avg. CBH (ft.)	Avg. CBD (kg/m^3)	Avg. % Mortality BA- Severe Fire	Avg. Crowning Index (mph)
Ponderosa pine	1123	56	6	0.09	45	27
Mixed conifer	3693	63	5	0.17	75	18
Lodgepole	531	25	5	0.20	83	15

Table 42 Fire metrics related to stand structures.

Structure	Acres	Avg. CC %	Avg. CBH (ft.)	Avg. CBD (kg/m^3)	Avg. % Mortality BA- Severe Fire	Avg. Crowning Index (mph)
Plantations (pole sized)	1174	62	5	0.16	69	19
Medium to large trees areas	1507	60	5	0.11	49	26

[16] Much of the lodgepole PAG has experienced a widespread beetle epidemic and/or Pole Creek Fire 2012. This material has and continues to fall down creating jack-strawed fuels near the 16rd.

Flame Lengths/ Crown Fire Potential

Surface flame lengths are a measure of how intense or severe a fire may become and a proxy for ease of fire suppression (resistance to control). Heavy surface fuel loads generally contribute to longer flame lengths. Since surface fuels consists mainly of shrubs, grass/sedge and duff, and scattered larger dead and down material, predicted average flame lengths are generally 5 feet across the project area. Canopy base height across the project area is generally also at this height (5ft) (Table 40, Table 41, and Table 42). The interaction of these two and severe fire weather are factors that have the potential to lead to crown fires and/or lethal surface fires that could kill a large proportion of the forest in the project area.

Crown fire potential, or hazard, is based on the amount of surface fuels, the amount of ladder fuels, and the density and spacing of the canopy. Heavy surface fuels generally contribute to longer flame lengths. Low canopy base heights can carry surface fires into the crowns. Once established the crown fire may persist. The more spaced the canopy, the greater the wind necessary to move fire from one crown to the next. Dense canopies require much less wind speed to support crown fire. The crowning index integrates these factors into a single value that reflects the hazard of crown fire being initiated and sustained.

FFE-FVS uses information about surface fuel and stand structure to predict whether a fire is likely to crown. Crowning index is a measure of how susceptible a stand is to developing a crown fire when a fire occurs. It depends on canopy bulk density, slope steepness, and surface fuel moisture content. As a stand becomes denser, active crowning occurs at lower wind speeds, and the stand is more vulnerable to crown fire. Lower index numbers indicate that crown fire can be expected to occur at lower wind speeds, so crown fire hazard is greater at lower index values. Current values for crowning index (wind speeds in miles per hour) in the project area are at or above the expected potential 14 mph wind speed for a fire in this area, indicating that the project area is moderate to highly susceptible to crown fires (Table 41 and Table 42). In addition, wind gusts must also be taken into consideration, and given the low CBH tree torching is likely to occur and could be sustained over with higher wind speeds. Overall, the crowning index values in Table 41 and Table 42 likely represent a moderate to high hazard of crown fire (see Fuels report for more information).

Crown fires are typically faster moving than surface fires, and result in more tree mortality and smoke production. A crown fire would loft more firebrands into the air than a surface fire due to the amount and type of fuel being consumed. A crown fire is generally more intense, thus producing more wind and convective heating. These forces acting alone or in combination would carry fire brands greater distances and increase likelihood for spotting to other areas. Crown fires are more dangerous than surface fires and are more difficult to suppress.

Predicted Fire Type and Severity

FVS-FFE was used to predict the type of fire and amount of mortality from a wildfire burning under severe (90th percentile) weather and fuel conditions. Four types of fire are recognized by the model, 1) surface fire which does not burn in the tree crowns, 2) active crown fire where the fire moves through the tree crowns killing all trees, 3) passive crown fire where individual trees or groups of trees are killed as their crowns torch, and 4) conditional crown fire where surface fuels are not heavy enough to sustain a crown fire but canopy bulk density is great enough that crown fire could be initiated from a neighboring stand. Predicted mortality is based on the amount of crowning, scorch height, species, and bark thickness.

The type of fire resulting from an ignition under severe conditions in the project area would be a combination of active, surface, passive and crown conditional fire (Table 43). Mortality is predicted to average 72 percent of the basal area. Much of this mortality would likely be from the combination of fire types associated with the different structures and ease of spread from ladder fuels and dwarf mistletoe. Of

particular importance is the large overstory ponderosa pine mortality susceptibility from ladders and root damage from buildup of bark mounds at the base of trees over time.

Table 43 Predicted fire type, severity and proportion of Melvin Butte Project area.

Predicted fire type and severity	Proportion of project area (%)
Active	22
Passive	12
Crown Conditional	27
Surface	39

Based on experience with previous wildfires, namely the Pole Creek Fire of 2012, fire behavior is expected to have moderate to severe effects on tree survival, and fire modeling with FVS-FFE substantiates this assumption. Passive or active crown fire is likely to occur wherever there are substantial amounts of understory trees that could bring fire into tree crowns, and higher wind gusts could lead to active crown fire as well. Soil heating and root damage is also likely to occur around heavier buildup of down woody fuels, leading to direct and indirect (insects/disease) mortality from fire.

Insects and Disease

The roles of insects and disease as disturbance agents in forests are very closely tied to vegetation patterns. Factors such as species composition, size structure, and density of forest stands are important in determining which agents are likely to affect that vegetation type. By their actions, forest insects and diseases can alter the vegetative patterns and set the stage for new processes to occur.

The primary mortality-inducing insects within the project area include western pine beetle, mountain pine beetle and pine engraver beetle (Eglitis et al. 2015). Mountain pine beetle are capable of causing extensive tree mortality and most often exhibit preference for larger diameter trees growing in high density stands with a high percentage of host type (Fettig et.al. 2007). When tree densities are above the upper management zone for density (see section on stand density for a definition of the upper management zone) they are considered imminently susceptible to bark beetles (Powell 1999, Eglitis et al. 2015). A study done in the Colorado Front Range illustrated that mountain pine beetle-infested plots exhibited higher basal area and stand density index (SDI) for ponderosa pine versus all tree species combined (Negron et.al. 2004). Bark beetles also tend to thin from above, killing the larger trees within the stand first. Within infested plots, infested trees were larger in diameter at breast height and in the dominant and co-dominant crown positions (Negron et.al. 2004).

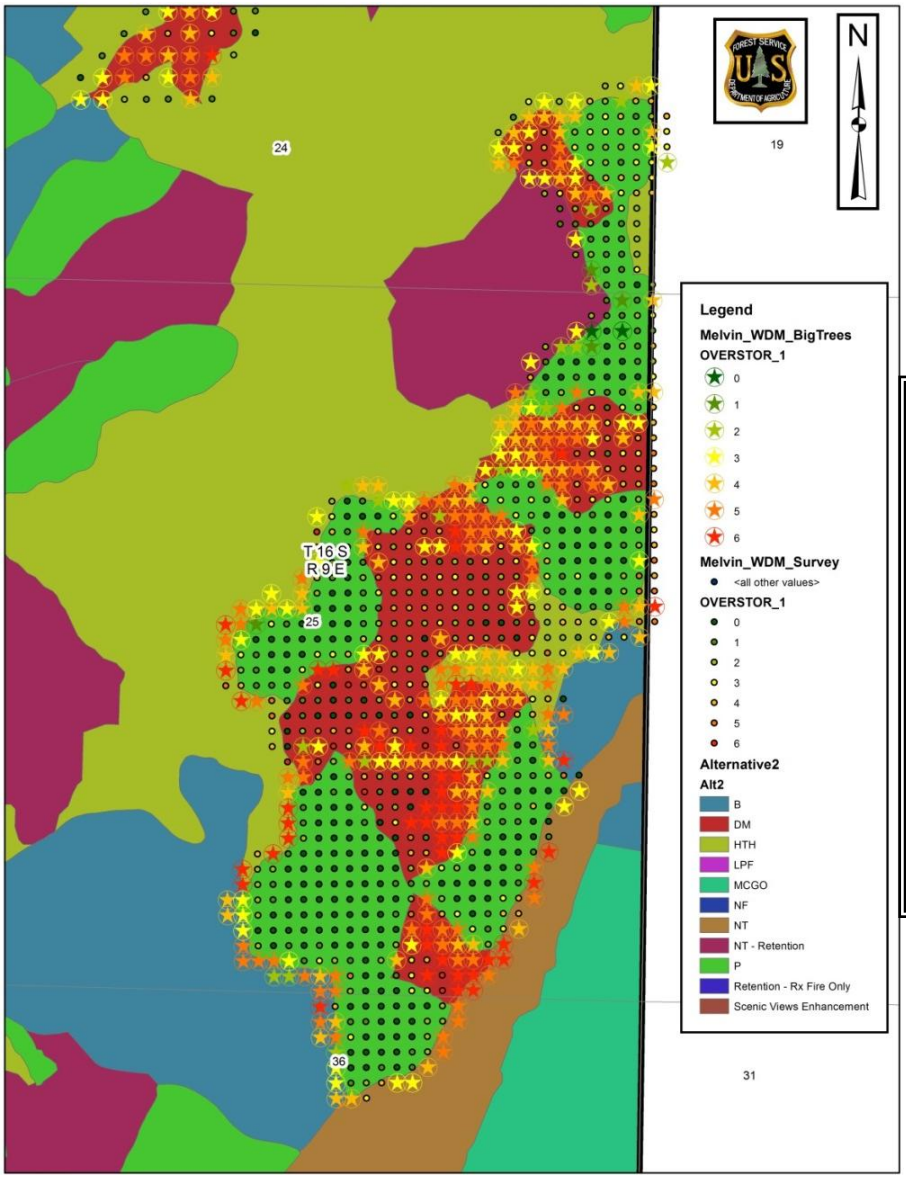
Western Dwarf Mistletoe

The primary disease found in all size/ age classes of ponderosa pine throughout the Melvin Butte project area is western dwarf mistletoe (WDM). The level of infection is largely related to PAG (Table 37) and to the incidence of past regeneration harvesting and/or pruning that has occurred. In general in the ponderosa pine PAG, the past regeneration harvest units (plantations) show the lowest level of infections. However, about 2/3 of these plantations now indicate spread interior to their stands, undermining the original purpose (Figure 18).

It is believed that incidence of dwarf mistletoe is elevated from historical conditions within the project area. Frequent, low-intensity fire played a large role in moderating the presence of mistletoe by maintaining fewer trees in lower canopy layers that would become infected and spread seed as well as ‘pruning’ lower limbs with broom-like infections on the larger trees (Bolsinger 1978, Hessburg et al. 1994, Campbell and Liegel 1996, Hessburg et al. 2008). Severely infected trees were also more likely to

torch resulting in individual tree or small group mortality. This created gaps where mistletoe spread between trees was less likely to occur.

Fire suppression/exclusion has caused increased infection in these stands by allowing susceptible understory trees to establish, become infected, and increase the incidence and rate of spread higher than historical levels (Edmonds et al. 2000). Ponderosa pine infected with WDM exhibits increased mortality due to successful western and mountain pine beetle attack (Miller and Keen 1960; Eglitis et al. 2015); reduced volume and height growth (Hawksworth 1996, Maffei and Jacobi 1986); reduced viable seed production for natural regeneration (Hawksworth 1996); and increased susceptibility to mortality from fire (Conklin and Geils 2008). These effects are proportional to increasing levels of infection (see Appendix F). A stand heavily infected with dwarf mistletoe has a decreased likelihood of developing into old forest structure (Hopkins 1992, Eglitis et al. 2015). Outbreaks of mountain pine beetle may increase the proportion of infected trees by killing the uninfected trees and increasing the rate of spread of mistletoe. Thus, management objectives for both beetles and dwarf mistletoe need to be taken into account (Edmonds, Agee and Gara 2000).



Western dwarf mistletoe ground survey of selected Melvin Butte stands (Hawksworth 1977). Green polygons represent plantations. Circled stars indicate >21”dbh ponderosa pine and small circles indicate ponderosa pine <21”dbh. Green circles and circled stars indicates no to light infection transitioning to red with severe infections.

Figure 18 Western dwarf mistletoe ground survey of selected Melvin Butte stands (Hawksworth 1977)

Project Area Insect and Disease Review and Recommendations

The project area was visited by Forest Health Protection Staff Helen Maffei, Ph.D. (Area Plant Pathologist), Brent Oblinger (Area Plant Pathologist) and Andris Eglitis Ph.D (Area Entomologist) at multiple times in summer 2014. The full reports for these visits can be found in the project record. Their conclusions and recommendations are summarized below:

Findings

Western Dwarf Mistletoe

Western Dwarf Mistletoe is a key disturbance agent influencing stand health and structure throughout parts of the project area. Severely infected trees (DMR 5 or 6; Hawksworth 1977) are adversely infected

and when they occur within large old trees their persistence is shorter than those without mistletoe. Managing for trees (replacement) underneath infected overstory is dubious at best and typically unsuccessful. Infected ponderosa pine (esp. larger ones) in adjacent stands (or parts of the same stand) can be detrimental to the effectiveness of the treatment. Thinning treatments using unevenaged silvicultural tools is complex, requires fine-scale knowledge of infection levels and extent, often time requires follow up monitoring and is often unsuccessful.

Recommendation- Prioritize dwarf mistletoe treatment areas based on fine-scale cues of infection level, location of infection and stand conditions.

Insects

Western bark beetle is the most significant beetle in the project area with scatter small pockets of ponderosa pine dead and dying. Mountain pine beetle is also present in small quantities attacking ponderosa pine and those pine weakened by western dwarf mistletoe and other areas under high stem densities. Western dwarf mistletoe is causing ponderosa pine to be more susceptible to the various pine bark beetles in the area. Adjacent and recent wildfires may contribute to population buildups of bark beetles. Legacy ponderosa pine are under extreme competition with grand/white fir throughout the understory and cannot compete successfully in the long term. White fir within the dry plant associations are not sustainable in the long-term especially at or below 20” of annual precipitation.

Recommendation- Thinning for density reduction using “management zone” as an indicator is an important predictor for likelihood of insect/ disease susceptibility (Cochran 1992, 1994).

Past Vegetation Management Activities

Vegetation management activities in the Melvin Butte project area have included timber harvest, small tree thinning, firewood cutting, and prescribed fire. Table 44 summarizes the known past management activities.

Table 44 Known past management activities within the Melvin Butte Project area.

Ownership at the time of the Treatment	Management Activity	Approximate Acres
Public (Forest Service)	Overstory Removal	177
Public (Forest Service)	Regeneration Harvest	944
Public (Forest Service)	Harvest Partial Removal	261
Public (Forest Service)	Selection Harvest	590
Public (Forest Service)	Thinning	261
Public (Forest Service)	Timber Stand Improvement	1,044

Desired Future Condition

On a broad-scale, development of the desired future condition comes, in part, from the 1998 Whychus Creek Watershed analysis which outlined watershed conditions from a 178,161 acre scale. Numerous changes have occurred since this analysis resulting in renewed attention in addressing forest health issues in some of the last continuously forest acres within the watershed.

Large-scale high severity (stand replacement) fires (>10 acres) and a mountain pine beetle outbreak (>10 acres) have altered the surrounding landscape. Resultant vegetation condition changes prioritized a 2009

watershed analysis (for Popper Project area[17]) and finally a 2013 (post Pole Creek Fore 2012 and pre this analysis). This condition change recognizes an urgent need to address forest conditions that have the potential to threaten interior habitat loss and resiliency in the face of uncertainty. The project boundary encompasses Strategy Areas 1,2, and 4 and are listed as "urgent" to "moderate".

A healthy, diverse, fire-resilient forest structure can be restored in these forest types through restoration treatments that include reducing stand densities, fuel loads and western dwarf mistletoe abundance and altering late seral species proportions. Maintaining stand densities at manageable levels is essential for; promoting forest health; maintaining or creating large tree character habitats; and meeting the goals of the Whychus Watershed Analysis.

Forest health is an important consideration in the management of stands within the Melvin Butte (see Insects/Disease, above).

The Forest Service Forest Health Protection staff defines forest health as, "A condition wherein a forest has the capacity across the landscape for renewal, for recovery from a wide range of disturbances, and for retention of its ecological resiliency while meeting current and future needs of people for desired levels of values, uses, products, and services" (Twery and Gottschalk, 1996). Treatment strategies to enhance forest resilience and wildlife habitat, and to affect potential fire behavior by allowing forests to equilibrate to fire under modern conditions, and for increasing forest heterogeneity are outlined in several recent publications (Franklin et al. 2008, North et al. 2009, Franklin et al. 2013).

Desired Future Condition for Forest Vegetation

Desired future condition includes maintaining and improving habitat for interior forest species, reducing fire hazard, maintaining and enhancing a heterogeneous landscape with stand densities and species composition that favor resistance and resiliency to future unknown disturbances. The Melvin Butte project area contains different PAGs and as such desired future conditions are modified, by these PAGs to capture broad-scale variations.

Overview

A forest with medium to large ponderosa pine acting as "anchor" points to continuous forest cover over the long-term; a condition indicative of Pre-European settlement (100-300 years past). A variety of stand conditions would be distributed throughout this larger ponderosa pine tree matrix. Stand densities, species composition and fuel loads would be consistent with natural fire frequencies. Snag and down log levels would be consistent with historic levels. The forest would be resistant and resilient to fire, insects, diseases and other future unknown disturbances.

The sustainability of this condition is an important characteristic. In this desired condition, there is a balance of various vegetation conditions so that although portions might not be perfectly resistant to large-scale fire, or insect/disease outbreaks, etc., yet on the whole, the landscape would exhibit resilience, so that when these natural disturbances occur it recovers more rapidly, without entire loss of broad-scale resource values.

[17] Popper Project area was planned, had public collaboration (Deschutes County Forest Project), and was nearing Decision when on September 9th, 2012 a wildfire began in the project area (Pole Creek Fire Assessment 2012).

Ponderosa Pine

The ponderosa pine plant association is made-up of relatively open stands of ponderosa pine that have irregular distribution both as individual trees and as relatively small groups. Reproduction is often in even-aged patches up to several acres in size, and scattered grass/shrub/forb openings, 1/10 to ¼ acre in size with a few larger scattered trees. This plant association group will generally develop into a ponderosa pine climax condition, with infrequent denser stands found in riparian bottomlands and other moist ecotones. Stands are primarily one or two storied and are often less than 25% canopy closure. Understories are almost entirely ponderosa pine as scattered individuals or small ($1/10^{th}$-$1/4^{th}$ acre) even-aged groups. Shrubs and grasses are young and vigorous, reflecting the influence of frequent, low intensity fire. Low intensity fire is the primary disturbance agent, with fire return intervals ranging from 5 to 20 years.

Mixed Conifer (Dry and Wet)

The mixed conifer landscape is a mosaic of varying patch sizes and seral stages and formed from influences of adjacent areas, site productivity and disturbance regimes. Stands contain a range of small, medium and large trees. Ponderosa pine is the dominant overstory "anchor" species with sparse understories of both shade tolerant and intolerant species. Low to mixed intensity fire return intervals are 0-50 years and help maintain seral species and prevent the dominance of climax species in most stands. Snag and down log levels would be consistent with historic levels and standards in the Northwest Forest Plan. Fire severities within mixed conifer PAGs would encompass the range from low to high severities with high severity consisting < 10% of the burn area occurring as small patches distributed throughout the burn area (departure from Watershed Analysis). In wet mixed conifer, stand replacement effects were more widespread in patches than surface fire effects, while in dry mixed conifer, surface fire effects are more widespread by nearly 2:1 (Hessburg et.al. 2007). Scattered stands of climatic climax conditions exist where disturbance intervals are longer. These stands are generally older, have higher site productivities and have a higher density of the largest trees.

Mixed Conifer Dry – Generally these areas are one or two storied stands with 20% to 40% canopy closure. Understory trees and shrubs are unevenly distributed and a mix of shade tolerant and intolerant species. Grand/white fir does not comprise more than 20% of the stand. Snags present are sufficient to meet 100% MPP for wildlife focal species (usually 4 to 7 per acre). Down logs are scattered throughout the stand. Small openings exist, generally less than 10 acres in size, with 10 to 15 trees per acre (primarily ponderosa pine) and with large snags present/created.

Mixed Conifer Wet – These plant associations occur mostly in moister ecotones such as riparian bottoms, higher elevations, north slopes, or other areas with fire return intervals at the upper end of 0-50 years. These stands are multi-storied, with 30%-60% canopy closure, and include a balance between grand/white fir and "anchor" ponderosa pine. Understory trees, which are mostly shade tolerant species, are multi-aged, and well distributed. Trees (either ponderosa pine or grand/white fir) may occur as dense thickets when pioneering an opening created by insects/disease, fire or windthrow. Due to surrounding area influences, grand/ white fir does not comprise more than 30% of the area over 30 years. Snags and large down logs provide a significant amount of structural complexity.

Lodgepole Pine

These areas are influenced by cold air drainages and in general have a longer disturbance interval, but can be influenced by the surrounding landscape and changes in insect/disease abundance (Simpson 2007, Stine 2014). Moderate to high intensity fire is the primary disturbance agent with return intervals of around 35 to 100+ years. Generally these areas are a mosaic of varying textures and seral stages and patch

sizes and contain stands of generally similar aged/sized trees with few large ponderosa pine grand/white fir remnants.

The desired future condition includes safety along a travel corridor would include reduced fuel loading from recent fires and beetle epidemic thereby lowering risk to public/fire fighter safety near a visual and escapement corridor (Forest Road 16). Tree species diversity among the different stand conditions would be favored where such exists.

Environmental Consequences

Goals, Objectives, and Issues Addressed and Indicators for Assessing Effects

Goals, objectives, and issues are discussed above under Overview of Issues Addressed and Desired Condition.

Issues Addressed and Indicators for Assessing Effects

This analysis discloses the predicted effects of tree thinning and fuels reduction on forest health and sustainability. The direct factors analyzed herein, and those which influence meeting the purpose and need of the project are; forest/stand structure, stand densities, species composition and insects and disease risk. Actions that affect these factors are the type and amount of vegetation management (e.g. tree thinning, prescribed burning, and mowing), and extensive disturbances.

The primary biotic risk agents identified in the project area were tree densities, bark beetles and western dwarf mistletoe. Key measures of the effects of the alternatives on these agents are the following:

- Bark beetle risk reduction is measured in terms of the acres above the upper management zone treated with density-reducing treatments.
- Western dwarf mistletoe reduction is measured in terms of the acres of stands infected with western dwarf mistletoe treated to remove/reduce infection, and the number of acres above the upper management zone treated with density-reducing treatments.

Key Issues and Analysis Issues are displayed below (Table 45 and Table 46).

Table 45 Key issues

Key Issue		Key Issue Indicator (s)
1	Temporary roads	1) Acres made assessable (by temporary road construction) 2) SDI
2	Group Opening in Mixed Conifer PAGs	1) Acres of openings 2) Past logging and fire suppression
3	Removal of large diameter dwarf mistletoe pine	1) Acres with potential large diameter heavily infested dwarf mistletoe pine tree removal.

Rationale within proposed action that resulted in Key Issue Development

Key Issue #1: No temporary roads

The proposed action of building 0.80 miles of temporary road action was developed to allow access to about 70-90 acres in the project acre. About 71 of these acres allow access to land directly interfacing with private land (Skyline Forest). This temporary road construction consists of reutilizing old road beds and/or skid trails from previous harvest activities.

Key Issue #2: Do Not Include Group Openings in the Mixed Conifer Plant Association

This portion of the proposed action was developed to address the interacting effects of past logging and fire suppression/exclusion within the mixed conifer type on grand/white fir site dominance. The proposed action describes the implementation location of these openings in terms of high relative grand/white fir/ ponderosa pine proportions and retains ponderosa pine from any size class if they are healthy or have low mistletoe infection[18]. It is estimated that a maximum of 30% (range 10-30%) of a given unit would have these openings and would range in size from 1-3 acres. These areas will also have reintroduced prescribed fire to improve natural regeneration of ponderosa pine and may be planted if ponderosa pine regeneration is delayed.

Key Issue #3: Do not remove large diameter dwarf mistletoe pine

This portion of the proposed action was developed to assign specific locations where Deschutes National Forest Collaborative (DNFC) ponderosa pine dwarf mistletoe recommendations would be specifically applied. These areas represent 160 acres and would remove select large trees in strategic locations as outlined in recommendations. These recommendations would be interpreted and communicated (feed-back) before these trees are removed. Old growth ponderosa pine outside of these areas would be maintained however pruning or girdling may occur.

Table 46 Analysis issues.

Analysis Issue	Analysis Issue Indicator (s)	Measures
Forest Ecosystem Restoration	Stand density	SDI
	Old growth development	SDI
	Stand structures /species composition	Acres treated
	Insects and disease	SDI, DMR
	Fuels restoration	CBH, CBD, CI, fire type
NWFP Standard and Guideline C-44	Retention of old-growth fragments in watersheds where little remains	Percent of Retention

Spatial and Temporal Context for Effects Analysis

Spatial and Temporal Bounds

The proposed action would occur within the project boundary and within the ponderosa pine, dry/wet mixed conifer and lodgepole types. Additional treatments are proposed within lodgepole stands, but are planned more as visual enhancement, fuels reduction or to open stands up for other in situ species (ponderosa pine).

Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

The cumulative effects boundary includes a 1000ft buffer around the project area to account for adjacent vegetation changes/ effects. This includes eastern edge of the Pole Creek Fire and southern boundary of the SAFR project area.

[18] Relative proportion: These areas indicate current grand/white fir which was not previously the case prior to past overstory logging and fire suppression/exclusion policy. Determination of this condition was done by historic ponderosa pine stumps both through direct quantitative and qualitative assessments and through the review of literature. Mixed conifer in Melvin Butte indicates greater historic ponderosa pine proportion than current levels.

Alternative 1 – Ecological Trends Direct and Indirect Effects

There are no treatments under the no action alternative, and therefore no direct effects.

Forest Ecosystem Restoration Trends

No thinning, harvest, prescribed burning or mowing would occur within the project area under the no-action alternative. Stand structure and density under the no action alternative would continue to deviate from historical conditions in the following ways:

- Stands would continue to be dominated by small trees (<21 in. DBH).
- Stand structure of stands would consist of dense, multi-storied canopies, resulting in large areas of contiguous ladder fuels or plantations with uniform canopies under high density shrub layer.
- Dead fuel on the surface would continue to accumulate in the form of decadent brush, dead material from insect and disease mortality, limbs, and needles, adding to the fuels that have accumulated since the last burn cycle.
- There would be an increase in western dwarf mistletoe in ponderosa pine.

The shift in species composition towards fire intolerant species (lodgepole pine and grand/white fir) would continue with the following effects:

- There would be more fire-intolerant species (primarily grand/white fir) on the landscape, and there would be more ladder fuels from the fire-intolerant species in the understory.
- There would be more shorter lived trees (i.e., lodgepole pine and grand/white fir).
- There would be more stress on overstory ponderosa pine.
- There would be an increased risk of future bark beetle outbreaks, which increases the fire hazard over the landscape.

Thinning towards historic forest conditions in order to promote sustainability and resiliency would be avoided. Stand structures, species composition, and hazardous fuels would continue to move further away from HRV proportions. Approximately 88% of the acres in the project area are above the upper management zone. These acres are considered at a higher risk for bark beetles (mountain and western pine beetle) mortality, stand replacement fire and dwarf mistletoe infection (Powell 1999). These high density areas will remain susceptible to dwarf mistletoe and bark beetle activity and the susceptibility will increase over time. High stand densities will result in the overall reduction in tree vigor among all size classes. A reduction in tree vigor will predispose those trees to the various insects and diseases that take advantage of low vigor/weakened trees (e.g. bark beetles and root diseases). The most significant effect of high stand densities will be the gradual loss of the existing historic large-tree component at a rate that is likely to be much faster than if stand densities had been reduced to lower density levels. Ponderosa pine dwarf mistletoe from all size classes would continue to spread down, out and within furthering spread within and adjacent plantations. Fuel buildup would continue contributing reductions in ponderosa pine natural regeneration. Lodgepole stands would continue to fall apart with areas within the Pole Creek fire and along the 16rd creating high down wood levels and impacting this escapement and visual corridor.

Stand Structures/Species Composition

Stand structures currently do not reflect the desired condition based on historical references, and are not likely to achieve this under no action (Youngblood 2006). Resistance and resilience to disturbance would remain low, since almost the large majority of stands are at or above the UMZ for stand density. Current fire suppression/exclusion policy and past logging has increased small trees that act to increase inter-tree competition (densities), fuel ladders and abundance and spread of dwarf mistletoe. Under the no action the interaction of these elements will continue and contribute to delays in old growth development and

attenuation of current old growth trees overtime. Since small shade-tolerant trees would continue to persist and grow under the overstory, and new regeneration of shade-tolerant species would be recruited, the stand structures would continue to be multi-layered and to succeed to grand/white fir. There would be continued loss of the larger ponderosa pine, which are the most fire-resistant trees, and which "anchor" late-successional habitat from disturbance to disturbance by providing a long-lived component with the ability to survive wildfire. At the high stand densities found in this area, the larger, older trees are often the first to die, because under stress they are unable to maintain their higher respiratory requirements compared to smaller trees, and are susceptible to bark beetles (Fettig et al. 2007).

Dense younger stands in the project area also would not benefit from thinning treatments designed to create heterogeneity and increase growth. These stands are currently very dense (some areas exceed 1000 trees per acre), and thinning would move them towards reference conditions for density and species composition. Many plantations established after clearcutting since the 1960s are dense and even-aged. Pole size lodgepole and mixed conifer stands, some of which developed after partial-cutting, would continue to be dense and relatively even-aged/sized. Given the high levels of insects and disease within the project area, not thinning these younger stands to increase growth and moving them towards desired conditions would be a lost opportunity. Thinning would provide potential replacement habitat for mortality-prone mature stands sooner than no treatment.

In the event of a wildfire it is expected that fire behavior and stand replacement conditions would occur and be similar to that of the Pole Creek Fire 2012. As such a large proportion of the area would be set back to an earlier seral and structural state therefore resulting greater and longer delays in old growth development.

The growth and crown development of the smaller trees would also be affected by No Action. Trees in the smaller size classes (<21" dbh) would remain in high density conditions that are not conducive to good growth or crown development. The types of crowns developed by historic old-growth ponderosa pine did not occur under the high densities that the majority of the small trees in the Melvin Butte project are growing under now.

Stand Density

Stand densities would remain at high levels and generally increase over the next 30 years under No Action. Whether density increases in a given stand or stand-type or not will depend on the amount of density-dependent mortality and density-independent (insect/disease related) mortality that occurs. Both types of mortality are difficult to predict, and are often triggered by drought which intensifies the competition process among trees and weakens trees so that they are less able to resist insects and pathogens. However, given that existing densities exceed thresholds based on MaxSDI (50 percent of MaxSDI) on over 4,730 acres (Table 47, Table 48 and Table 49), and given that mortality is already occurring, it is highly likely that mortality would continue and increase in the future. Stand densities will remain high and continue to increase in areas where they are already high. In areas where they may not already be high they will continue to increase, eventually reaching undesirable levels. Under the No Action alternative, the large tree component, as well as smaller trees, which represent future large trees, would exhibit low resistance to bark beetle attack, and higher risk of mortality from dwarf mistletoe. With continued competition from understory trees, mortality within the large tree component would be expected to increase. Losses would be especially pronounced under drought conditions.

No action alternative would result in the slowdown of the recruitment of large trees due to the continued density-related decline in tree growth and vigor. Stands would continue to decline in growth and vigor due to increasing competition and reduced crown development. Risk to insects and disease would continue to intensify. Increased bark-beetle activity would be anticipated with the next drought cycle.

Table 47 Existing and 2045 stand metrics for mixed conifer dry PAG.

Stand Metric	Existing Condition	Year 2045
Trees/acre	1425	965
Basal Area/acre (ft.^{2})	207	221
Canopy Cover (%)	64	63
SDI	467	472
% MaxSDI	69	67

Table 48 Existing and 2045 stand metrics for mixed conifer wet PAG.

Stand Metric	Existing Condition	Year 2045
Trees/acre	1939	1464
Basal Area/acre (ft.^{2})	228	262
Canopy Cover (%)	65	66
SDI	551	586
% MaxSDI	84	89

Table 49 Existing and 2045 stand metrics for ponderosa pine PAG.

Stand Metric	Existing Condition	Year 2045
Trees/acre	1575	522
Basal Area/acre (ft.^{2})	149	167
Canopy Cover (%)	55	54
SDI	335	333
% MaxSDI	87	88

Insects and Disease

Dwarf Mistletoe

Table 50 Western Dwarf Mistletoe Ratings by PAG.

PAG	Existing Mean DMR (Avg. across all stands)	2045 Mean DMR (Avg. across all stands)
Ponderosa pine	2.02	4.08
Mixed Conifer	1.05	2.20
Lodgepole	0.80	1.35

Due to current levels of dwarf mistletoe, stand structures and densities the trends of dwarf mistletoe will increase substantially (Table 50). This can likely be explained by the numerous plantation and second growth blocks surrounded by medium to large heavily infested ponderosa pine (Figure 16). These trees would continue to spread mistletoe seeds down, within and outward filling in areas with low to medium infections. With a rate of 2-3 ft/year in even aged stands, currently infected plantations will be completely or nearly so enveloped with dwarf mistletoe in 2045. High stand densities are expected to increase large tree mortality and dwarf mistletoe infection and bark beetles interactions are expected to reduce large tree recruitment. Since dwarf mistletoe is specific to ponderosa pine, increase of grand/white fir is expected creating conditions that are further outside of reference conditions.

Re-Introduction of Fire

Re-introduction of fire for beneficial uses would be extremely difficult under the no action alternative due to the current propensity towards crown fire, mortality and adjacent private lands. Holding and suppression activities would place firefighters at risk due to dense understories which could lead to dangerous flaming fronts along potential hold lines. Anchor points would need to be established, which during suppression activities are usually done in haste as opposed to planned treatments executed by contracts.

Uncharacteristic Wildfire

Fire regimes in the ponderosa and mixed conifer PAG were historically primarily frequent/low to mixed severity regimes that consumed mostly understory fuels, vegetation with small pockets of torching. Predicted fire types now have substantial amounts of stand-replacing severity, which is considered uncharacteristic of these plant associations (Table 51, Agee 1994).

Table 51 Predicted fire type under No Action (2019).

Fire type under severe conditions	Acres	% of project boundary
Active	2441	45
Cond. Crown	217	4
Passive Crown	1009	19
Surface	1705	32

Alternative 2 – Direct and Indirect Effects

Effects on Forest Ecosystem Restoration

A total of 4,435 acres would be treated using a variety of treatment types to reduce tree and shrub density, increase average tree size, reduce fire-intolerant late-seral species, reduce abundance of mistletoe laden trees, enhance visuals and provide fuel breaks to protect people and property from wildfire from the project area. Two hundred and forty of these acres will be a visual and WUI escapement corridor “clean up” of heavy fuel loading adjacent to Forest Road 16 (Three Creeks Lake road). The no treatment areas correspond to Three Creek while retention strategy areas correspond to different areas within the project boundary (see Wildlife report).

Stand Structures/Species Composition

Alternative 2 thinning and underburning treatments would move stands towards reference conditions. All treatments would lead to a greater patchwork distribution of size/age classes rather than the current continuous vertical and horizontal distribution of trees. Early seral, fire climax ponderosa pine species composition is improved by the number of acres treated which includes areas where this is the focus strategy (i.e. mixed conifer group openings).

Management practices aimed at maintaining vigorously growing stands can considerable reduce the potential impacts of insects and disease agents and enhance forest health (Hessburg, et.al. 1994). Under Alternative 2, thinning and harvest treatments would reduce competition stress on larger, older ponderosa pine by thinning from below. High densities and competing species (e.g. juniper and grand/white fir) can represent a considerable component of competition with older overstory pines. Reducing the small tree component and other competing species around older pines would provide needed growing space to keep overstory trees growing at rates that would allow them to be resistant to bark beetles and resilient to dwarf mistletoe.

Stand structure and species composition under Alternative 2 would be moved towards historical conditions in the following ways:

- On at least 4,201 treated acres, average stand diameter would be increased by cutting/removing smaller trees, increasing the resistance of those acres to fire.
- A larger increase of early seral (ponderosa pine) species proportion within the mixed conifer types by heavy thinning of fire intolerant species. This would include up to a maximum of 250 acres broken into 1-3 acre areas.
- Stand structure of most stands would still consist of multi-layered canopies, but the density and number of layers would be reduced and large areas of contiguous ladder fuels would be broken up and crown bulk densities would be reduced.
- Dead fuel on the surface in the form of decadent brush, dead material (from recent insects/disease/fire), limbs, and needles, would be treated along with activity created fuels.

The current trend, in some portions of the project area, in species composition towards fire intolerant species (juniper, lodgepole and grand/white fir) would be abated with the following effects:

- More fire- and disease-resistant species would occupy the landscape, and ladder fuels in the form of shade-tolerant trees in the understory would be reduced.
- Less fire intolerant species (juniper, lodgepole pine and grand/white fir) would occupy the landscape.
- There would be a reduction in competitive stress on overstory ponderosa pine.
- Species diversity would be maintained by retaining fire intolerant species in retention areas, no-treatment clumps/areas, riparian corridors as well as the higher productive plant associations.

Stand Density

On the project (Melvin Butte landscape) level, SDI moves from 88% max SDI (pre-treatment) to 44% max SDI (after thinning). This proportion change represents movement to between the lower and upper management zones for forest health. While specific areas within the project are still above the UMZ (60% Max SDI) (Table 52 and Table 53) and has sustained risk for insects/ disease and fire, other areas near or surrounding these are within the zone predicting these factors to be less likely. Plantation stands have received greatest release and are expected to develop into large trees more rapidly (assuming reduced mistletoe influences).

Table 52 Stand density metrics pre-and post-thinning (2016) for proposed action prescriptions.

Rx	Acres	Pre-BA	Post-BA	Pre-SDI	Post-SDI	Post % MaxSDI	Pre-QMD	Post-QMD
Prescribed fire	779	200	153	470	307	53	5.6	8.8
Retention strategy areas	775	225	225	518	518	74	5.9	5.9
Lodgepole pine improvement	249	210	73	528	159	24	4.8	6.5
Plantations	1174	103	43	327	198	23	5.6	8.5
Dwarf Mistletoe	159	174	80	400	173	35	5.7	9.3
Thinning	998	174	119	448	208	43	5.9	11.4
Thinning w/group openings	835	237	102	559	219	33	5.5	8.0
No treatment	159	221	221	542	542	81	4.9	4.9
Note: Rx acres represent what was assigned in FSVeg SDA and are approximate due to GIS slivers and non-forest polygons (not assignable); all values are averages of all treated stands (retention strategy acres displayed for								

reference) Scenic views is omitted here since it was largely stand replacement and thus is in the grass/forb state with low live tree densities.

Table 53 Stand density metrics pre- and post-thinning (2016) for predominate PAGs in project area.

PAG	Acres	Pre-BA	Post-BA	Pre-SDI	Post-SDI	Post % MaxSDI	Pre-QMD	Post-QMD
Lodgepole*	312	205	96	505	213	33	5.1	7.0
Ponderosa pine	1123	156	116	349	237	55	6.2	8.2
Mixed Conifer Dry	2123	212	129	489	276	40	5.7	7.7
Mixed conifer wet	1571	231	129	555	277	42	5.3	7.3
Note: These metrics represent stand metric averages across PAG treatment. * Lodgepole PAG metrics reported here include those areas outside the Pole Creek Fire 2012								

Insects and Disease

Variable thinning to lower SDI values and move stands towards reference conditions will have a positive effect on tree resilience against bark beetles and lightly (DMR1-3) infected dwarf mistletoe ponderosa pine. On the project level, dwarf mistletoe abundance is reduced by half and in 30 years levels are approaching the no action as mistletoe spread has impacted regeneration and other under/midstory trees. On the fine-scale (stand level), it is expected that strategic removal, pruning and girdling of point source locations including select large trees will aid in size development of ponderosa pine in fine-scale locations especially plantations and areas at least 100 ft from mistletoe infected trees.

160 acre Dwarf Mistletoe Areas-

Variable thinning under and midstory trees and strategic removal of select overstory trees within 160 acre dwarf mistletoe emphasis areas will aid in reduced spread rates to coordinating and neighboring plantations promoting these areas to develop into the overstory. Follow up pruning of other trees and underburning in these areas will help reduce other point sources into and among stands. Outside of neighboring plantations, most of these areas will maintain a mistletoe component in the short and long-term.

Outside of 160 acre Dwarf Mistletoe Areas-

Variable thinning under and midstory trees will reduce mistletoe abundance within stands and create larger distances between crowns. Follow up underburning and pruning will aid in reduced infection levels when trees are killed by fire or point source locations are reduced from pruning. Natural regeneration or any overstory trees in these areas will continue to be infected and offer infections to neighboring understory trees. Isolating and confining groups of overstory trees with a thinning buffer will help reduce spread (outside the group) in the short term, but in the long-term rates are expected to return as regeneration occurs. Strategic thinning of moderately to heavily infected small to medium sized ponderosa, pruning or girdling will help promote resource reallocation to non- or lightly-infected ponderosa pine leave trees. These trees may become more resilient to dwarf mistletoe infection if their distances are at an adequate distance from mistletoe point sources. When this is the case they will be more likely to develop into larger size classes. Table 54 displays ratings after treatments in 2019 and 2045.

Table 54 Dwarf mistletoe rating after treatments in 2019 and 2045. Averaged across all stands in PAG.

PAG	2019 Mean DMR (Avg. across all stands)	2045 Mean DMR (Avg. across all stands)

Ponderosa pine	1.03	3.50
Mixed Conifer	0.85	1.95
Lodgepole	0.51	1.28

Large tree component

Thinning stands towards reference conditions to reduce density; adjust species proportions (favoring ponderosa pine over white fir); reduce dwarf mistletoe and reintroduce fire would have short-term albeit minor reduction in large trees (Table 55). In 30 years it is expected there will be an increase in the large ponderosa pine tree component across the project area as growing conditions are improved for large ponderosa pine tree recruitment/ development.

Table 55 Large tree per acre (TPA) change of across Melvin Butte project area under Alt. 2 old growth ponderosa and large and young white/grand fir among proposed action [19].

TPA (>21"dbh across Melvin Butte project area)	TPA >21"dbh after large and young white/ grand fir removal	TPA >21"dbh across all acres after implementation of Alt 2.	TPA >21"dbh across all acres in 2045
9.95	9.57	9.46	11.13

Potential for Crown Fire

Under the proposed action, the potential for crown fire is greatly reduced across the project as a whole (treated and untreated areas) as thinning, fuels work, underburning raises CBH and decreases CBD (Table 56 and Table 57). These changes increase the CI and reduce the potential for crown fire in all PAGs (Table 58). Although, no treatment and retention areas maintain high CBH, CBH (Table 57), acres treated show a marked decrease in the likelihood for stand replacement fire. Active crown fire is predicted to occur on 10% of the project area which is primarily allocated to retention strategy and no treatment areas (Table 59).

Table 56 Potential fire metrics post-treatment under Proposed Action (2019).

PAG	Acres	Avg. CC	Avg. CBH	Avg. CBD	Avg. BA Mortality Severe Fire	Avg. CI
Lodgepole*	312	34	8	0.10	58	32
Ponderosa pine	1123	35	16	0.04	47	54
Mixed Conifer Dry	2123	36	17	0.06	58	46
Mixed Conifer Wet	1571	35	16	0.08	63	44
*** Lodgepole PAG metrics reported here include those areas outside the Pole Creek Fire 2012**						

Table 57 Potential fire metrics for treated areas under Proposed Action after treatments completed (2019).

PA Rx	Acres	Avg. CC	Avg. CBH	Avg. CBD	Avg. BA Mortality Severe Fire	Avg. CI
Prescribed fire	780	40	19	0.08	53	38
Retention strategy areas*	745	41	10	0.09	69	37

[19] This included simulation removal estimates of up to 1 strategic ponderosa pine per acre from 160 acres (in dwarf mistletoe units), 1 TPA white fir from 1000 acres of thinning units and 2 TPA from 835 acres of mixed conifer thinning units.

Lodgepole pine improvement	249	23	14	0.05	48	59
Plantations	1174	30	20	0.05	52	52
Dwarf Mistletoe	159	33	15	0.04	35	55
Thinning	998	38	15	0.05	53	44
Thinning w/group openings	835	30	17	0.06	55	53
No treatment areas	159	43	13	0.12	70	29
*These areas mimic no treatment areas, but were a deliberate strategy based on soils. Rx fire may occur with 30 acres of the 745 acres.						

Table 58 Predicted fire type post-treatment under Proposed Action, acres by PAG after treatments completed (2019).

PAG	Active Crown	Cond. Crown	Passive Crown	Surface	Totals
Lodgepole*	6	2	33	271	312
Ponderosa pine	0	0	399	725	1123
Mixed Conifer Dry	69	228	825	1000	2123
Mixed Conifer Wet	311**	15	685	556	1567
Note: totals may not exactly match proposed action figures due to GIS operations and rounding in SDA. * Lodgepole PAG metrics reported here include those areas outside the Pole Creek Fire 2012 **These acres are due to no treatment or retention strategy areas with the PAG					

Table 59 Predicted fire type post-treatment under Proposed Action, treated acres by Alt 2 Rx (2019).

Rx	Active Crown	Cond. Crown	Passive Crown	Surface	Totals
Prescribed fire	7	79	36	657	779
Retention strategy areas*	431	0	84	260	775
Lodgepole pine improvement	0	0	86	163	249
Plantations	3	0	139	1032	1172
Dwarf Mistletoe	0	0	114	45	159
Thinning	0	7	190	800	997
Thinning w/group openings	0	40	131	664	835
No treatment areas**	61	0	24	74	159
Note: totals may not exactly match proposed action figures due to GIS operations and rounding in SDA *These areas mimic no treatment areas, but were a deliberate strategy based on soils. Rx fire may occur with 30 acres of the 745 acres. **No treatment areas are associated with Three Creek (riparian reserve)					

Uncharacteristic Wildfire

Alternative 2 greatly reduces the predicted mortality within treated areas, by changing the majority of the potential fire type acres to surface and passive crown (73% and 16% respectively, Table 59).

Alternative 2 – Cumulative Effects

All present and reasonably foreseeable future actions are designed to reverse the trends of past actions that have led the Whychus watershed away from HRV.

For cumulative effects to occur in terms of ecosystem restoration, fire behavior/severity and resilience/resistance to disturbance, those projects need to be within the project boundary or directly adjacent to this project.

The cumulative effects boundary includes a 1000ft buffer around the project area to account for adjacent effects due to fire spread and dwarf mistletoe from these areas. This area includes a portion of the Pole Creek Fire to the west and the SAFR project to the north. It is not known whether recent projects have or are going to occur east of the project on private lands. Boundary reconnaissance and aerial imagery review indicates low stocking and widely spaced trees in this area. The present vegetation management project and reasonably foreseeable future vegetation management projects in the Whychus watershed, under the current ecosystem principles, have or will be designed to minimize the loss of large trees and enhance the recruitment of trees into the medium/large tree category by favoring growth of dominant and co-dominant trees. The cumulative effects of the SAFR and Pole Creek Fire include higher fuels loads (hazard) to the west and untreated forest blocks (some with mistletoe) to the north. These combine to provide cumulative purpose/need for the proposed action for thinning within the project boundary for forest health and fuels reduction.

Besides that described above, there are no past, present or reasonably foreseeable projects that address the dense forest conditions, species proportions, fuels, provide for safety and visuals of evacuation routes, return fire as a natural disturbance process within or adjacent to the project area.

Alternative 3 – Direct and Indirect Effects

To address scoping key issues, the proposed action was modified into Alt. 3. These prescription modifications include: the removal of small group openings (1-3ac size areas up to 30%max of 835 acres) in the mixed conifer stands; retention of select large heavily infested ponderosa pine dwarf mistletoe trees in dwarf mistletoe units (160 acres) and avoidance of temporary road construction. As such, thinning modifications treatments become lumped under the “Thinning” analysis treatment type, Chapter 2 EA). The avoidance of temp road construction automatically drops about 71 acres of “Thinning” with these acres located along private land in the southeast portion of the project. As such the direct and indirect effects in this section will be focused[20] on the “Thinning” and on the entire project as a whole.

Effects on Forest Ecosystem Restoration

The major overarching difference between Alternative 2 and Alternative 3 has to do with changes in treatments acres, effects on species proportions and abundance and spread of dwarf mistletoe. Under Alternative 3 total treatment acres are reduced by 71 acres and treatment type within 995 acres are altered.

Stand Structures/Species Composition

There would be little difference in stand structures between Alternative. 3 and Alternative. 2 as stands are variably thinned from below lowering stand densities and reducing competition to larger trees. Treatment acres designed to address the effects of past selective logging and fire suppression (species composition

[20] Analysis indicated similar results for Alt. 2 and Alt. 3 for plantations, lodgepole pine improvement, scenic views enhancement, underburning and retention strategy areas.

implied) in the mixed conifer PAG by improving fire-tolerant localized ponderosa pine growing areas would be dropped. As a result, and in order to maintain stocking, fire intolerant species proportions would be retained. About 30% of the 835acres (250 acres maximum) would be maintained under a fire intolerant dominated trajectory.

Stand Density

On the project (Melvin Butte landscape) level density measures for Alternative 3 are similar to Alternative 2, SDI moves from 88% max SDI (pre-treatment) to 48% max SDI (after thinning). The 4% increase (from Alternative. 2) is a result of treatment acres being dropped and altered. As a result, 321 acres are kept at higher densities with more of a fire intolerant tree composition with 71 acres directly next to private land. See Table 60 and Table 61 for the effects of Alternative 3.

Table 60 Alt 3 stand density metrics pre-and post-thinning (2016) for those treatment acres modified by Alternative 3 Rx proposed action prescriptions.

Rx	Acres	Pre-BA	Post-BA	Pre-SDI	Post-SDI	Post % MaxSDI	Pre-QMD	Post-QMD
Thinning	1922	214	124	498	273	46	5.7	13.2
No treatment	229	220	220	535	535	81	5.0	5.0
Note: Rx acres represent what was assigned in FSVeg SDA and are approximate due to GIS slivers and non-forest polygons (not assignable); all values are averages of all treated stands. Scenic views is omitted here since it was largely stand replacement and thus is in the grass/forb state with very little tree densities.								

Table 61 Alt 3 stand density metrics pre-and post-thinning (2016) for predominate PAGs in project area.

PAG	Acres	Pre-BA	Post-BA	Pre-SDI	Post-SDI	Post % MaxSDI	Pre-QMD	Post-QMD
Ponderosa pine	1123	156	119	349	245	57	6.2	8.3
Mixed Conifer Dry	2123	212	139	489	301	44	5.7	7.1
Mixed conifer wet	1571	231	135	555	294	45	5.3	6.8
Note: These metrics represent stand metric averages across PAG treatment. * Lodgepole PAG was omitted since results are the same (see table 22).								

Insects and Disease

Thinning to lower SDI values and moving stands towards reference conditions will have a positive effect on tree resilience against bark beetles and lightly (DMR1-3) infected dwarf mistletoe ponderosa pine.

On the project level direct and indirect effects of dwarf mistletoe among Alternative 3 and Alternative 2 are similar (Table 54 and Table 62). At the project level dwarf mistletoe rating is reduced by about 1/3rd from existing levels and in 30 years those levels return to slightly below the no action for that year (Table 54 and Table 62). On the stand-scale overstory influences into plantations and small medium small trees are maintained as large trees continue to provide mistletoe point source locations. Retaining any small trees underneath or adjacent to, highly infected ponderosa pine trees decreases the likelihood for large tree development (Eglitis et al. 2014). Overtime infestations will spread down, out and within infecting more and more of the plantations and adjacent area. Under this alternative managing for young ponderosa pine or replacement near highly infected trees, of any size, is challenged by reduced height/ diameter growth.

Table 62 Alt 3 dwarf mistletoe rating in 2019 (post treatments) and 2045. Averaged across all stands within PAGs.

PAG	2019 Mean DMR (Avg. across all stands)	2045 Mean DMR (Avg. across all stands)
Ponderosa pine	1.19	3.65
Mixed Conifer	0.88	2.02
Lodgepole	0.51	1.28

Potential for Crown Fire

On the landscape as a whole, crown fire potential reduced from no action though would be slightly higher than the Proposed Action. This difference from the proposed action is due to the reduction in treatment acres and type within the ponderosa pine and mixed conifer types (Compare Table 56 though Table 59 and Table 63 to Table 66).

Table 63 Potential fire metrics post-treatments under Alternative 3 (2019).

PAG	Acres	Avg. CC	Avg. CBH	Avg. CBD	Avg. BA Mortality Severe Fire	Avg. CI
Ponderosa pine	1123	37	16	0.04	49	49
Mixed Conifer Dry	2123	38	15	0.07	65	40
Mixed Conifer Wet	1571	40	14	0.09	69	37
Lodgepole PAG is omitted here due similar results as Alt 2 (see table 24)						

Table 64 Potential fire metrics for treated areas under Alternative 3 after treatments completed (2019).

PA Rx	Acres	Avg. CC	Avg. CBH	Avg. CBD	Avg. BA Mortality Severe Fire	Avg. CI
Thinning	1922	40	12	0.07	67	39
No treatment areas	229	44	12	0.13	75	27
Fire metrics for the remaining treatments are the same as those displayed in Table 25.						

Table 65 Predicted fire type post-treatment under Alternative 3, acres by PAG after treatments completed (2019).

PAG	Active Crown	Cond. Crown	Passive Crown	Surface	Totals
Ponderosa pine	0	0	398	725	1123
Mixed Conifer Dry	123	228	822	949	2122
Mixed Conifer Wet	311*	15	719	522	1567
Note: totals may not exactly match previous figures due to GIS operations and rounding in SDA. Lodgepole PAG is omitted here due similar results as Alt 2 * These acres are due to no treatment or retention strategy areas					

Table 66 Predicted fire type post-treatment under Alternative 3, those treatment acres modified by Alt 3 Rx (2019).

Rx	Active Crown	Cond. Crown	Passive Crown	Surface	Totals
Thinning	27	47	281	1566	1922
No treatment areas	61	27	68	74	229
Note: totals may not exactly match proposed action figures due to GIS operations and rounding in SDA. Fire metrics for the remaining treatments are the same as those displayed in Table 27.					

Uncharacteristic Wildfire

Access to about 70-90 acres of restoration units would be avoided with over ½ of this land directly interfacing with private land (2/3rd mile). As such, potential fire behavior and influences (egress) in these areas would be less predictable as current crowns have both horizontal and vertical fuel connectivity. Ongoing fire suppression/exclusion policy would continue and in the event of extreme wildfire fire behavior, related suppression tactics and existing conditions and trends; high severity sizes and proportions would range comparable to recent past fires (Eyery Fire 2002, Rooster Rock 2010, Pole Creek Fire 2012, Green Ridge Fire 2013, Bridge 99 Fire 2014, Whychus Watershed Analysis 2013).

Alternative 3- Cumulative Effects

Cumulative effects are the same as the proposed action.

All present and reasonably foreseeable future actions are designed to reverse the trends of past actions that have led the Whychus watershed away from HRV.

For cumulative effects to occur in terms of ecosystem restoration, fire behavior and severity and resilience/resistance to disturbance, those projects need to be within the project boundary or directly adjacent to this project.

The cumulative effects boundary includes a 1000ft buffer around the project area to account for adjacent effects due to fire spread and dwarf mistletoe. This area includes a portion of the Pole Creek Fire to the west and the SAFR project to the north. It is not known whether recent projects occurred to the east on private lands. Boundary reconnaissance and aerial imagery review indicates low stocking and widely spaced trees in this area. The present vegetation management project and reasonably foreseeable future vegetation management projects in the Whychus watershed, under the current management paradigm, have or will be designed to minimize the loss of large trees and enhance the recruitment of trees into the medium/large tree category by favoring growth of dominant and codominant trees.

The cumulative effects of the SAFR and Pole Creek Fire include higher fuels loads (hazard) to the west and north side of the project and untreated forest blocks (some with mistletoe) to the north. These combine to provide cumulative purpose/need for the proposed action for thinning for forest health and fuels reduction.

Besides that described above, there are no past, present or reasonably foreseeable projects that address the dense forest conditions, species proportions, fuels, provide for safety and visuals of evacuation routes, return fire as a natural disturbance process within or adjacent to the project area.

Northwest Forest Plan Standard and Guideline C-44

Introduction

The Northwest Forest Plan contains direction in the Matrix land allocation to provide for retention of old-growth fragments in watersheds where little remains (NWFP standard and guideline (C-44)). Landscape area where little late successional forest persists should be managed to retain late successional patches. This standard and guideline will be applied in the fifth field watersheds (20 to 200 square miles) in which federal forest lands are currently comprised of 15 percent or less late successional forest.

Analysis

The Deep Canyon (1/5th field) watershed consists of a wide range of biophysical environments that include inherent soil limitations to tree growth, from alpine meadows to xeric shrub lands and as such only a portion of the watershed can support development of trees let alone large trees that develop into an assemblage that becomes old growth habitat for late successional species (Craigg et al. 2015).

The old growth fragments/ patches[21] in the Deep Canyon Watershed and Melvin Butte Project area total 1,188 acres at the watershed scale. Six hundred and sixty-two of these acres are within the Melvin Butte project boundary (). In addition, these old growth patches/fragments in the watershed are disproportionally located to public (primarily National Forest System lands) and/or to biophysical environments more productive in nature (Simpson 2007, Appendix F, Table 38).

Over ½ (about 56%) of the entire watershed's large tree patches/ fragments are contained within Melvin Butte project area. The large tree patches/ fragments were further analyzed among the differing Melvin Butte project treatment descriptions areas which are presented below (Table 68). This analysis was chosen in order to demonstrate meeting Standard and Guideline C-44 of the Northwest Forest Plan.

Figure 19 displays old growth areas and patches within the Deep Creek 5th field watershed.

[21] Old growth patch size/ fragment determination came from a Lidar process of using a 30meter raster in order to determine large tree assemblages (number of large (>21"dbh) trees per 30 meter grid) that meet (or exceed) the Interim Old Growth Guide1993. Areas determined by Lidar analysis and consist of a height derived diameter. See correlation variables including diameter in Appendix E.

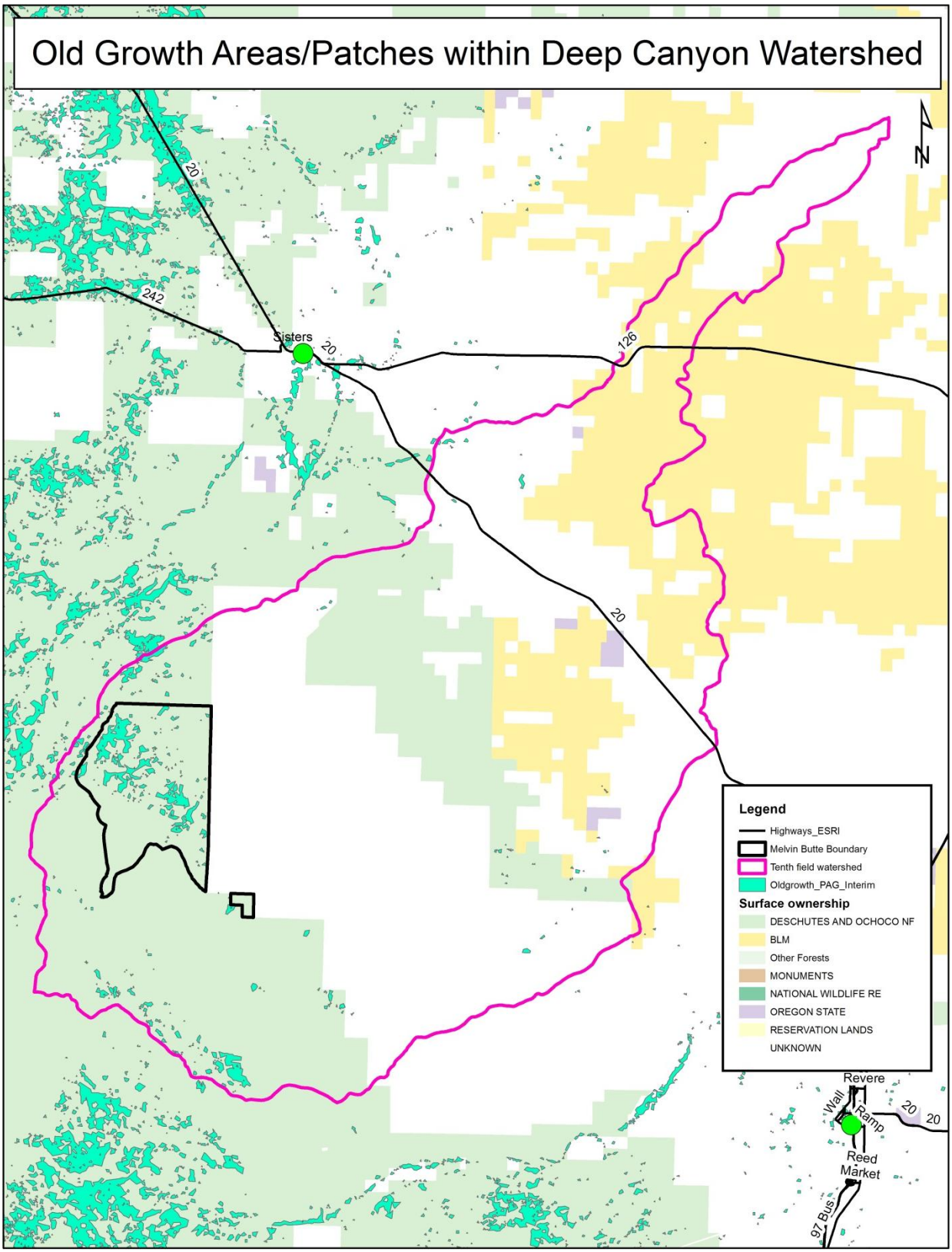


Figure 19 Old growth areas and patches within the Deep Creek 5th field watershed

Alternatives 2 and 3- Direct and Indirect Effects

Retention of Melvin Butte old growth patched/ fragments are being met in several ways under either action alternatives. See Tables 67 and 68. The below acre proportions come from the 662 acres found within Melvin Butte project area. These are broken out by Alternative 2 treatment type.

1) Retention strategy and other areas (ex. Three Creek) that are absent of thinning treatment.
    a. 33% of the old growth fragments/ patches found within Melvin Butte project area are in these areas.
2) Restriction of treatments to prescribed fire and/or 8”dbh thinning limit in Prescribed Fire treatment units.
    a. 30% of the old growth fragments/patches found within Melvin Butte project area are in these treatment areas and would not be impacted due to nature of small understory tree thinning and use of low intensity prescribed fire.
3) Retention of all old growth ponderosa pine clumps/ areas within the 160 acre Dwarf Mistletoe Units when they meet clump designation quota (at least 4 old growth ponderosa pine within a connected 66ft distance between trees).
    a. Less than 1% of the old growth fragments/ patches within Melvin Butte area are contained in this treatment type and by Lidar determination process[15] (and above parameter) provides retention of old growth.
4) Unit by unit silvicultural implementation prescriptions that describe retention of old growth structure, composition (and accentuation) where present. Retention to include old growth ponderosa pine and old growth white fir and other species (where present) to a frequency that maintains large tree structure/ frequency across stands and maintains the definition as described in the Interim Old Growth Definitions (USDA 1993).
    a. 30% of the old growth patches/ fragments acres are contained in the Thinning treatment description areas.
        i. All prescriptions call for the retention and/or accentuation of old growth trees to maintain or exceed definitions (VanPelt 2008, USDA 1993).
    b. Less than 4% of the old growth patches/ fragments acres are contained in the Mixed Conifer Group Opening treatment areas.
        i. All prescriptions call for retention of old growth ponderosa pine. Any and all openings would maintain ponderosa pine tree composition and structure.
    c. Less than 2% of the old growth patches/ fragments are contained in the Plantation treatment areas.
        i. No old growth will be cut in plantations; this number represents trees detected on the boundaries of these areas. Boundary trees may be pruned if infected with dwarf mistletoe.
    d. All other treatment areas do not contain these old growth patches/ fragments

Table 67 Acres and proportions of the large tree patches/fragments among different "subareas" within the Deep Canyon watershed.

	Acres	Old growth fragments/patches acres (Lidar determined based on large trees/acre)	Proportion of area with old growth patches/fragments (%)
Deep Canyon watershed	97,509	1,188	1.2%
Applicable assessment area due to pertinent biophysical environment	60,712	1,188	2.0%
FS land with pertinent	49,601	1105	2.2%

biophysical environments			
Private land with pertinent biophysical environments	47,908	83	0.2%

Table 68 Acres and proportions of the large tree patches/fragments among the Melvin Butte treatment types.

	Total Acres	Old growth fragments/patches acres (Lidar determined based on large trees/acre)	Proportion of Melvin Butte old growth fragment/ patches acres by Alt 2. Treatment type[22] acres
Melvin Project	5,375	662	N/A
Retention strategy, no treatment and no thinning treatment areas	940	222	33%
Plantations	1174	13	2%
Prescribed fire (includes small tree thinning)	809	201	30%
Dwarf Mistletoe	160	2	0%
Mixed Conifer Group Openings	835	24	4%
Scenic Views Enhancement	240	0	0%
Lodgepole pine improvement	249	0	0%
Thinning	998	201	30%

Conclusion

Alternative 2 and Alternative 3 are nearly identical in retention proportions and needs and meet Standard and Guideline C-44. Difference is “Thinning Treatment” (Item 4a above in this section) increases to 35% as those old growth patches/fragments acres from Dwarf Mistletoe and Mixed Conifer treatments are reclassified to “Thinning Treatment”. Under Alternative 3, Items 3 and 4b (above in this section) are not applicable. Thus unit by unit silvicultural prescriptions (Item 4 above in this section) describes how old growth fragment/patch retention would occur in these combined areas.

Other Effects- Action Alternatives

Contrasting Effects of Proposed Actions with Past Actions

The proposed action and other action alternative differ from previous actions in that tree removals would not be focused on the largest and most fire-resistant trees. All treatments are designed to leave the largest trees, improve heterogeneity and improve the composition of fire- and disease-resistant species. Rather than eliminating fire, prescribed fire is an integral part of these proposals.

Effects of Ongoing and Reasonably Foreseeable Actions

Similar restoration projects are being carried out within the Deschutes NF. In conjunction with these projects, it is likely that the potential for large uncharacteristic wildfires and bark beetle outbreaks in the project area would be reduced. Management options for the future would be increased. Wildland fire use

[22] NOTE-this table is identical among Alternatives EXCEPT acre contribution from Mixed Conifer Group Openings AND Dwarf Mistletoe are added to the Thinning treatment type under Alternative 3.

may become more of an option, and the ability to implement long-term uneven-aged silviculture would be improved.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions

Proposed, ongoing, and foreseeable actions are all geared towards restoring ecosystem structure and processes, and undoing the effects of most of the previous management consequences, whether they were intentional or not. It is expected that the combined effects would be positive in terms of maintaining healthy forests and the natural and human communities that depend on them.

NFMA Consistency

Suitability for Timber Production

Harvest units proposed on suitable lands have been reviewed by a certified silviculturist and determined that they are located on suitable lands and are capable of being regenerated within 5 years of timber harvest, although regeneration harvest is not being proposed in this project.

Regeneration Harvest and Even-aged Management

Treatments in this entry would provide future management options, including possibly the implementation of uneven aged systems on suitable sites. Regeneration harvest is not being proposed in this project, but rather planting of ponderosa pine and Douglas-fir would be done in alternatives 2 to help shift the composition towards these more disease-resistant and historically dominant species in the long term.

Vegetative Manipulation

NFMA provides that timber harvest and other silvicultural practices shall be used to prevent damaging population increases of forest pest organisms, and treatments shall not make stands susceptible to pest-caused damage levels inconsistent with management objectives. Harvest of trees provides social and economic benefit, reduces potential losses attributed to insects and diseases, and manipulates forest vegetation to enhance wildlife habitat and/or meet associate objectives. The silvicultural prescription which directs the vegetative management process is designed to meet Forest Plan goals, objectives, and guidelines for forest productivity and wildlife habitat improvement while achieving ecosystem-based management.

Improvement harvest and commercial thinning are proposed for some stands in order to improve tree vigor of the desired leave trees and to maintain or enhance the plant diversity. NFMA provides for these treatments where they increase the growth rate of residual trees, favor commercially valuable species, favor species valuable to wildlife, or achieve some other multiple-use objective.

Regeneration Potential

NFMA specifies, "timber would be harvested from national forest system lands only where there is assurance that such lands can be adequately stocked within five years after final harvest" (16 USC 1604). Determination of adequate stocking is based on reforestation surveys conducted within a 5-year period following harvest or site preparation. Results of these stocking surveys are compared with the desired and minimum levels identified in a site-specific silvicultural prescription written for each treatment area. Restocking is considered satisfactory when the harvest area contains the minimum number, distribution, and species composition of vegetation specified in the prescription. There is no final harvest proposed in this project, and as discussed above, planting would be done with the objective of creating patches of younger, desired species.

WILDLIFE

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Wildlife specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Threatened and Endangered Species, Regional Forester's Sensitive Species, Management Indicator Species (MIS), Species of Concern, and Survey and Manage

A Biological Evaluation has been prepared in compliance with the requirements of Forest Service Manual (FSM) 2630.3., FSM 2670-2671, FSM W.O. Amendments 2600-95-7, and the Endangered Species Act (ESA) of 1973. A Biological Assessment (BA) was 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).

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 impact sensitive wildlife species, and to comply with the requirements of the Endangered Species Act.

The Deschutes National Forest Land and Resource Management Plan (LRMP) (USDA 1990a) identified a group of wildlife species as Management Indicator Species (MIS). These species were selected because they represent other species with similar habitat requirements. Management Indicator Species can be used to assess the impacts of management activities for a wide range of wildlife species with similar habitat needs (FSM 2620.5). Those Management Indicator Species selected for the Deschutes National Forest include the bald eagle, northern spotted owl, golden eagle, red-tailed hawk, osprey, northern goshawk, Cooper's hawk, sharp-shinned hawk, great gray owl, great blue heron, woodpeckers (cavity nesters), peregrine falcon, California wolverine, elk, mule deer, American marten, Townsend's big-eared bat, waterfowl, snags and down wood habitat.

In addition to the above mentioned MIS species, there have been a number of wildlife species (species of concern) in which analysis is required either through the Northwest Forest Plan (e.g. bats; pg. C-43) or through other directives (e.g., landbirds, see Birds of Conservation Concern section).

Survey and manage species are managed by the Deschutes National Forest Land and Resource Management Plan (LRMP) as amended by the Northwest Forest Plan (NWFP). Management of these species occurs within the range of the northern spotted owl under the Northwest Forest Plan. These species were addressed where they occur under another category (i.e. TES, MIS, BCC etc.). If they did not get addressed in those sections, they were addressed individually and listed as NWFP species.

Introduction to Wildlife Effects

The following specialist reports for wildlife, Threatened, Endangered and Sensitive Species (TES), Management Indicator Species (MIS), Birds of Conservation Concern (BCC), and Big Game have been incorporated in their entirety. The Zone of Influence for discussion on cumulative effects is bounded by the project area for all species except Big Game which is bounded on a subwatershed basis. The area of influence includes overlap with existing conditions such as roads, trails, and past management activities.

This section includes discussion on data used, methods, models, general assumptions, evaluation criteria and a summary of effects. General effects are discussed in this section. General effects cover broad categories of species and those effects that are common to all alternatives including the no action alternative.

Recently completed surveys and historical data were used in determination of species occupancy within the Melvin Butte project area. Incidental species observations have also contributed to the knowledge of species presence within the project area and/or Sisters Ranger District. Potentially suitable habitat is considered to be occupied.

ACE Model (Action/Change/Effect)

The long-term sustainability of forest ecosystems and wildlife habitat is dependent on a variety of factors, but the purpose and need of this project identified that due to fire suppression and existing conditions from past management, stands are over-stocked and outside the Historic Range of Variability (HR). HRV is used to determine the desired future condition for wildlife habitat as it relates to each Plant Association Group, and what management action is needed for departure from the existing condition to continue to promote future wildlife habitat. Forest thinning and fuels reduction treatments are the two main treatment types that would occur to move stands toward HRV and have the potential to impact existing wildlife habitat in the short-term. Removal of habitat from these management activities could directly or indirectly affect wildlife species and their habitat. An evaluation of the potential effects to wildlife species will be completed for the project to determine if these effects are negative or beneficial.

Duration and Degree of Impacts (Short-Term vs. Long-Term)

Under each action alternative, the project would primarily manipulate vegetation through a variety of thinning techniques. However, stands may also be treated by use of prescribed fire or a combination of thinning and prescribed fire. In addition, some treatments may not directly impact habitat but could cause disturbance through equipment operation or smoke from prescribed fire. Effects of these treatments to habitat would be assessed as short-term and long-term impacts. Stand Density Index (SDI) is used to measure the risk of a stand's susceptibility to insect and disease as a result of stand densification. From the initial density reduction treatment, effects from the reduction occur roughly over a 30 year period. After 30 years stands begin to put on basal area growth, height, and begin to recruit new trees into the stands, increasing SDI (personal communication Will Brendecke, District Silviculturist). To standardize the length of time when referencing short-term and long-term impacts to wildlife habitat from forest thinning, short-term impacts are $\leq$30 years and long-term impacts are those that would occur over $\geq$30years.

Bounding Spatial and Temporal Changes within the Zone of Influence

For this project proposal, activity area boundaries are considered to be the smallest identified area where the potential direct and indirect effects from different management practices could occur. The project area proposes treatments to ponderosa pine, mixed conifer, and lodgepole pine stands within the Matrix land allocation on the Sisters Ranger District. A watershed analysis was completed in 2013 to characterize the human, aquatic riparian, and terrestrial features, conditions, processes and interactions (ecosystem elements) within the watershed. The discussion of wildlife cumulative effects will be focused on the units proposed for treatments and their incremental impacts in combination with past, present and reasonably foreseeable projects primarily within the Deep Canyon Watershed ("zone of influence"). Only National Forest System lands will be analyzed within the "zone of influence".

Project effects to northern spotted owl Critical Habitat and spotted owl habitat connectivity are assessed at the landscape scale. The cumulative effects analysis will be assessed for the East Cascades North Critical Habitat Unit #7, ECN Subunit #8.

Initially, only the watersheds that overlapped the Melvin Butte project area in space were considered for cumulative effects (e.g. Deep Canyon) because these watersheds, combined, would encompass habitat and territory size for a number of wildlife species. However, in order to be consistent with the best available science and account for variation in habitat types and structural conditions for analyzing effects to dead wood (snags and logs), at least 12,800 acres of a habitat type are necessary. The overlapping Deep Canyon watershed does not contain this amount of lodgepole pine or eastside mixed conifer habitat; therefore a second watershed was added: the adjacent Whychus watershed. The Whychus watershed is very large, making up a large portion of the southern end of the Sisters Ranger District. Effects using this watershed would focus on the lodgepole pine and eastside mixed conifer habitat. These watersheds comprise the habitat types the action alternatives are treating at scales that would meaningfully represent any cumulative effects (e.g. species territory size, connectivity to habitat across the Forest, and account for variation). Only National Forest System lands will be analyzed within the "zone of influence"; private lands are not managed for snag and log habitat or Management Indicator Species. Habitat for each identified species associated with the project area would be discussed on a forest wide basis to address species viability as it relates to MIS.

Chapter 3 of the EA contains a list of past, present and reasonably foreseeable future projects within the Deep Canyon and Whychus watersheds that has the potential to contribute to cumulative effects. However, not all projects on the list impact wildlife or wildlife habitat. Therefore, Table 69 is a subset of the list from Chapter 3 of ongoing and reasonably foreseeable future actions identified as potentially contributing towards cumulative effects to wildlife in the watersheds. Habitat for each identified species associated with the project area will be discussed on a forest wide basis to address species viability as it relates to MIS.

Table 69: Ongoing or Reasonably foreseeable actions in the project area and Deep Canyon 10th field watershed

Type of Action	General Description	Status/Timing	Acres
Vegetation Management			
Pole Creek Fire Timber Salvage	Salvage of fire killed timber	Ongoing	54 acres
Pole Creek Fire Hazard Tree Removal	Felling and Salvage of fire killed danger trees	Ongoing	350 acres
Three Creeks Personal Use Firewood	Personal use firewood cutting	Ongoing	3,029 acres
Ursus BFR	Thinning and mastication	Reasonably foreseeable	5,900 acres
Bear Wallow Firewood BFR	Fire wood cutting along the FS Road 4601	Ongoing	11 miles of road approximately 510 acres
Bend Municipal Watershed Fuels Reduction BFR	Hazardous fuels reduction; thinning	Reasonably foreseeable	12 miles of road approximately 400 acres
Two Bulls Fire Salvage, BFR	Salvage of fire killed timber	Ongoing	Approximately 250 acres.

Management Indicator Species (MIS) Analysis

A Forest wide assessment for each Management Indicator Species (MIS) identified in the Deschutes National Forest Land and Resource Management Plan (LRMP) was completed in 2012 for the entire Deschutes National Forest (NF) (USFS 2012). For this document, where USFS (2012) is cited, those individual citations associated with the analysis can be found in those documents (USFS 2012). Suitable

habitat for each species was defined as habitat that has the structure or characteristics utilized for reproduction. An exception to this is associated with species specific standards and guidelines within the Deschutes LRMP, not associated with reproductive habitat, although essential to the viability of that species population within its range. An example of this exception is hiding cover standards and guidelines for mule deer summer range. An assessment was completed for each species based on the amount of suitable habitat that occurs across the Deschutes NF, associated threats, and population trend data where it was available. The assessment used the best available science and guidance such as research found in books, scientific journals, and scientific websites. NatureServe, an international non-profit conservation organization whose mission is to provide the scientific basis for effective conservation action was a major contributor to population trend data. NatureServe and its network of natural heritage programs, including the Oregon State Heritage Program, are the leading source for information about rare and endangered species and threatened ecosystems. Their website, http://www.natureserve.org/, compiles historic and current information from The Nature Conservancy and other conservation groups, U.S. government agencies, private sector partnerships, international agencies, and data cooperators. In addition, for those MIS species which are also hunted or are furbearing species (e.g. big game, waterfowl, and American marten), the Oregon Department of Fish and Wildlife provided population trend data for big game, data relative to trapping for marten, and monitoring data for waterfowl. Habitat definitions were developed and modeled for each MIS species. Information from the species assessments formed the baseline for species habitat across the Deschutes National Forest. The Melvin Butte project analysis is referenced to those assessments.

Modeling Methodology

Habitat for the various wildlife species was determined using district occurrence data, habitat descriptions found in scientific literature, various data sets, and professional experience. The Viable Ecosystem Model (Viable) was used to determine the live tree component of habitat and formed the basis of acres of existing nesting/denning habitat (Viable Ecosystems Management Guide 1994). For selected species, such as the black-backed woodpecker and American marten, the snag components of habitat were determined using a variety of sources including gradient nearest neighbor (GNN) data and DecAID, as well as Viable. Because of Forest Plan standards for cover and thermal cover requiring trees per acre and height, deer and elk habitat was determined using GNN data.

Viable Ecosystems Model

The Ochoco and Deschutes Viable Ecosystems Management Guide (VEMG) was developed to classify vegetation on a landscape basis. The Viable Ecosystem model provides a process to apply ecosystem management concepts to project level planning. This system compares existing vegetation with site potential. The model focuses on relationships between combinations of vegetation structure and species composition, and habitat requirements for animals, insects, and plants. Viable Ecosystems is a useful tool for cumulative effects analysis of broad scale changes in vegetation and subsequent changes in animal, insect, or plant communities.

Viable stratifies the environment along a gradient of size, structure, species composition, and relative tree density. The various classifications are then linked to wildlife habitat requirements. For example, a classification with a value of 5615**2** is white fir (56), early seral (1), medium/large structure (5), and **low density (2)** and would typically have a single story (low density) dominated by ponderosa pine (early seral in white fir) 21” diameter or greater (medium/large structure). This provides nesting habitat for white-headed woodpeckers. A value of 5635**1** would equate to white fir (56), late seral (3), medium/large structure (5), and **high density (1)** and would be a multi-storied stand dominated by white fir 21” diameter or greater and provide nesting habitat for pileated woodpeckers. All values that provide habitat for species were used.

The 2002 satellite imagery layer was used to develop the vegetation layer to run in the Viable Ecosystem Model. Data is mapped on a 30 meter pixel grid, meaning the map is divided up on a 30 meter grid and that every 30 meter square (pixel) is assigned a value (i.e. 56351) that relates to a stratum of size, structure, tree species composition, and relative tree density. Criteria used (vegetation, seral state, structure, and density) to determine habitat for each species is described in the existing condition of each species. Existing conditions include past actions such as timber sales which used the Forest "FACTS" database. Presenting information in this way and including those current and foreseeable future actions in cumulative effects is the most informative for the decision maker.

GIS Analysis and ArcMap

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. The information can be related to visual data (maps), tabular data (tables, spreadsheets, or data bases), and used to run models (create new data set from existing data based on criteria or specific conditions). ArcMap is a component of the ArcGIS program. The client software developed by Economic and Social Research Institute (ESRI) was used for the processing and presentation of GIS data.

Gradient Nearest Neighbor (GNN)

GNN maps consist of 30 meter pixel (grid) maps with associated data (tree size, density, snag density, canopy cover, percent down wood cover, etc.). The maps used for this analysis were developed by the Landscape Ecology, Modeling, Mapping, and Analysis (LEMMA) team as part of the GNNPAC Pacific States Forest Vegetation Mapping project. This project involves developing detailed maps of existing forest vegetation across all land ownerships in the Pacific Coast States (Oregon, Washington, and parts of California). It is being conducted by the LEMMA team (Pacific Northwest Research Station (PNW) and Oregon State University) at the Corvallis Lab, in close collaboration with the Western Wildlands Environmental Threats Assessment Center, the Interagency Mapping and Assessment Project (IMAP), Northwest Forest Plan Effectiveness Monitoring, the Remote Sensing Applications Center, and Forest Inventory and Analysis at the PNW Research Station.

The process to create the maps involves using gradient imputation (Gradient Nearest Neighbor, or GNN). GNN uses many variables on a gradient along with satellite imagery to assign data from known field plots to pixels with no data that have the same satellite imagery signature (i.e. it "looks" the same to the computer). The species-size GNN model was used in the Melvin Butte analysis. This model uses species composition and stand structure as components for developing maps. Accuracy of the modeling depends on how "like" pixels match up based on numerous variables. Generally speaking, forest types that had more samples like white-fir were more accurate than those with fewer samples like mountain mahogany (Ohman et al. 2008). Information on GNN accuracy, the LEMMA group, IMAP and the GNNPac project is available at the project website: http://www.fsl.orst.edu/lemma/gnnpac.

DecAID

DecAID is a web-based dataset; it is not a model. It is a synthesis of the best available research on dead wood. DecAID does not provide information on all life needs of a given species. It integrates 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.

Tolerance level (t.l.) is the percent of the studied population that would use a density of snags or down wood. For example, the following table shows the tolerance levels for white-headed woodpeckers. For a population of 100 individual white-headed woodpeckers, at the 50 percent tolerance level, 50 of them would use habitat with at least 1.7 snags per acre greater than or equal to10 inches in diameter. Basically,

the higher the tolerance level, the more assurance that habitat is being provided to meet the needs of more individuals in the population (Mellen et al. 2006).

Tolerance intervals (t.i.) 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 percent tolerance interval would be habitat with more than 0.3 snags per acre and less than or equal to 1.7 snags per acre. The 0-30 percent category is included (where 0 values are actually greater than 0) as it provides habitat for a few individuals. A zero category is included in the analysis showing what acreage does not provide habitat. Table 70 provides as example of tolerance levels and intervals developed from DecAID.

Table 70: Example of Tolerance Levels and Intervals developed from DecAID Information.

Habitat type and Table used from DecAID: Table PPDF_S/L.sp-22; Species: White-headed Woodpecker									
Minimum DBH	**10"**					**20"**			
Tolerance Level		30%	50%	80%			30%	50%	80%
Snag Density (#/acre)		0.3	1.7	3.7			0.5	1.8	3.8
Tolerance Interval	0-30%	30-50%	50 -80%	80%+		0-30%	30-50%	50 -80%	80% +
Snag Density (#/acre)	0-0.3	0.3 - 1.7	1.7-3.7	3.7+		0-0.5	0.5-1.8	1.8-3.8	3.8+

Often times, DecAID only has one study available to base its tolerance levels on. While applying findings from a single research site to another area is not always wholly applicable, DecAID provides the best available science to determine effects to a species at this time. 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 indicate habitat at varying snag densities.

More information on DecAID can be found on the website at:
www.fs.fed.us/wildecology/decaid/decaid_background/decaid_home.htm

Deer and Elk Habitat

The Deschutes Forest Plan defines suitable deer hiding cover as one of the following:

a) six acre or larger stand capable of hiding 90 percent of a standing adult deer from view of a human at a distance of 200 feet, or

b) six acre or larger stand with an average height of six feet and which has not been thinned in 15 years, or

c) residual clumps of one half acre or larger stands within units with advanced regeneration (trees including small trees up to seven inches in diameter) and at least 12 greater than seven inch trees per acre remaining after harvest (LRMP, WL-54, p. 4-58). Residual clumps less than six acres in size were not modeled which likely under-represents the amount of hiding cover present in the subwatershed analysis.

Suitable elk hiding cover is similar**:**

a) six acres or larger stand capable of hiding 90 percent of a standing adult elk from view of a human at a distance of 200 feet, or

b) six acre or larger stand with an average height of 10 feet and which has not been thinned in 20 years, or residual clumps of two acres, or

c) larger stands within units with advanced regeneration (trees including whips up to seven inches in diameter) and at least 12 greater than seven inch trees per acre remaining after harvest (LRMP, WL-47, p.4-57).

To be conservative, hiding cover for both deer and elk was modeled using Gradient Nearest Neighbor (GNN) with the criteria of hiding 90 percent of a standing adult elk from view of a human at a distance of 200 feet. This condition was modeled using trees with a density of at least 469 trees/hectare (190 trees/acre or a tree every 15 feet) with a diameter of 3-25 cm (1-10 in dbh) and at least two meters (7 ft) tall across the Melvin Butte planning area. Fields containing this data in GNN and the definitions from the data dictionary include:

- TPH_3_25 – Density of live trees 2.5-25 cm dbh in trees/hectare.
- STNDHGT – Stand height, computed as average of heights of all dominant and codominant trees in meters.

Similarly thermal cover for both deer and elk was modeled using the GNN. The criteria used to model thermal cover were an average stand height of 30 feet and the stands must contain 40% crown cover.

LEMMA Data Dictionary: http://www.fsl.orst.edu/lemma/common/dataDictionary.php

An important finding from the Starkey Experimental Forest and Range studies is that road (or route) density is not the best predictor of habitat effectiveness for elk. Instead, a model based on distance bands proved to be a more spatially explicit and biologically meaningful tool for assessing effects from roads. Road densities do not provide a spatial depiction of how roads are distributed on the landscape (Rowland 2005). Hillis et al. (1991) defined elk security habitat for forested stands greater than 250 acres in size and greater than ½ mile from an open route. Rowland et al. (2000) determined that the distance of 1,969 yards (1,800 meters) is equivalent to that at which elk response to open roads diminished markedly. Therefore, acreage greater than one mile from an open motorized route is assumed to provide greater security habitat for elk than the ½ mile distance.

Northern Spotted Owl

The analysis conducted for the northern spotted owl includes a forest-wide analysis of all nesting, roosting, foraging (NRF) and dispersal habitat, Critical Habitat Units, known home ranges, and late-successional reserves. NRF acres used are derived from the 2014 Programmatic Biological Assessment (BA) update for the 2014 Deschutes and Ochoco Programmatic Biological Assessment and reflect the most current situation (USDA 2014). CHU refers to the area reflected in the 2013 update to the Critical Habitat Rule (USDI 2012). An analysis of each home range has also been conducted. A 1.2 mile radius circle is used as a home range distance in the Cascade Range. This equates to approximately 2,882 acres.

R6 Sensitive Species

Sensitive species from the R6 Regional Forester's Sensitive Species list (07/13/2015) were only analyzed if they have potential habitat in the project area. Some Sensitive Species are also Management Indicator Species (MIS) identified in the Deschutes National Forest Land and Resource Management plan and were analyzed for the Forest and the project area. Surveys have not been conducted for each species. In some cases, no surveys have occurred and in others, surveys may not have been conducted on a consistent basis. Incidental observations may also contribute to known sittings.

Key Issues/Analysis Issues and Comparison Measures

Key Issues identified from public scoping were used to develop Alternative 3. In addition, Analysis Issues identified from Forest Plan Standards and Guidelines (as Amended) or the latest science and guidance, were used to illustrate the effects to wildlife and how those effects differ by alternative. In this analysis, commercial thinning and fuels treatments are the major impacts to habitat quality, quantity and species life needs. Using the same units of measure allows the major impacts to be easily understood and compared, providing the Decision Maker the necessary information to make an informed decision.

Units of Measure

Suitable habitat for each MIS species analyzed in this document has been quantified for the project area, the watershed, and at the Forest level. The following measure will be used to evaluate the impacts and associated effects of the planned activities:

- Acres of potentially suitable habitat were calculated by GNN located within the Melvin Butte area and associated watershed (Deep Canyon Watershed) to complete an effects analysis.
- Potentially suitable habitat was calculated using GNN and Viable at the Forest level to compare project direct, indirect, and cumulative effects to the watershed with the overall habitat on the forest, to determine effects to habitat viability across the Forest.

Road Closures and Road Decommissioning Common to all Action Alternatives

Under Alternatives 2 and 3 the Melvin Butte project proposes to close approximately 6 miles of roads and decommission approximately 8 miles of roads. These actions are beneficial to all wildlife species analyzed in both the Biological Evaluation and MIS analysis. These actions reclaim habitat as well as remove motorized disturbance to individuals and reproductive habitat.

This analysis specifically addresses the effects of road closures and obliteration when road density objectives are directly associated with a specific standard or guideline, or there is habitat management direction from recent science and guidance that identifies specific habitat benefits associated with road density objectives. Finally, road closure and decommissioning are identified in specific species analysis when effects directly contribute to habitat restoration.

Executive Summary

Summary of Effects/Impacts for TES, MIS, SOC, (landbirds and NWFP/S&M)

The Biological Evaluation (BE) analyzes the effects to federally Threatened, Endangered, Proposed, and Candidate species, and impacts to Region 6 Sensitive Species associated with the Melvin Butte project on the Deschutes National Forest. Habitat occurs in the project area for two federally listed species, designated northern spotted owl Critical Habitat, and seven Sensitive Species. The following is a summary of the findings of this BE on the effects/impacts of the two action alternatives.

Alternatives 2 and 3 would have ***No effect*** to the federally endangered gray wolf and its habitat.

Alternatives 2 and 3 would have ***No effect*** to the proposed Threatened pacific fisher and its habitat.

Alternatives 2 and 3 would have ***No effect*** to the federally Threatened northern spotted owl and its habitat.

Alternatives 2 and 3 ***May affect but not likely to adversely effect*** northern spotted owl designated Critical Habitat.

Alternatives 2 and 3 would have ***No effect*** to the federally Threatened Oregon spotted frog and its habitat.

Alternatives 2 and 3 would have ***No effect*** to Oregon spotted frog proposed Critical Habitat.

Alternatives 2 and 3 would have ***No impact*** to the Townsend's big-eared bat, but ***May impact but will not lead to a trend towards federal listing*** for the fringed myotis, and pallid bat.

Alternatives 2 and 3 ***May impact but will not lead to a trend towards federal listing,*** for the western bumblebee and Johnson's hairstreak.

Alternatives 2 and 3 ***May impact but will not lead to a trend towards federal listing*** for the sensitive white-headed woodpecker and Lewis' woodpecker.

Alternatives 2 and 3 would have **No impact** for the following Sensitive Species due to a lack of habitat:, silver-bordered fritillary, Crater Lake tightcoil, evening fieldslug, Columbia spotted frog, wolverine, American peregrine falcon, bald eagle, greater sage grouse, bufflehead, northern waterthrush, harlequin duck, horned grebe, tricolored blackbird, yellow rail, and Tule greater white-fronted goose.

Alternatives 2 and 3 are consistent with the standards and guidelines in the Deschutes National Forest Land and Resource Management Plan as amended by the Northwest Forest Plan for the following Management Indicator Species: Townsend's big-eared bat, White-headed woodpecker, and the Lewis' woodpecker.

Alternatives 2 and 3 consistent with the Biological Objectives in the Conservation Strategy for Landbirds of the East-Slope of the Cascade Mountains in Oregon and Washington for the white-headed woodpecker, Lewis' woodpecker and the black-backed woodpecker.

The Wildlife Report analyzes the impacts to management indicator species (MIS) and species of concern (landbirds and/or NWFP S&M species) associated with Melvin Butte project on the Deschutes National Forest.

Thirteen management indicator species occur on the Deschutes National Forest and/or their habitats are known or suspected to occur within the project area. In addition, 11 landbirds on the Deschutes National Forest and/or their habitats are known or suspected to occur within the project area. The following is a summary of the findings of the Wildlife Report on the impacts of the proposed alternatives.

1. Implementation of Alternatives 2 and 3 is associated with reproductive habitat for 13 management indicator species (MIS) on the Deschutes National Forest but will not contribute to a change in viability for these species.

2. Implementation of Alternatives 2 and 3 is associated with the habitat of 11 landbird species on the Deschutes National Forest, although treatments will reduce and or modify habitat, treatments are consistent with the Landbird Conservation Strategy.

3. Implementation of the Melvin Butte project is consistent with the Standards and Guidelines for the Deschutes Land and Resource Management Plans for MIS.

4. Implementation of Melvin Butte project is consistent with the biological objectives outlined in the Conservation Strategies for Landbirds of the East-slope Cascades. Treatments were designed to be beneficial to these species by providing long-term habitat.

Federally Listed and Proposed Species

Habitat for the northern spotted owl occurs in the Melvin Butte project area. A Joint Aquatic and Terrestrial Biological Assessment for Federal Lands within the Deschutes and John Day River Basins

Administered by the Forest Service was completed in 2014 (USDA Forest Service 2014) for projects proposed on the Deschutes National Forest that may affect but would not likely adversely affect the northern spotted owl. The BA established project design criteria to sreamline the consultation process with the U.S. Fish and Wildlife Service (FWS) for projects proposed from 2013 to 2016. The goal for the Forests is to fully implement the criteria to achieve conservation and recovery objectives of federally listed, proposed, and candidate species. Project design criteria are used as sideboards for the planning process and include effects from habitat alteration and noise disturbance. The federal listed Endangered gray wolf is also included in this analysis. See Table 71: Federally listed and proposed species under the Endangered Species Act. Table 71 lists these species, their habitats, and potential effects.

Table 71: Federally listed and proposed species under the Endangered Species Act.

Federally Listed and Proposed Species under the Endangered Species Act				
Species	**Status**	**Habitat**	**Habitat/ Presence in Project Area**	**Effect**
Gray wolf (*Canis lupus*)	Federal Endangered	Any plant association group	No denning or rendezvous habitat; low potential for dispersal habitat	No Effect
Northern spotted owl (*Strix occidentalis caurina*)	Federal Threatened, MIS	Old growth mixed conifer forests	No Nesting, roosting, and foraging habitat (NRF) within project boundary	No Effect
Northern spotted owl (*Strix occidentalis caurina*) Critical Habitat	Federal Threatened, MIS	Old growth mixed conifer forests	Designated Critical Habitat within project boundary	May Effect NLAA
Oregon spotted frog (Rana pretiosa)	Federal Endangered	Shallow lakes, ponds	No habitat	No Effect
Oregon spotted frog (Rana pretiosa) proposed Critical Habitat	Federal Endangered	Shallow lakes, ponds	No habitat	No Effect

Gray wolf

Measure: Effects to denning habitat and rendezvous sites

Existing Condition

The gray wolf usually occurs in forested habitats with some open areas such as river valleys and meadows for hunting prey including pronghorn, deer and elk, and smaller mammals. Wolf packs (usually 5-10 animals) can have very large territories—up to 400 square miles or larger. Key wolf habitat components identified in the 1987 Wolf Recovery Plan (USDI Fish and Wildlife Service 1987) include: “1) a sufficient, year-round prey base of ungulates and alternative prey, 2) suitable and somewhat secluded denning and rendezvous sites, and 3) sufficient space with minimal exposure to humans. Den sites are excavated areas in the soil but hollow logs, beaver lodges, the base of hollow trees, pit excavations, and rock caves, usually near water, are also used. Rendezvous sites are the activity sites used after the denning period and prior to the nomadic hunting period of fall and winter. They are often in open grassy areas near water or at forest edges.”

There are no known denning habitat or known rendezvous sites on the Deschutes National Forest. There are no known wolf packs on the Deschutes National Forest. The closest known packs occur on the Umatilla National Forest in northeastern Oregon and on the Rogue River Siskiyou National Forest in southwest Oregon. The project area contains habitat for wolf prey species (deer and elk).

In Oregon, the gray wolf is listed as federally Endangered in areas west of Highways 395, 78, and 95 which includes the Deschutes National Forest. In 2011, a single male gray wolf was documented dispersing through the southern portion of the Deschutes National Forest and subsequently traveled south into California. In 2012, it was documented traveling back and forth across the California/Oregon southern border and has established a pack in southern Oregon on the Rogue Siskiyou National Forest. More recently (2014/2015), there have been several wolves documented moving through the Forest but none have taken up residency.

Alternative 1 (No Action)—Ecological Trends

Under the No Action Alternative vegetation management treatments would not occur within Melvin project area. However, the "ecological trend" in the short-term is that stands would continue to remain suppressed and at risk of a stand replacement wildfire. Development of future old growth within ponderosa pine and mixed conifer stands would be prolonged and the old trees within the stands would continue to be stressed, decreasing their longevity. However, stands would continue to provide habitat for ungulate populations that provide the main prey base for the gray wolf. In the long-term, in the absence of a stand replacement wildfire or insect outbreak, diseased stands would continue to die and the multi-storied stand structure would diminish along with any remnant old growth trees, providing a very discontinuous overstory and lack of suitable hiding cover across the project area for ungulates. However, stand replacement fires are beneficial to deer populations due to the increase in browse production resulting from the removal of the forest canopy. Other prey species would also decline due to lack of habitat in the short-term. Elk tend to avoid the stand replacement fire areas due to lack of shade in the hot summer months and grass for forage since these areas are dominated by early seral shrubs.

Direct and Indirect Effects—Alternatives 2 and 3

There are no known gray wolf packs associated with the Melvin Butte project area or the Deschutes National Forest; therefore there are no direct or indirect effects associated with the action alternatives.

The action alternatives provide some level of thinning and mowing and burning across the project area. Thinning would open up stands reducing crown closure, promoting the development of herbaceous plants. Thinning treatments have the potential to improve the forage base of prey species of the wolf such as snowshoe hare, deer, and elk. Treatments would create a mosaic of forage and browse while retaining cover which is beneficial to all gray wolf prey species. There is No Effect to gray wolf or its habitat under Alternative 2 or Alternative 3.

Cumulative Effects— Alternatives 2 and 3

Alternatives 2 and 3 would have no cumulative effects to the gray wolf and their habitat.

Conclusion—Alternatives 2 and 3

In conclusion, because there are no denning or rendezvous sites or wolf packs on the Deschutes national Forest, there are no direct indirect, or cumulative effects to the gray wolf or its habitat under Alternatives 2 or 3. There would be ***No Effect*** to the gray wolf. There would be beneficial effects to prey habitat under the action alternatives.

Northern Spotted Owl, Federally Threatened, MIS

Measures:

(1) Effects to nesting, roosting, and foraging habitat

(2) Effects to dispersal/connectivity habitat

(3) Effects to critical habitat

Existing Condition

The project area occurs within the range of the northern spotted owl. 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 old or greater than 32 inches dbh (USDA Forest Service and USDI Fish and Wildlife Service 1990). Functional nesting, roosting, and foraging (NRF) habitat for the spotted owl on the Deschutes National Forest includes stands of mixed conifer, ponderosa pine with white fir understories, and mountain hemlock with subalpine fir. The canopy cover is typically greater than or equal to 40% with an overstory comprised of at least five percent of trees greater than 21 inches diameter-at-breast- height (dbh). Habitat that meets NRF requirements also provides foraging habitat, although a wider array of forest types are used for foraging, including more open and fragmented habitat. (USDA 2014).

Suitable nest sites are generally in cavities in the boles of either dead or live trees. Platform nests may also be used (but more rarely), which include abandoned raptor nests, broken treetops, mistletoe brooms, and squirrel nests. Relatively heavy canopy habitat with a semi-open understory is essential for effective hunting and movement.

Habitat conditions that support good populations of northern flying squirrels (*Glaucomys sabrinus*), western red-backed voles (*Clethrionomys californicus*), and other nocturnal or crepuscular small mammals, birds, and insects are essential to supporting spotted owls. An analysis of local spotted owl pellets showed the primary prey species on the Deschutes National Forest is the northern flying squirrel with red-backed vole, bushy-tailed woodrat (*Neotoma cinerea*), western pocket gopher (*Thomomys mazama*), Douglas squirrel (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), voles (*Microtus spp.*), mice (*Peromyscus spp.*), and insects as secondary prey items.

Flying squirrels were once thought to be old-growth dependent but several studies have shown that densities were similar in both young and old forests, especially if old forest legacies (e.g. large decaying logs) and well-developed understories were present (Rosenberg and Anthony 1992, Carey 1995, Waters and Zabel 1995, Carey et al. 1997, Carey 2000, Carey et al. 2002, and Ransome and Sullivan 2003). Den sites have been documented 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 (Carey et al. 1997). Mychorrizal and epigeous fungi, in particular truffles, are an important food source for flying squirrels (Waters and Zabel 1995, Waters et al. 2000, Carey et al. 2002, and Lehmkuhl et al. 2006a) but where winter snow levels are deeper, as seen in eastside habitats more often, other foods become important such as lichens (Rosentreter et al. 1997, and Lehmkuhl et al. 2006a).

Carey et al. (1997) specifically studied dens of the northern flying squirrel. They found the majority of dens were in live trees. They recommend that management for northern flying squirrels include leaving large fallen trees, large diameter tall stumps, and large green trees with platform branching, multiple tops and/or cavities. While retaining snags in burned areas is important to provide options for the flying squirrel, retaining all snags is not. Developing closed canopy stands to provide habitat may be more important following a fire.

Legacy retention (snags and coarse woody debris) is important to prey species following a disturbance (Courtney et al. 2004). Legacy materials left on site increase the complexity of the environment of young stands by increasing horizontal and vertical structure, which provides for greater prey species diversity (Carey and Harrington 2001). Carey and Johnson (1995) suggest conservation of some coarse woody debris, woody plant species diversity, and understory promotion to enhance biodiversity for prey species.

Carey (1995) recommends a range of snags from 2.8 to 8.1 snags per acre >21 inches dbh along with well-distributed patches of dense shrubs for high densities of flying squirrels. The legacy retention can accelerate habitat development for spotted owls and their prey.

Consultation History

Level 1 review was initiated on August 8, 2013 to discuss project effects to northern spotted owl designated Critical Habitat. Jennifer O'Reilly, U. S Fish and Wildlife Biologist, Lauri Turner, Deschutes National Forest Wildlife Biologist, and Monty Gregg ,Sisters Ranger District Wildlife Biologist participated in the discussion. A rationale for determination of effects to northern spotted owl primary constituent habitat elements in designated critical habitat was developed at that time. A Biological Assessment was submitted on February 15, 2015 and a Letter of Concurrence was issued by the U.S. Fish and Wildlife Service on March 5, 2015.

2011 Revised Recovery Plan for the Northern Spotted Owl

The Revised Recovery Plan for the Northern Spotted Owl (Recovery Plan) was approved on June 28, 2011 (USDI Fish and Wildlife Service 2011). The Recovery Plan states that many populations of spotted owls continue to decline, especially in the northern parts of the subspecies' range, even with extensive maintenance and restoration of suitable habitat. Managing sufficient habitat for the spotted owl now and into the future is important for its recovery. However, it is becoming more evident that securing habitat alone will not recover the spotted owl. Based on the best available scientific information, competition from the barred owl (*Strix varia*) poses a significant and complex threat to the owl. Past and current habitat loss are also threats to the spotted owl, even though loss of habitat due to timber harvest has been greatly reduced on Federal lands over the past two decades (USDI Fish and Wildlife Service 2011).

The Recovery Plan recognizes the extremely complex nature of management of spotted owl habitat in dry forests. It recommends that the dynamic, disturbance-prone forests of the eastern Cascades, California Cascades and Klamath Province be actively managed to meet overlapping goals of spotted owl conservation, responds to climate change, and restores dry forest ecological structure, composition and processes, including wildfire and other disturbances (III-20). The intent of the Recovery Plan is " …to embed spotted owl conservation and recovery within broader dry forest ecosystem restoration efforts to increase the likelihood spotted owl habitat will remain on the landscape longer and develop as part of this fire adapted community instead of being consumed by uncharacteristic wildfires." (III-32). On page III-34 of the Recovery Plan, the FWS provides the following principles for dry forest restoration treatments:

- Emphasize vegetation management treatments outside of spotted owl core areas or high value habitat where consistent with overall landscape project goals;
- Design and implement restoration treatments at the landscape level;
- Retain and restore key structural components, including large and old trees, large snags and downed logs;
- Retain and restore heterogeneity within stands. (Fine scale mosaic);
- Retain and restore heterogeneity among stands. (Meso-scale mosaic); and
- Manage roads to address fire risk: use wildfires to meet vegetation management objectives where appropriate.

2013 Designated Critical Habitat

The final rule for Critical Habitat designation was released on December 4, 2012 and became effective on January 3, 2013 (USDI Fish and Wildlife Service 2012). The FWS encourages land managers to consider implementation of forest management practices recommended in the Revised Recovery Plan to restore

natural ecological processes where they have been disrupted or suppressed and the application of "ecological forestry" management practices within critical habitat to reduce the potential for adverse impacts associated with commercial timber harvest when such harvest is planned within or adjacent to critical habitat. The FWS encourages land managers to consider the conservation of existing high quality northern spotted owl habitat, the restoration of forest ecosystem health, and the ecological forestry management practices recommended in the Revised Recovery Plan that are compatible with both the goals of spotted owl recovery and Standards and Guidelines of the Northwest Forest Plan. In fire-prone forests east of the Cascade crest, it is recognized that vegetation and fuels management may be appropriate both within and outside designated critical habitat where the goal of such treatment is to conserve natural ecological processes or restore processes such as fire where they have been modified or suppressed.

Critical Habitat is defined in section 3 of the Act as (50 CFR Part 17 p. 71896):

- The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features
- Essential to the conservation of the species and
- That may require special management considerations or protection and
- Specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species

Physical and Biological Features

Physical and biological features (PBFs) are essential to the conservation of the species and may require special management considerations or protection. Physical or biological elements of habitat include but are not limited to (50 CFR Part 17 p. 71897):

- Space for individual and population growth and for normal behavior
- Food, water, air, light, minerals, or other nutritional or physiological requirements
- Cover or shelter
- Sites for breeding, reproduction, and rearing (or development) of offspring
- Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species

For the northern spotted owl, physical or biological features essential to the conservation of the species are forested areas that are used or likely to be used for nesting, roosting, foraging, and dispersing. The specific characteristics or components that comprise these features include, for example, specific ranges of forest stand density and tree size distribution, coarse wood debris, and specific resources, such as food, nest sites, cover, and other physiological requirements of spotted owls and considered essential to the conservation of the species.

Primary Constituent Elements

For the northern spotted owl, primary constituent elements (PCEs) are specific characteristics that make areas suitable for nesting, roosting, foraging, or dispersal habitat. To be essential to the conservation of the northern spotted owl, features need to be distributed in a spatial configuration that's conducive to persistence of populations, survival, and reproductive success of resident pairs and survival of dispersing individuals until they can recruit into a breeding population. There are four PCEs: (1) a forest type in early, mid, or late seral stages and that supports the owl across its geographical range; (2) habitat that provides for nesting and roosting; (3) foraging habitat; and (4) habitat to support the transience and

colonization phases of dispersal. The PCE #1 (forest type) must be in concert with at least one other PCE to be critical habitat.

The Melvin Butte project area does not provide owl habitat because canopy closure and stand structure do not meet the definition of nesting, roosting, and foraging habitat (NRF). No NRF habitat is located in the project area. Existing stands do not provide adequate cover or shelter for the owl or their prey (flying squirrels) and sites for breeding, reproduction, and rearing (or development) of offspring. Due to the presence of insects and disease stand canopies are very fragmented and disjunct and do not provide canopy closure and contiguous overstory large tree structure needed for nesting, roosting, foraging (prey habitat). The Melvin Butte project area does support the transience and colonization phases of dispersal but does provide the minimum stand requirements to provide the security needed for dispersing birds through the project area. The Melvin Butte project area provides the PCEs for dispersal habitat.

Critical Habitat on the Deschutes National Forest

Critical Habitat delineation on the Deschutes National Forest does not occur in a contiguous fashion but is instead mapped as two separate Critical Habitat units (CHUs) across the three ranger districts. The Deschutes National Forest lies primarily in CHU #7. In addition, there is a small portion of CHU #6, West Cascades South, on the southern end of the Deschutes National Forest on the Crescent Ranger District. Table 72 lists the acres in the CHUs and percentage of the CHUs that occur on the Deschutes National Forest. There are 250,056 acres of CHU #7 and 3,274 acres of the CHU #6 on the Deschutes National Forest.

Table 72: Acres of Critical Habitat units 6 and 7 on the Deschutes National Forest.

Critical Habitat Unit	Total Acres of Critical Habitat Unit	Total Acres of Critical Habitat Unit on Forest	Percent of Total CHU the Forest Occupies
Unit 7 – East Cascades North	1,345,523	250,056	18.5%
Unit 6 – West Cascades South	1,355,198	3,274	<1%
Total	2,700,721	253,321	19%

The critical habitat units are further divided into subunits. Three CHU subunits occur on the Deschutes National Forest: ECN 8, ECN 9, and WCS 5. Subunit ECN 8 is entirely on the Sisters Ranger District and Subunit WCS 5 is entirely on the Crescent Ranger District. Subunit ECN 9 lies on both the Bend-Fort Rock and Crescent Ranger Districts. It falls between the other two subunits on the Deschutes National Forest and therefore is important in providing north/south connectivity of habitat along the eastern range of the species. Connectivity within and between critical habitat subunits is necessary to provide demographic support and genetic diversity should fire, insects, disease, wind storms, and/or inclement weather significantly reduce the population in any individual subunit. Table 73 lists the number of acres in the Critical Habitat subunits on the Deschutes National Forest.

Table 73: Critical Habitat subunits on the Deschutes National Forest. The ECN 8 subunit occurs wholly on the Sisters Ranger District.

Critical Habitat Unit (CHU) Name	CHU Number	CHU Subunit	Total CHU Acres	Total CHU Acres on Forest lands	Total CHU Acres on Private lands	Total CHU Acres on Forest lands	Percent of CHU on Forest lands
East Cascades North	**07**	**ECN 8**	**94,622**	**94,517**	**106**	**94,622**	**100%**
East Cascades North	07	ECN 9	155,434	155,405	30	155,434	100%
West Cascades South	06	WCS 5	356,415	3,274	0	3,274	<.92%

Total	606,471	253,196	136	253,330	

Status of the Spotted Owl Including Barred Owl Detections in Subunit ECN 8

Subunit ECN 8 consists of approximately 94,622 acres in Jefferson and Deschutes counties of federal lands managed by the Forest Service under the NWFP. Of the 94,622 acres, approximately 94,517 acres occur on the Deschutes National Forest while the remaining 106 acres occur on private lands.

Special management considerations or protection are required in this subunit to address threats from current and past timber harvest, losses due to wildfire and the effects on vegetation from fire exclusion, and competition with barred owls. This subunit is expected to function primarily for demographic support to the overall population, as well as north-south connectivity between subunits. It was determined that all of the unoccupied and likely occupied areas in this subunit are essential for the conservation of the species to meet the recovery criterion that calls for the continued maintenance and recruitment of northern spotted owl habitat. The increase and enhancement of northern spotted owl habitat is necessary to provide for viable populations of spotted owls over the long term by providing for population growth, successful dispersal, and buffering from competition with the barred owl.

This subunit is divided into four areas: Green Ridge, Meadow Lakes, Bluegrass Butte, and Trout. The Green Ridge area lies at the north end of the forest on the Sisters Ranger District and runs north-south along Green Ridge, wrapping around Black Butte and Suttle Lake running north to Brush Creek. It is bounded on the west by the Mt. Jefferson Wilderness and on the north by the Warm Springs Reservation. This area excludes the Metolius Basin and overlaps portions of the Metolius and Cache Late Successional Reserves (LSR). The Meadow Lakes area is small and is centered around Link and Meadow Lakes on the Sisters Ranger District and does not overlap any LSR. Bluegrass Butte is a small area bounded on the west by both the Mt. Washington and Three Sisters Wilderness areas. Highway 242 runs through the center and the Belknap Crater lava flow is excluded. It overlaps a portion of the Cache and Trout LSRs. The Trout area is bounded on the west by the Three Sisters wilderness and on the east by the NWFP line. It overlaps a portion of the Trout LSR.

Approximately 15% of the subunit is classified as NRF habitat (13,964 acres) and NRF is generally distributed throughout with the majority of habitat in the eastern half of the Green Ridge and Bluegrass Butte areas. The majority of the remaining habitat is considered dispersal habitat with the exception of the stand- replacement and mixed mortality fire areas. The major plant associations are white fir with moderate amounts of Douglas-fir, mountain hemlock, Pacific silver fir, and ponderosa pine (Table 74).

Table 74: Plant Association Group acres within Critical Habitat Subunit ECN 8 on the Deschutes National Forest.

PAG	Acres in PAG	% of PAG
Douglas Fir	11,643	12%
Grand Fir	120	<1%
Lodgepole Pine	0	0%
Mountain Hemlock	5,872	6%
Pacific Silver Fir	1,808	2%
Parkland	190	<1%
Pinyon-Juniper	92	<1%
Ponderosa Pine	2,425	3%
Subalpine Fir	66	<1%
Western Hemlock	283	<1%
White Fir	72,124	76%
Grand Total	**94,622**	**99%**

Approximately three-quarters (76%) of this subunit is comprised of the white fir PAG that has the potential to provide suitable spotted owl habitat in the appropriate plant associations. The mountain hemlock PAG does not have the complex structure needed to provide suitable spotted owl habitat and the ponderosa pine PAG is usually too dry and open to produce suitable habitat. However, due to fire suppression, understories contribute to short-term marginal NRF habitat and dispersal habitat in some locations. This occurs across the subunit where large trees can be grown but due to the overstocked nature of the stands areas are at high risk of loss from insects, disease, and/or wildfire that has occurred frequently on the Sisters Ranger District over the last 20 years.

Several wildfires have occurred partially or wholly in the ECN 8 since 2002: Cache Mtn. (2002), Eyerly (2002), RNA (2002), Link (2003), B&B (2003), Black Crater (2006), Lake George (2006), GW (2007), Summit Springs (2008), Wizard (2008), Black Butte II (2009), Shadow Lake (2011), Pole Creek (2012), Green Ridge (2013), and Bridge 99 (2014). Over 38,800 acres (41%) of this subunit have been impacted by fire (Table 75).

Table 75: Vegetation mortality due to wildfire in ECN 8 on the Deschutes National Forest.

Acres of Low Mortality	Acres of Mixed Mortality	Acres of Stand Replacement	Total Acres
17,874	10,927	10,064	38,865

Mixed mortality and stand replacement burns generally result in the loss of NRF habitat and potential dispersal habitat if the majority of stands are comprised of true firs, such as white fir. Low mortality areas are generally underburned and dispersal habitat is likely to be retained in these areas. In addition, significant insect and disease outbreaks have occurred within this subunit, most of which has been impacted by wildfire. A mountain pine beetle epidemic has impacted lodgepole pine stands in and adjacent to the Trout Creek area. As a result, approximately 90% of the lodgepole pine has been killed. This has led to the degradation of mixed conifer stands; primarily a reduction in canopy cover due to the loss of lodgepole pine. These white fir stands also contain significant levels of dwarf mistletoe which has resulted in canopy closure reductions as well and has left the area fragmented.

This subunit is expected to function primarily for demographic support to the overall population, as well as north-south connectivity between subunits. Connectivity exists from Green Ridge to Black Butte and occurs across Metolius Basin through ponderosa pine stands but becomes limited along the eastern slope of the Cascades as a result of wildfire. Impacts from large wildfires can be seen from the base of Mt. Jefferson south along the east slope of the Cascades to Three Creek Lake. The majority of these fires ranged from high elevation wilderness through the mid-slope regions where the majority of historic spotted owl home ranges were found. In addition, mortality has occurred within the high elevation lodgepole pine stands within the wilderness from the mountain pine beetle. Impacts from this outbreak occur from roughly Trout Creek Butte area south to Cultus Mountain on the Bend-Ft. Rock Ranger District. Impacts from fire and insects have limited north-south connectivity on the Sisters Ranger District primarily. Dispersal habitat occurs in the lower elevations primarily in overstocked ponderosa pine stands which are also at risk of loss. This subunit is still providing demographic support but at a reduced level due to impacts from past wildfires. In stand replacement and mixed mortality areas it may take >300 years to produce suitable NRF habitat and >100 years to produce dispersal habitat due to the lack of a seed source for desired tree species (USDA Forest Service 2004a). In underburned areas, habitat is likely to be produced in 25-50 years and NRF in approximately 100 years due to the remaining residual trees.

Eight known spotted owl home ranges are found partially or wholly in ECN 8 subunit and all are considered viable. The Castle Rocks, Trout Creek, Davis Creek, and Bluegrass Butte home ranges have

not been surveyed in the past 2 to 3 years and the site status is unknown. One additional pair, Black Crater, has been surveyed over the past two years but no birds have been detected.

In 2011, a new pair (Metolius Basin) was detected. This pair has not been found to be reproductive. In 2013, a new pair was detected (Meadow Creek). The reproductive status of this pair has not yet been determined.

Eight barred owl detections have occurred in this subunit since 1999. Two barred owl pairs have been documented with one pair found on the north end of Green Ridge near the Metolius Basin spotted owl pair and the other barred owl pair is associated with the north side of Black Butte (near the Obsidian spotted owl home range). A single barred owl was detected near Six Creek in 2012. Barred owls have not been detected Deep Canyon watershed associated with the Melvin Butte project area.

Subunit ECN 8 also overlaps four NWFP allocations – Late Successional Reserve (LSR), Matrix, Congressionally Reserved, and Administratively Withdrawn. Late-Successional Reserves have the objective to protect and enhance conditions of late-successional and old growth ecosystems, which serve as habitat for late-successional and old growth forest related species including the spotted owl. Administratively Withdrawn lands include recreation and visual areas, back country and other areas where management emphasis precludes scheduled timber harvest. Matrix is the area where most timber harvest and other silvicultural activities will be conducted. There is no LSR land allocation located in the project area.

Table 76 lists the mapped critical habitat acres at different spatial scales. There are 253,196 acres of critical habitat on the Deschutes National Forest and 94,517 acres of Subunit ECN 8. Within the Melvin Butte project area, there are approximately 3,731 acres of critical habitat mapped in the ECN 8 subunit. Approximately 2,971 acres of Melvin Butte vegetation management units occur in Critical Habitat.

Table 76: Mapped critical habitat that overlaps with the Melvin Butte project area.

	Acres of mapped critical habitat on the Deschutes National Forest	Percent (%) of Acres
CHU 7 on the Deschutes National Forest	253,196	100%
Subunit ECN 8 on the Deschutes National Forest	94,517	37% of CHU
Melvin Butte Project Area Boundary	3,731	4% of subunit ECN 8
Melvin Butte Vegetation Management units	2,971 acres	3% of subunit ECN 8
		1% of CHU on Forest

NRF Habitat Within Critical Habitat and the Project Area

Elevation and corresponding changes in temperature or moisture regimes constrain the development of vegetation communities selected by spotted owls and may exceed the bounds of physiological tolerance of spotted owls or their prey. In addition, topography influences the distribution of spotted owl habitat and patterns of habitat selection. The effects of topography are strongest in drier forests, where aspect and insolation (amount of solar radiation received in an area) contribute to moisture stress that can limit forest density and tree growth. In drier forests east of the Cascades, suitable habitat can be concentrated at intermediate topographic positions, on north-facing aspects, and in concave landforms that retain moisture. This leads to a distribution of suitable habitat characterized by ribbon-like bands and discrete patches. Ribbons occur along drainages and valley bottoms, along the north faces of ridges that trend from east to west, and at intermediate topographic positions between drier pine-dominated forests at

lower elevations, and subalpine forest types at higher elevations. Discrete patches also occur on top of higher plateaus. The majority of suitable spotted owl NRF habitat as well as historic and current spotted owl home ranges occur within the mid-elevational mixed conifer (white fir PAG) band on the Deschutes National Forest. This band includes the east slope of the Cascades and buttes, especially on the southern half of the forest. Approximately 56% of the NRF habitat on the Deschutes National Forest occurs within designated Critical Habitat and a large portion of the NRF occurring outside Critical Habitat is located within Wilderness.

Stand composition and structure associated with NRF habitat varies greatly from north to south across ECN 8 and across the Sisters Ranger District. Although elevation, corresponding temperature, and moisture regimes influence the vegetation communities, these factors coupled with soil types also greatly influence vegetation communities. The soil types north of Highway 242 (primarily associated with the Metolius Basin and Green Ridge) are more highly productive than the soil types on the southern end of the district, south of Highway 242. As a result, the northern end of the district and northern portions of ECN 8 have a more diverse stand composition in the mid-elevation mixed conifer PAG's. This mixed conifer PAG s contains an overstory of predominantly long-lived and fire tolerant Douglas-fir and ponderosa pine. In addition, this PAG contains incense cedar, western larch, and western white pine, which are also long-lived fire tolerant species. Lastly, white-fir is a short live species that is very susceptible to insects and disease and dominates the understory. Due to these highly productive soils associated diverse vegetation communities, the majority of the historic NRF habitat and historic spotted owl territories occurred north of Highway 242 on the north end of the district.

South of Highway 242 in the southern portion of the Sisters Ranger District, ECN 8, and within the Melvin Butte project area, NRF habitat in mid-elevational mixed conifer is similar to the rest of the Deschutes National Forest. Due to the lower site productivity associated with the southern end of the district, these mid-elevation mixed conifer (white fire) PAG's have very limited species composition. Ponderosa pine is the primary long-lived fire tolerant species in the overstory. White fir dominates the understory and secondarily lodgepole pine, both of which are fire intolerant and highly susceptible to insects and disease. As a result, very little NRF habitat historically or currently occurs in the southern portion of the district as well as the southern ECN 8. Due to the lack of stand diversity, NRF habitat is limited in this area, as well as historic nesting territories. In addition, with the last 100 years of fire exclusion and without harvest, these stands did not develop NRF habitat. Typically the white fir and lodgepole pine die from insects and disease before they are able to develop into large overstory trees contributing to high crown closures and large tree structure.

Differences in mixed conifer vegetation composition across the Sisters Ranger District may be explained by changes in landscape geomorphology and soils from north to south. Land Type Association (LTA) mapping which characterizes different landscapes at large scales can be useful for displaying these differences. LTA mapping separates out large landforms based on differences in ecological drivers including geomorphology and soils which in turn influence different soil/climatic zones at a landscape scale. LTA's identified for the mixed conifer zone in the western portion of the District, including areas of Metolius Basin and lower to mid flanks of the Cascade Range, are identified primarily as ashmantled glacial valleys and ashmantled glaciofluvial fans. Glacial till and glacial outwash in the lower soil profile of these landforms result in low water permeability. The result is a perched water table in the upper soil profile and making it available for plant use. Mixed conifer vegetation in the areas of Green Ridge in the northeast portion of the District include areas identified as ashmantled low mountains on which ash deposits occur over dense volcanic tuffs and non-fractured rock. Similar to the Metolius Basin soils these materials also help to hold soil moisture for longer periods in the upper soil profile. Landforms in the southern portion of the Ranger District and Melvin Butte project area differ from the north in that they include landforms primarily identified as ashmatled volcanos, ashmatled flows, and ashmantled volcanic plains. Soils on these landforms consist of volcanic ash mantles over highly fractured volcanic rock. The

result is lower water availability for vegetation growth due to water moving through the soil profile into the fractured rock below the plant rooting zone.

Overall, the largest impact to NRF habitat and spotted owl territories across the Sister Ranger District has been wildfire. Since 2002 approximately 144,110 acres has burned or 44% of the district. The majority of these fires have been in the mid-elevation mixed conifer stands.

Table 77 lists the acres of NRF habitat at different spatial scales. Of the 70,108 acres of NRF habitat on the Deschutes National Forest, approximately 13,964 acres of NRF occur in Subunit ECN 8. The Melvin Butte Project area lies in the southern portion of ECN 8 on the eastern edge of the northern spotted owl's range.

Of the 5,375 acre Melvin Butte project area, approximately 3,731 acres are associated with CHU Subunit ECN 8. NRF habitat identified through a forest wide mapping process underwent field review during the 2011 field season. It was determined during field review that the mapped NRF did not contain adequate stand characteristics to qualify as viable NRF habitat. In addition, to further validate that the lack of suitable stand characteristics in mapped NRF, surveys were completed to protocol from 2009 to 2011 and no responses were detected within the Melvin Butte project area. There is no NRF habitat associated with the project area or with the portion of the project area associated with the CHU.

Table 77: Nesting, roosting, and foraging habitat in Critical Habitat and the Melvin Butte Project area.

Scale	Acres of NRF Habitat
Deschutes National Forest	70,108
Critical Habitat Subunit ECN 8	13,964
Melvin Butte Project Area Boundary	0
Melvin Butte Vegetation Management Units	0
Percentage of NRF Habitat Affected by Melvin Butte Project	0%

Dispersal Habitat and Connectivity

Northern spotted owls regularly disperse through highly fragmented forested landscapes. Corridors of forest through fragmented landscapes serve primarily to support relatively rapid movement through such areas, rather than colonization or residency of nonbreeding owls. During the transience or movement phase, dispersers use mature and old-growth forest slightly more than its availability; during the colonization phase, mature and old-growth forest is used at nearly twice its availability. Closed-sapling sawtimber habitat is used roughly in proportion to availability in both phases and may represent the minimum condition for movement. Spotted owls can also disperse successfully through forests with less complex structure, but risk of starvation and predation likely increase with increasing divergence from the characteristics of suitable habitat. The suitability of habitat to contribute to the successful dispersal of spotted owls is likely related to the degree to which it ameliorates heat stress, provides abundant and accessible prey, limits predation risk, and resembles habitat in natal territories. Dispersal habitat is essential to maintaining stable populations by promoting rapid filling of territorial vacancies when resident spotted owls die or leave their territories, and to providing adequate gene flow across the range of the species. Generally, dispersal habitat across the Deschutes National Forest is fragmented by roads, timber harvest units, or by areas that have been burned or defoliated by insects or disease but is found from the low ponderosa pine areas to the mountain hemlock zone in varying degrees of quality.

Dispersal habitat was defined by the Interagency Scientific Committee (USDA Forest Service and USDI Fish and Wildlife Service 1990) as stands with an average dbh of 11 inches and a 40% canopy cover. Those conditions are not biologically possible in all eastside plant association groups. In 1996, the Forest conveyed a Science Team of experts on local conditions to determine plausible definitions of dispersal

habitat. The team developed a process by which local biological knowledge of sites would be used to describe dispersal habitat (USDA Forest Service 1996). Table 78 lists the criteria used to define dispersal habitat on the Deschutes National Forest.

Table 78: Dispersal habitat definitions.

Plant Association Group	Stand Criteria Average dbh, Percent Canopy Cover (CC)
Mixed Conifer Wet	11" dbh, 40% CC
Mixed Conifer Dry	11" dbh, 30% CC
Ponderosa Pine	11" dbh, 30% CC
Lodgepole Pine	7" dbh, 30% CC
Mountain Hemlock	7" dbh, 30% CC

Based on the criteria identified in the previous table, an analysis was completed and dispersal habitat was mapped for the entire Deschutes National Forest. Table 79 lists the acres of dispersal habitat at different spatial scales. Of the 289, 552 acres of dispersal habitat on the Deschutes National Forest, approximately 24,342 acres of dispersal habitat occur in Subunit ECN 8. The Melvin Butte Project area lies in the southern portion of ECN 8 on the eastern edge of the northern spotted owl's range. Approximately, 2,796 acres of dispersal habitat exists across the Melvin Butte project area.

Table 79: Dispersal habitat in critical habitat and the Melvin Butte Project area.

Scale	Acres of Dispersal Habitat
Deschutes National Forest	289,552
Critical Habitat Subunit ECN 8	24,342
Melvin Butte Project Area Boundary	2,796

Connectivity in ECN 8 is highly fragmented due to the amount of fires and past timber harvest that has occurred across the Sisters Ranger District. ECN 8 was delineated in 2011 and Critical Habitat was officially designated in 2013. Although ECN 8 is associated with many fires, during the delineation, areas with the highest fire severity were avoided. Since 2011, the Green Ridge, Pole Creek, and Bridge 99 fires have continued to impact and fragment ECN 8.

The 2012 Pole Creek fire is directly adjacent to the Melvin Butte project and has been the largest fire on the District since 2011. The Pole Creek fire burned approximately 26,795 acres and heavily fragmented the southern portion of ECN 8.

As part of the overall project design for dispersal habitat and to meet the intent of the purpose and need of the project, a retention strategy was developed for spotted owl dispersal habitat. The primary objective of the retention strategy is to provide connectivity for spotted owls in a north to south continuum throughout the project area by retaining dispersal habitat. The retention strategy is based on the inherent soil quality and stand productivity, where the project retains more untreated stands in areas that have high site productivity and contain the most contiguous acres of dispersal habitat. By using the Land Type Association (LTA) mapping that was previously described, the project was broken into 3 major soil types which are classified as low, moderate, and high site productivity. Due to the high canopy closure and high tree density that must occur in stands to provide dispersal habitat, stand viability is greatly reduced in areas where site productivity is low to moderate. In areas where site productivity is moderate to high, stand viability may be maintained for a longer duration.

The retention strategy identified a range of retention levels for dispersal habitat across the project area. Within stands containing low site productivity, dispersal habitat/untreated stands would be retained at a 10% level; in the areas with moderate site productivity dispersal habitat/untreated stands would be

retained at 15% level; and in areas that have the highest site productivity dispersal habitat/untreated stands would be retained at the 20% level. Retention would occur on a stand by stand basis to retain areas that contain the highest densities of contiguous dispersal habitat. Therefore no untreated areas would occur within implementation units. Approximately 1,317 acres of the project area have been identified as low site productivity, therefore 10% or 131 acres would be retained in areas that provide dispersal habitat for the spotted owl. Approximately 1,451 acres of the project area have been identified as moderate site productivity, therefore 15% or 217 acres would be retained in areas that provide dispersal habitat for the spotted owl. Approximately 1,832 acres of the project area have been identified as high site productivity, therefore 20% or 366 acres would be retained in areas that provide dispersal habitat for the spotted owl. Table 80 provides a summary of retention objectives by site potential. These areas would provide residual overstory diversity and structure to allow for dispersal through the project area.

Table 80: Retention Strategy by Site Productivity for the Melvin Butte Project Area.

Site Productivity	Retention Levels	Acres of Melvin Butte Project Area in Low, Medium, and High Site Productivity	Total Acres Identified to Minimally Retain as Dispersal Habitat
Low	10 percent	1,317 acres	131 acres
Medium	15 percent	1,451 acres	217 acres
High	20 percent	1,832 acres	366 acres
	Total	4,600 acres	714 acre

To meet the objective identified Table 80 stands were reviewed and those stands containing the highest densities of contiguous dispersal habitat were identified and retained as no treatment areas. Table 81 displays the actual acres identified for dispersal stands based on site productivity.

Table 81: Retention Strategy by Site Productivity for the Melvin Butte Project Area.

Site Productivity	Retention Levels	Acres of Melvin Butte Project Area in Low, Medium, and High Site Productivity	Actual Acres Retained for Dispersal Habitat
Low	10 percent	1,317 acres	158 acres
Medium	15 percent	1,451 acres	230 acres
High	20 percent	1,832 acres	364 acres
	Total	4,600 acres	752 acres

In addition, the connectivity strategy was built around other stands that would not be treated for other resource issues which also contain dispersal habitat. These areas include the Three Creeks Riparian Reserve and some areas of steep slopes that are excluded from treatment which total approximately 162 acres.

Of the 2,796 acres of dispersal habitat identified within project area, 914 acres or 32% of the area would be retained to provide connectivity for dispersing birds in a north south continuum throughout the project area.

Alternative 1 (No Action)—Ecological Trends

Under the No Action Alternative no treatments would occur within Melvin Butte project area. However, the “ecological trend” in the short-term is that stands would continue to remain suppressed and at risk of insects, disease and a stand replacement wildfire. Development of future old growth within ponderosa pine and mixed conifer stands would be prolonged and the old trees within these stands would continue to be stressed, decreasing their longevity. However, stands would continue to provide dispersal habitat in

the short-term. In the long-term, in the absence of a stand replacement wildfire or insect outbreak, the stands containing disease would continue to die and the multi-storied structure would diminish along with any remnant old growth trees. As a result, dispersal habitat for the northern spotted owl would continue to diminish as the overstory canopy becomes more open making the species more susceptible to predation. Due to stand densities within the project area and increases in mortality, the risk of large scale disturbance event in the project area increases over time, potentially impacting spotted owl dispersal habitat.

Stand resilience to insects and disease is measured by the Upper Management Zone (UMZ). The UMZ relates to the density of trees (basal area, trees per acre, etc.) a forest stand can support without significant mortality from bark beetles. The upper management zone is the density level at which trees begin to come under significant stress and can become susceptible to bark beetles and other insects and diseases. Forest stands managed below the upper management zone are more resilient. There are approximately 4,456 acres that have the potential to receive vegetation treatment. Under the existing condition, 92% of these stands are above the Upper Management Zone and are at risk or may currently be impacted by insects and disease due to high stand densities, resulting in low stand resiliency.

Direct and Indirect Impacts—Alternatives 2 and 3

The Revised Recovery Plan emphasizes the conservation of spotted owl sites and high value spotted owl habitat (page I-2). Interim Guidance recommends that site conservation priorities for reproductive status are (page III-44):

- Known sites with reproductive pairs;
- Known sites with pairs;
- Known sites with resident singles; and
- Historic sites with reproductive pairs, pairs, and resident singles, respectively.

Further recommendations include avoiding activities that would reduce nesting, roosting, and foraging habitat within provincial home ranges (1.2 mile radius) of reproductive pairs (III-45). The project meets the interim guidance and recommendations.

There are no known sites or historic sites within the project area, therefore disruptive work activities would not take place within ¼ mile (1.0 miles for blasting, ½ mile for helicopter) of nest sites or home ranges.

The project area does not contain any suitable NRF habitat, therefore no thinning or prescribed burning would occur within suitable NRF habitat. There would be no modification of any NRF habitat in Critical Habitat ECN 8 subunit.

Treatment types for Alternatives 2 and 3 in dispersal habitat include thinning from below (HTH), mixed conifer thinning from below with group opening (MCGO), mixed conifer thinning from below without group openings (MC without openings), non-commercial thinning (P), Burn Only (B), lodgepole improvement (LPI), and dwarf mistletoe restoration (DM). Table 82 summarizes the acres associated with each treatment type.

Table 82: Treatment Type and Acres for Alternative 2 and 3.

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
HTH	998	1,164
MCGO	839	0
MC without openings	0	769

P	1,174	1,174
B	809	809
LPI	249	249
DM	160	0
Total Acres.	**4,469**	**4,405**

Under Alternatives 2 and 3 of the approximately 2,796 acres of available dispersal habitat, about 1,882 acres would be treated. The majority of the dispersal habitat occurs primarily within units associated with thinning from below (HTH), mixed conifer thinning from below (MCGO and MC without openings), and Prescribed Burning. Some of the second growth ponderosa pine non-commercial thinning units (P), where trees are approximately 40+ years old, minimally meet the requirement for dispersal habitat and therefore dispersal is not typically contiguous in these units.

Very little to no dispersal habitat exists in the Dwarf Mistletoe Treatment units. The dwarf mistletoe units are associated with past ponderosa pine shelterwood harvest, containing a sparse overstory of individual large trees with a dense understory of regeneration approximately 20 to 40 years old. These stands are very open and overstory canopy is discontinuous and does not provide dispersal habitat.

Very little to no dispersal habitat exists within the Lodgepole Pine Improvement Treatment units. A mountain pine beetle outbreak impacted this area approximately 15 years ago and as a result stands are very fragmented and discontinuous.

The objective each type of thinning is to reduce stand densities by thinning from below to 1) increase stand resiliency to insects and disease, 2) reduce fuel loading as well as ladder fuels minimizing the risk of stand replacing fire and 3) promote the development of fire tolerant late and old structure stands.

Due to impacts to the majority of NRF and dispersal habitat from stand replacement fire across the Ranger District, thinning treatments were designed to maintain and promote overstory ponderosa pine. Ponderosa pine is the key building block of large tree structure that provides the basis for NRF and dispersal habitat. These trees take the longest to develop and recruit into the overstory. Due to overstocked stands fire intensity has been such that these once fire resilient trees succumb to crown fire and many old growth ponderosa pine stands, as well as residual old growth legacy trees, have been lost to stand replacement fire. Thinning from below (HTH) is designed to thin stands in a mosaic fashion retaining heterogeneity in dry mixed conifer and promoting heterogeneity in second growth ponderosa pine stands. Although HTH units would reduce stand densities to a level that canopy cover does not meet minimum requirements for dispersal habitat, treatments would maintain fully stocked stands and contiguous overstory crowns.

Mixed conifer thinning (both MCGO and MC without openings) would also thin stands from below. This treatment focuses on maintaining overstory ponderosa pine by removing white-fir and lodgepole pine that contain insects and disease. Treatments focus on removing ladder fuels in the understory of overstory ponderosa pine. To maintain a contiguous overstory stand larger overstory white-fir not directly competing with overstory ponderosa pine would be retained. However, to build stand resiliency, within mixed conifer treatments associated with group openings, where stands do not contain ponderosa pine, 1-3 acre group openings would be created and reforested with ponderosa pine. This would occur within 30% of this treatment type or on approximately 268 acres, reducing some overstory continuity.

Prescribed Burning Treatments (B) are designed for maintain late and old structure ponderosa pine stands. This treatment is not expected to reduce canopy cover but would reduce understory shrub densities, as well as sapling size conifer regeneration.

Treatments were designed to minimize the continued fragmentation of spotted owl dispersal habitat on the landscape in the long-term, and in the short-term to provide connectivity through the project area. The

largest blocks of contiguous dispersal habitat were retained throughout the project area. Treatments were designed around blocks of habitat to facilitate movement of owls through the project area.

Because there are no known or historic sites within the project area and the project area does not contain any suitable NRF habitat, the project would have ***No Effect*** to the northern spotted owl.

Physical and Biological Features/ Primary Constituent Elements of Critical Habitat

East Cascades Special Management Considerations/Protection

Special management considerations or protection may be required in the East Cascades to address the effects of past activities associated with Euro-American settlement, such as timber harvest, livestock grazing, fire suppression, and fire exclusion, that have substantially altered the Inland Northwest, modifying the patterns of vegetation and fuels and subsequent disturbance regimes to the degree that contemporary landscapes no longer function as they did historically. This has affected not only the existing forest and disturbance regimes, but the quality, amount, and distribution of spotted owl habitat on the landscape. In order to preserve the essential physical or biological features, dynamic, disturbance-prone forests should be managed in a way that promotes spotted owl conservation, responds to climate change, and restores dry forest ecological structure, composition, and processes including wildfire and other disturbances. The following restoration principles were considered during project design:

1. Conserve older stands that contain the conditions to support spotted owl occupancy or high value owl habitat
2. Emphasize vegetation management treatments outside spotted owl territories or highly suitable habitat
3. Design and implement restoration treatments at the landscape level
4. Retain and restore key structural components, including large and old trees, large snags, and downed logs
5. Retain and restore heterogeneity within stands
6. Retain and restore heterogeneity among stands
7. Manage roads to address fire risk
8. Consider vegetation management objectives when managing wildfires where appropriate

Approximately 3,731 acres of CHU Subunit ECN8 occur within the project area. Overall, the project encompasses approximately 4% of the total ECN 8 acres. Approximately, 2,343 acres of dispersal habitat occurs within the CHU area associated with the Melvin Butte project. Approximately 742 acres or 31% of dispersal/connectivity stands within the CHU associated with the Melvin project would be retained in untreated stands. No NRF habitat exists within the CHU. Table 83 provides a summary of effects to dispersal habitat in CHU ECN 8 overlapping the Melvin Butte project area. Table 84 provides a summary of dispersal habitat in the entire Melvin Butte project area.

Table 83: Summary of Effects to Dispersal Habitat in CHU ECN 8 overlapping the Melvin Butte Project Area.

Acres of CHU occurring Melvin Butte Project Area	% of Melvin Butte Project Area associated with total CHU Subunit ECN8	Acres of Dispersal Habitat within CHU in Melvin Butte Project Area	Acres of Dispersal Habitat retained within CHU in Melvin Butte Project Area Post Treatment	Acres of Dispersal Habitat reduced within CHU in Melvin Butte Project Area	% Dispersal Habitat within CHU in Melvin Butte Project Area Post Treatment
3,731 acres	4%	2,343 acres	742 acres	1,601 acres	31%

Table 84: Summary of Effects to Dispersal Habitat within the entire Melvin Butte Project Area.

Overall acres of Dispersal Habitat within Melvin Butte Project Area	Overall acres of Dispersal Habitat retained within total Melvin Butte Project Area Post Treatment	Overall acres of Dispersal Habitat reduced within total Melvin Butte Project Area	% Dispersal Habitat retained with the Melvin Butte Project Area Post Treatment
2,796 acres	914 acres	1,882 acres	33%

Treatments within critical habitat in the Melvin Butte project area were designed with the intent of following the East Cascade Special Management Considerations. All thinning from below (HTH), mixed conifer with and without group openings (MCGO), and prescribed burning (B) treatments were designed to meet all eight management considerations: **1) Conserve older stands that contain the conditions to support spotted owl occupancy or high value owl habitat**-There are no stands within the project area that support owl occupancy; site productivity within the project area is such that with fire exclusion, no highly suitable or high value habitat has developed over the last 100 years. The site productivity of the project area is low and will not support stand densities and condition associated with spotted owl occupancy or high quality habitat. The only habitat that exists is dispersal and untreated areas containing older stand characteristic will be retained to provide adequate dispersal for the spotted owl through the project area. **2) Emphasize vegetation management treatments outside spotted owl territories or highly suitable habitat -** No owl territories occur within or adjacent to the project area. The nearest viable owl territory is approximately 4 air miles and has not been occupied since 1994. **3) Design and implement restoration treatments at the landscape level -** The Melvin Butte project is part of Deschutes Collaborative Landscape Restoration (CFLR) process. This CFLR area covers approximately 208,028 acres of national Forest System lands and is associated with 5 other project areas covering 57,500 acres of NWFP lands including Melvin Butte. These projects are associated with spotted owl habitat. The Melvin Butte project connectivity strategy was developed to provide connectivity within the CFLRA. In the short-term (<30 years), the project will reduce the overall level of dispersal habitat. Although it will not create any movement barriers, it will not provide the needed levels of canopy cover to provide security for dispersing birds. In the long-term (30+ years), treatments will promote the development of more fire tolerant dispersal habitat developing contiguous stands of late and old structure habitat dominated by overstory ponderosa pine increasing resiliency. **4) Retain and restore key structural components, including large and old trees, large snags, and downed logs -** Thinning prescriptions retain late and old structure habitat where it exists including snags and down logs. **5) Retain and restore heterogeneity within the stands -** Mosaic thinning will occur within black bark ponderosa pine to promote heterogeneity and the development of late and old structure. **6) Retain and restore heterogeneity among stands -** Thinning from below in multi-story mixed conifer stands will retain stand heterogeneity by maintaining all the components of the residual age classes and fully stock stands post thinning; stands containing the largest contiguous blocks of dispersal habitat would be retained between treatment units to retain heterogeneity between stands **7) Manage roads to address fire risk -** To reduce risk of fire starts associated with public use approximately 8 miles of road is proposed to be closed under the proposed action reducing road densities in the project area from 5.98 miles/sq. mile to 4.66 miles/sq. mile. **8) Consider vegetation management objectives when managing wildfires where appropriate -** Due to fire severity across the Sisters Ranger District, wildfire use is not used for management except site specifically in the Wilderness.

The portion of ECN 8 associated with the Melvin Butte project is an important element of the subunit. This area provides a very narrow band of connectivity between unsuitable habitat associated with the highly fragmented Pole Creek fire northwest of the project area and private timber land directly adjacent and east of the project to the next largest block of suitable dispersal habitat directly south of the project area. This provides a narrow movement corridor between ECN 8 and ECN 9.

Overall, treatments would reduce dispersal habitat in the short-term (<30 years) reducing the overall dispersal habitat within Critical Habitat in the Melvin Project area while retaining approximately 31%. Treatments would not cause barriers to movement but would reduce canopy cover by approximately 50%. In the long-term (30+ years), treatments would promote the development of understory ponderosa pine creating a contiguous stand of fire resistant dispersal habitat within the project area.

In the short-term, the project would reduce the overall amount of dispersal habitat by 3% in the ECN-8 subunit.

Alternatives 2 and 3 ***may affect but are not likely to adversely effect*** designated Critical Habitat.

Cumulative Effects—Alternatives 2 and 3

The cumulative effects area for the action alternatives are the Whychus and Deep Canyon watersheds as they both overlap ECN 8. Both watersheds were utilized to best display the historic spotted owl occupancy on the landscape. The western half of both watersheds occurs within the range of the northern spotted owl. Approximately 122 acres of NRF habitat occurs in the eastern area of the Deep Canyon watershed, though there are no known spotted owl homes ranges or home ranges or detections in the Deep Canyon watershed. None of the proposed actions in the watersheds are anticipated to have an effect on spotted owl NRF habitat.

No home ranges occur in the Deep Canyon watershed. Table 85 lists the habitat conditions for each historic home range that occurs in the adjacent Whychus watershed. The Black Crater and Bluegrass Butte home ranges are considered viable.

Table 85: Spotted owl home ranges

Spotted Owl Home Range	Viability and Status	NRF Acres within 1.2 Mile Home Range	Existing Percent (%) NRF acres within 1.2 Mile Home Range	NRF Acres in ECN 8 within 1.2 Mile Home Range	Last year of Activity
Deep Canyon Watershed					
No home ranges occur in this watershed					
Whychus Watershed					
Snow Creek	Non-viable	37	1%	0	2010
Trout Creek	Potentially viable but inactive	553	19%	2,611	1993
Black Crater	Potentially viable but inactive	807	28%	1,197	2007
Bluegrass Butte	Potentially viable but inactive	249	9%	2,510	2007

Fires have had the greatest influence on spotted owl habitat across the Sisters Ranger District by causing reduction of canopy cover, loss of multi-storied stands, and mortality of understory white-fir and to a lesser degree the loss of large Douglas-fir and ponderosa pine prior to the fires. These open stands are unsuitable nesting habitat for spotted owls. Insect and disease outbreak in the Whychus and Deep Canyon watersheds along with the Pole Creek Fire have produced ample down wood to meet forest standards and guidelines for down wood in the LSR and Matrix land allocations. The watershed has experienced moderate to heavy mortality with the insect outbreak of the early 1990s.

The influx of snags would increase the amount of down wood in the next 20 years. In the mixed severity areas, trees that survived the Pole Creek Fire would be able to provide a more consistent supply of dead wood material. Within stand replacement fire areas much of the pre-existing downed wood was consumed. However, within the fire perimeter a percentage of the existing down woody material are trees that have fallen since the fire and most are hard logs in Decay Classes 1 and 2 (Thomas 1979, Brown 1985). Some downed material was consumed within the mixed mortality and underburned areas as well, especially where fire intensity was greater. This primarily consisted of smaller material (<12 inches dbh) and advanced decayed logs. Larger pre-existing material is still present although logs are now case-hardened in many situations, making them less suitable for prey species.

The last 100 years of fire suppression has changed stand composition across the Sisters Ranger District. Stand densities have increased as well as outbreaks of insects and disease, although both are endemic to the district. As a result of disturbance large tracks of mortality exist in stands across the district. Since 2002, no major fires have occurred within the Deep Canyon watershed until the 2012 Pole Creek fire where approximately 4,081 acres burned and the Two Bulls fire burned approximately 487 acres, totaling approximately 4,568 acres. Table 86 provides a summary of recent fire history in the Deep Canyon and Whychus watersheds since 2002.

Table 86: Recent Fire History in the Deep Canyon and Whychus Watersheds since 2002.

Fire	Year	Acres of National Forest Land
Deep Canyon Watershed		
Pole Creek	2012	4,568
Two Bulls	2014	487
Whychus Watershed		
Cache	2002	40
Black Crater	2006	5,147
Lake George	2006	1,857
GW	2007	186
Black Butte 2	2009	559
Rooster Rock	2010	1,362
Pole Creek	2012	22,512
	Whychus Total	**31663**

There are two ongoing timber salvage projects within the Whychus and Deep Canyon watersheds; the Pole Creek Fire Timber Salvage and Two Bulls Timber Salvage Projects. Approximately 54 acres of ongoing salvage logging is occurring within the Pole Creek Fire Timber Salvage project and approximately 250 acres of on going salvage logging is occurring within the Two Bulls Timber Salvage Project. These are ongoing projects that would and have removed fire killed trees reducing snag densities and snag habitat in the watersheds. The Two Bulls project does not occur within the range of the northern spotted owl and therefore does not impact habitat. Pole Creek Fire Timber Salvage Project does not propose to remove spotted owl NRF or dispersal habitat. The Pole Creek Fire Timber Salvage project occurs within ECN 8.

The Ursus Hazardous Fuels Reduction Project occurs in the Deep Canyon watershed. The project proposes to thin green stands of mixed conifer from below, removing over story lodgepole pine infected with dwarf mistletoe and salvage log dead lodgepole pine and white-fir. This project is approximately 5,900 acres and does not occur in spotted owl critical habitat. The project would remove between approximately 1,859-1,883 acres of dispersal habitat depending on the selected alternative. A determination was made that because the Ursus project has no indirect or direct to spotted owl NRF habitat or designated critical habitat there would be no cumulative effects to NRF or designated critical habitat as a result of the proposed actions under either alternative. The Ursus project may affect but would

not likely adversely affect the northern spotted owl due to the reduction of dispersal habitat in the project area, although this would not likely create a barrier to movement due to the juxtaposition of the project area with inventoried roadless areas as well as no treatment areas within the project boundary.

The Bend Municipal Watershed Fuels Reduction and the Bear Wallow Firewood Projects are within mixed conifer or lodgepole pine habitat types. Both projects occur within the Deep Canyon watershed. However, these projects do not occur within ECN 8. Only one project occurs within spotted owl Critical Habitat, the Bend Municipal Watershed Project, and it occurs in ECN 9. These areas are associated with high levels of bark beetle mortality in lodgepole pine stands. These project areas would directly remove snags to disrupt fuel continuity within these areas and therefore would reduce snag and log habitat. In addition, these projects would thin stands from below reducing stand densities. No suitable spotted owl NRF habitat would be removed as result of these projects. Overall, the projects would reduce fuel densities on approximately 910 acres. These projects are designed to reduce the risk of loss of existing habitat from future large-scale disturbances.

Personal use firewood cutting is occurring within the 3,029 acre Three Creek's Firewood Cutting Area. Individual dead trees are being removed for personal use firewood primarily within the road prism of open roads. Cutting is not wide spread and occurs on a site specific basis where individual trees are removed or small groups of dead trees. Only dead lodgepole pine and white-fir can be utilized for firewood.

The silvicultural treatments, including prescribed fire, associated with the Whychus and Deep Canyon watersheds would accelerate the development of large tree structure in mixed conifer which would provide positive benefits for owl habitat in the long-term (i.e., greater than 30 years post-implementation). Treatments would select and retain the healthiest and largest trees that would be the most resilient to the effects of fire. Within lodgepole pine stands, the focus would be to remove concentration of dead trees, and promote natural regeneration. Lodgepole pine treatments would not remove spotted owl habitat but would promote the development of fully stocked overstory stands. The intent of the treatment is to maximize the utility of green lodgepole pine stands for spotted owl dispersal during the 100 year rotation and before the next infestation of the mountain pine beetle. However, mixed conifer thinning from below would occur and would directly reduce dispersal habitat.

Conclusion—Alternatives 2 and 3

In conclusion, Alternatives 2 and 3 in the Melvin Butte project area would not impact NRF habitat; therefore there is ***No Effect*** to the spotted owl. Alternatives 2 or 3 would reduce approximately 1,882 acres of dispersal habitat, retaining 914 acres of the largest concentrated blocks of dispersal habitat; therefore the project ***May Affect but is Not Likely to Adversely Effect*** designated Critical Habitat. The project is consistent with the 2011 Revised Recovery Plan and the 2013 Critical Habitat Rule. The project is consistent with the Deschutes National Forest Plan standards and guidelines, as amended. A Letter of Concurrence was issued by the U.S. Fish and Wildlife Service on March 5, 2015.

Oregon Spotted Frog, Threatened

Measure: Effects to breeding, reproduction, and rearing habitat

Existing Condition

The Oregon spotted frog inhabits the margins of lakes, marshes, and pools in streams where there is an abundant growth of vegetation (Csuti et al. 2001). Literature cited in the Conservation Assessment (Cushman and Pearl, 2007) describes spotted frog breeding habitat as moderate to large wetlands with extensive emergent marsh coverage that warms substantially during seasons when Oregon spotted frogs

are active on the surface (February to May). Sites always include some permanent water juxtaposed to seasonally inundated habitat.

Conclusion

No habitat exists for the Oregon spotted frog within the Melvin Butte project area. No Oregon spotted frog Critical Habitat Exists within the Melvin Butte project area. There is ***No Effect*** to the Oregon spotted frog as a result of the Melvin Butte project. There is ***No Effect*** to Oregon spotted frog Critical Habitat as a result of the Melvin Butte project. No further analysis is required.

Sensitive Species

Table 87 lists 22 Regional Forester sensitive species known to occur or potentially occur on the Deschutes National Forest. Based on a review of records and habitat requirements, the following sensitive species have potential habitat in the project area and may be impacted by the proposed action: western bumblebee, Johnson's hairstreak, Townsend's big-eared bat, fringed myotis, pallid bat, wolverine, white-headed woodpecker, and Lewis' woodpecker.

Table 87: Regional Forester Sensitive Species occurring or potentially occurring on the Deschutes National Forest.

Regional Forester Sensitive Species				
INVERTEBRATES				
Species	Status	Habitat	Habitat /Presence in Project Area	Effect
Western bumblebee (*Bombus occidentalis*)	**Sensitive**	**Forest edges, gardens, near houses and urban areas**	**Existing habitat**	**May Impact**
Johnson's hairstreak (*Callophrys johnsoni*)	**Sensitive**	**Mixed forests with dwarf mistletoe**	**Existing habitat**	**May Impact**
Silver-bordered fritillary (*Boloria selene*)	Sensitive	Bogs and wet meadows	No habitat	No impact
Crater Lake tightcoil (*Pristiloma articum crateris*)	Sensitive	Perennial riparian areas	No habitat	No impact
Evening field slug (*Deroceras hesperium*)	Sensitive	Perennial wet meadows	No habitat	No impact
AMPHIBIANS				
Columbia spotted frog (*Rana luteiventris*)	Federal Proposed, Sensitive	Shallow lakes, ponds	No habitat	No impact
MAMMALS				
Townsend's big-eared bat (*Corynorhinus townsendii*)	Sensitive, MIS	Caves, mines, bridges, buildings, rock outcrops,	No habitat	No Impact
Fringed myotis (*Myotis thysanodes*)	**Sensitive**	**Caves, mines, bridges, buildings, rock outcrops, snags in conifer forests, desert**	**Existing habitat**	**May Impact**
Pallid bat (*Antrozous pallidus*)	**Sensitive**	**Caves, mines, bridges, buildings, rock outcrops, snags in conifer forests, desert**	**Existing habitat**	**May Impact**

Spotted bat (*Euderma maculatum*)	Sensitive	Cliffs, caves, rock outcrops in sagebrush/desert habitat	No habitat	No Impact
North American wolverine (*Gulo gulo luscus*)	**Sensitive, MIS**	**Mixed forests, High elevation**	**No denning habitat; low potential for dispersal habitat**	**No Effect**
Pacific fisher (Martes pennant)	Sensitive	Mixed conifer forests, high elevation	No habitat	No effect
BIRDS				
Lewis' woodpecker (*Melanerpes lewis*)	**Sensitive, MIS**	**Open ponderosa pine snags, burned areas**	**Existing habitat**	**May Impact**
White-headed woodpecker (*Picoides albolarvatus*)	**Sensitive, MIS**	**Large-diameter ponderosa pine snags**	**Existing habitat**	**May Impact**
American Peregrine Falcon (*Falco peregrinus anatum*)	Sensitive, MIS	Riparian, Cliffs	No habitat	No Impact
Bald eagle (*Haliaeetus leucocephalus*)	Sensitive, MIS	Lakes, snags	No habitat	No Impact
Greater sage grouse (*Centrocercus urophasianus)*	Sensitive	Sagebrush flats	No habitat	No Impact
Bufflehead (*Bucephala albeola*)	Sensitive	Lakes, snags	No habitat	No Impact
Northern waterthrush (*Seiurus noveboracensis)*	Sensitive	Riparian streambanks with dense willows	No habitat	No Impact
Harlequin duck (*Histrionicus histrionicus*)	Sensitive	Rapid streams, Large trees	No habitat	No Impact
Horned grebe (*Podiceps auritus*)	Sensitive	Lake	No habitat	No Impact
Tricolored blackbird (*Agelaius tricolor*)	Sensitive	Lakeside, bulrush (cattails)	No habitat	No Impact
Yellow Rail (*Coturnicops noveboracensis*)	Sensitive	Marsh	No habitat	No Impact
Tule greater white-fronted goose (*Anser albifrons*)	Sensitive	Nests on marshy ponds in the tundra; winters in open country	No habitat	No Impact

Rationale for Regional Forester Sensitive Species Not Analyzed in Detail

Silver-bordered fritillary

This butterfly ranges from Central Washington south along the Rocky Mountains to northern New Mexico and east to Illinois, Virginia and Maryland. They inhabit wet meadows, bogs, and marshes as well as forest openings in mountainous areas, and spring-fed meadows in dry prairies (NatureServe 2012). Two primary colonies exist in Oregon: one at Big Summit Prairie on the Ochoco National Forest and one in the Strawberry Mountains in the Malheur National Forest (Miller and Hammond 2007). Threats to this species include livestock overgrazing, wetland loss, and woody vegetation encroachment of willows and hawthorns from fire suppression (Miller and Hammond 2007). Adults lay eggs singly near host plants of the violet family including *Viola glabella* and *V. nephrophylla*. Caterpillars that develop from the eggs feed on these host plants and overwinter by hibernating, emerging as adults in the spring. Favored nectar

sources for adults are composite flowers including goldenrod and black-eyed susans. Adults fly May to July with a second generation flying from August into September. There are no proposed treatment activities in riparian habitat. Alternatives 2 or 3 would have ***No impact*** on the silver-bordered fritillary.

Crater Lake tightcoil

This snail can be found in suitable wet habitat on the undersides of woody debris, among wet mosses, rushes, and other low vegetation at the edges of wetlands, springs, seeps, and streams in perennially damp forest floor litter, especially where it has accumulated at the bases of shrubs and against logs (Duncan et al. 2003). Suitable wet habitat would be considered as almost exclusively very stable, perennially wet riparian edges around wetlands, springs, seeps, streams, and damp forest floor. Areas that are temporarily wet habitat such as stream borders that may change location (up and down the stream bank) or are seasonally underwater or dry, are not suitable habitat for this species. Only areas with constant water levels that create perennially saturated habitat year-round are suitable and may be occupied. There are no proposed treatment activities in riparian habitat. Alternatives 2 or 3 would have N***o Impact*** on the Crater Lake tightcoil.

Evening fieldslug

According to Duncan (2005), the evening fieldslug is associated with perennially wet meadows in forested habitats. Microsites include a variety of low vegetation, litter, and debris; rocks may also be used as refugia. This species appears to have high moisture requirements and is almost always found in or near herbaceous vegetation at the interface between soil and water, or under litter and other cover in wet situations where the soil and vegetation remain constantly saturated. Typical landscape features that may provide constant moisture conditions include springs and seeps, as well as wetlands in depressions and around perennial ponds. There are no proposed treatment activities in wet meadows, springs, or seeps. Alternatives 2 or 3 would have ***No Impact*** on the evening fieldslug.

Columbia spotted frog

Columbia spotted frogs inhabit the margins of lakes, marshes, and pools in streams where there is an abundant growth of vegetation (Csuti et al. 2001). There are no proposed treatment activities in standing water, streams (intermittent or perennial) or riparian areas. This species is not known to occur on the Sisters Ranger District. Alternatives 2 or 3 would have ***No Impact*** on the Columbia spotted frog.

Townsend's big-eared bat

The Townsend's big-eared bat is a Regional Forester Sensitive Species and a Forest Plan Management Indicator Species. The following information is summarized from the 2012 Forest-wide habitat assessment for the Townsend's big-eared bat (USDA Forest Service 2012a). This species is dependent on cave or cave-like structures (buildings) year-round in mixed conifer forests, deserts, and agricultural areas. Foraging associations include edge habitats along streams and in forested habitats, particularly in sagebrush steppe and open ponderosa pine stands. There are no known caves in the project area. They are known to occur in a cave during fall and winter several miles north of the project area. They are assumed to seasonally migrate from the cave north of the project area to caves or cave-like structures in lower elevations during spring and summer. They were documented roosting in forested lava flows on the Deschutes National Forest during spring migration (Dobkins 1995). It is considered stable or slightly decreasing on the Deschutes National Forest (USDA Forest Service 2012a). The project are does not contain caves or cave like structures/rock outcrops that provide roosting habitat that would promote dispersal. Alternative 2 or 3 would have ***No Impact*** on the Townsend's big-eared bat.

Spotted bat

The spotted bat is mostly found in desert and canyon habitats. They roost in caves, mines, rock outcrops, and especially crevices in tall vertical cliffs. Roosts are usually near a source of water, but this does not appear to be a main requirement for roosting locations. Winter hibernation sites are poorly known. NatureServe (2012) considers the spotted bat to be widespread in western North America with sparse populations but it may be more common than formerly believed. Abundance, population trends, and threats are largely unknown. This species has not been documented on the Deschutes National Forest but has been detected adjacent to the Deschutes National Forest at Lake Billy Chinook east of the Sisters Ranger District and in Dry River Canyon near Highway 20 north of the Bend-Ft. Rock Ranger District. Potential habitat exists on the eastern fringe of the Deschutes National Forest but not in the project area. Alternatives 2 or 3 would have ***No Impact*** on the Pallid bat.

American peregrine falcon

In Oregon, the peregrine falcon nests on cliffs ranging in height from a 75-foot escarpment at a reclaimed quarry to monolithic 1,500-foot high cliffs, as well as structural features of bridges (Joel E. Pagel *in* Marshall et al. 2006). There are no high escarpments, cliffs, or tall bridges in the project area. Alternatives 2 or 3 would have ***No Impact*** on the peregrine falcon.

Bald eagle

Suitable habitat for the bald eagle is characterized by the presence of large (mature) trees generally >32 inches dbh. Ponderosa pine and Douglas fir trees with large open limb structures are preferred for nesting on the Deschutes National Forest. Other habitat attributes are the availability of prey, usually within one mile of their nesting territory, and a large water body. Reproductive or foraging habitat for the bald eagle does not occur in the project area. The closest known nest site is six miles from the project area. Alternatives 2 or 3 would have ***No Impact*** on the bald eagle.

Greater sage grouse

The greater sage grouse is 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 (palatable sagebrush) is probably the most limited seasonal habitat in some areas (NatureServe 2012). Sagebrush habitat in or adjacent to the project area does not exist. Alternatives 2 or 3 would have ***No Impact*** on greater sage grouse.

Bufflehead

The bufflehead typically nests at high-elevation forested lakes in Central Oregon, using cavities or artificial nest boxes in trees close to water, with most nests within 75 feet of water, but sometimes as far as 650 feet away (Marshall et al. 2003). The birds nest in natural cavities or abandoned northern flicker holes in mixed coniferous-deciduous woodlands near lakes and ponds. There are no lakes or ponds in the project area. Alternatives 2 or 3 would have ***No Impact*** on the bufflehead.

Northern waterthrush

The northern waterthrush inhabits riparian habitat, often with willow and alder (NatureServe 2012). There are no proposed treatment activities in stream or riparian habitat. Alternatives 2 or 3 would have ***No Impact*** on the northern waterthrush.

Harlequin duck

The harlequin duck nests along fast-moving rivers and mountain streams on rocky islands or banks. It requires relatively undisturbed, low gradient, meandering mountain streams with dense shrubby riparian

areas (greater than 50% streamside shrub cover), and woody debris for nesting and brood rearing; also needs mid-stream boulders or log jams and overhanging vegetation for cover and loafing; indicator of high water quality (Spahr et al. 1991). There are no proposed treatment activities in stream habitat or riparian in the project area. Alternatives 2 or 3 would have ***No Impact*** on the harlequin duck.

Horned grebe

The horned grebe is a rare breeder east of the Cascades and favor semi-permanent ponds (Marshall et al. 2003). They nest among tall vegetation in shallow water on small and large lakes and ponds (approximately ¼ acre or larger), in calm waters of marshes, along rivers and streams. The highest breeding densities occur in pothole marshes of aspen woodlands. Outside the breeding season, horned grebes are found on bays, estuaries and seacoasts, and in migration commonly in inland freshwater habitats, especially lakes and rivers (NatureServe 2012). There are no proposed treatment activities in stream or riparian habitat in the project area. Alternatives 2 or 3 would have ***No Impact*** on the horned grebe.

Tricolored blackbird

In Oregon, this species is restricted to breeding in southern Oregon and prefers to breed in freshwater marshes with emergent vegetation (cattails) or in thickets of willows or other shrubs (Csuti et al. 2001). In migration and winter they are found in open cultivated lands and pastures (NatureServe 2012). There are no marshes with emergent vegetation in the project area. There are no proposed treatment activities in marshes with cattails and tules Alternatives 2 or 3 would have ***No impact*** to the tri-colored blackbird.

Yellow rail

The nesting habitat of the yellow rail in southcentral Oregon was described as marshes or wet meadows with an abundance of thin-leaved sedges, a layer of senescent (old) vegetation to conceal their nests, and water depths of 0.5 to 5 cm (Popper and Stern 2000). There are no proposed activities in wet meadows or riparian areas. Alternatives 2 or 3 would have ***No Impact*** to the yellow rail.

Tulewhite-fronted goose

Tule greater white-fronted geese use Oregon as a stop-over location during migration. They prefer marshes and feed more in lower elevation wetland habitat and less in agriculture fields (NatureServe 2012). There are no proposed treatment activities in marshes or tules. Alternatives 2 or 3 would have ***No Impact*** to the tule greater white-fronted goose.

Western Bumblebee

Measure: Impacts to flowering plants, Nest sites, and hibernation sites

The western bumblebee was once widespread and common throughout the western United States and western Canada before 1998. Since 1998, populations of this bumblebee species have declined drastically throughout parts of its former range. Populations in central California, Oregon, Washington, and southern British Columbia have mostly disappeared. NatureServe (2012) reported this species has declined about 70-100% since the late 1990s in many places, especially from British Columbia to California. Other recent observations in Oregon were documented in Wallowa County in 2008 and near Mt. Hood in 2009 (NatureServe 2012). Observations associated with the Deschutes National Forest have been as recent as 2014 within meadows in the areas of Sunriver, Sparks Lake, Todd Lake, Green Lakes, and Canyon Creek Meadow (on the Sisters Ranger District).

Habitat alterations including those that could destroy, fragment, alter, degrade or reduce the food supply produced by flowers, as well as destruction of nest sites and hibernation sites for overwintering queens, such as abandoned rodent burrows and bird nests, adversely affect these bees. Agriculture and urban

development alter landscapes and habitat required by bumblebees. The size of bumblebee populations diminish and inbreeding becomes more common as habitats become fragmented. This in turn decreases the genetic diversity and increases the risk of population decline (NatureServe 2012).

When exotic plants invade and dominate native grasslands, they may threaten bumblebees by competing with the native nectar and pollen plants relied upon by bumblebees. A small invasive parasite of the honeybee, the small hive beetle (*Aethina tumida*), can also infest bumblebee colonies. Although it has not been well studied it could severely impact bumblebee colonies. The invasion of exotic plants and insects should be restricted as much as possible by reducing the rate of introduction of new species and by controlling populations of invasive species (NatureServe 2012).

This species has been observed on the Sisters Ranger District but there is currently no district or Forest data to determine acres of suitable habitat. Since there are flowering plants within the project area it is assumed that it may potentially provide western bumblebee habitat. Flowering shrubs exist in the project area exist in the form of manzanita and ceanothus. Manzanita primarily occurs within the lower elevation ponderosa pine community, whereas ceanothus is highly associated with Pole Creek Fire in the western edge of the project area. Habitat for nest sites and hibernation sites are also likely available within the project area.

Alternative 1 – (No Action) Ecological Trend

The No Action alternative would result in no immediate impact to western bumblebees since no vegetation management actions would occur to reduce flowering plant populations or alter or destroy nest and hibernation sites. Potentially suitable habitat would be maintained based on the wide spread presence of ceanothus and manzanita across the ponderosa pine community and western edge of the project area.

Alternatives 2 and 3 - Direct and Indirect Impacts

The selection of either action alternative would result in the temporary crushing of flowering plants (after project completion, flowering plants, especially the dominant forbs are expected to recover) and potential destruction of nest/hibernation burrows by large machinery. On average, approximately 20% of the project area is not proposed for treatment providing and flowering shrubs and other plants for bumblebees. Retention would maintain the presence of undisturbed ground and flowering plants widely distributed across the entire 5,375 acre project area.

The project proposes to treat approximately 4,437 acres. Based on the proposed silviculture and fuels treatments approximately 60%-61% (3,231-3,295 acres) could temporarily reduce flowering plants across the forested acres of the project area. In Alternative 2 approximately 0.8 miles of temporary roads would be constructed removing all flowering shrub and forb habitat within the road prism. However, both alternatives propose to close approximately 6 miles of road and decommission approximately 8 miles of road. These actions could potentially promote additional acres of flowering plants and shrubs. Alternative 2 would have the greatest impact because of the larger treatment footprint creating a higher potential of destructing nest/hibernation burrows and the greatest potential loss of a food source by crushing vegetation during harvest treatments. Fuels treatment such as mastication and burning have a high potential of direct mortality of bee individuals due to treatment most likely occurring in the spring when plants are flowering. This alternative presents the greatest potential of crushing or disturbing a nest or hibernation site. In the long term, however, reduced canopy cover and prescribed burning is expected to increase the abundance of flowering plants and be beneficial to the Western bumblebee.

Alternative 3 disturbs less acreage (3,231 acres (60% of the forested acres)) than Alternative 2.

Alternative 3 has the smallest treatment footprint within the forested acres, would have a lower potential

to destroy nest/hibernation burrows, the least potential loss of the bumblebees food source by crushing vegetation during harvest activities and mowing and loss during prescribed fire, and a decreased potential of direct mortality to individual bees.

Impacts are expected to be short-term as the potential to destroy a nest/hibernation burrow would diminish after project activities are complete and flowering shrubs and other flowering plants affected by burning and activity fuels treatment regrow within a 5-10 year period to pre-disturbance conditions.

Alternatives 2 and 3 - Cumulative Impacts

For this species, cumulative effects were bounded by the Deep Canyon watershed based on the limited scale of the proposed actions in relation to the size of the watersheds, the availability of habitat outside of regulated timber harvest and mechanized use (e.g. Wilderness and inventoried roadless areas), and the general lack of flowering shrubs and forbs within the project area. Past actions were considered in the existing condition of habitat and the cumulative effects of ongoing and reasonably foreseeable actions taken into account.

Two large wildfires have occurred within or partially within the Deep Canyon watershed –the Pole Creek and the Two Bulls Fires. Approximately 54 acres of the Pole Creek Salvage are ongoing and approximately 250 acre is being salvaged in association with the Two Bulls Fire. Danger tree removal occurred on these fires to varying degrees. Impacts to rodent burrows used by the Western bumblebee for nesting and overwintering could occur from these project. There are no additive impact to species habitat as a result of these projects.

There would be additive impacts from the Ursus Hazardous Fuels Reduction Project. The project is approximately 5,900 acres in size and is associated with approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to break up the fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project would impact approximately 68% to 69% of the forest habitat that has the potential to provide habitat. Thinning and fuels reduction efforts under both project proposals would impact potential bumblebee habitat in the short term by reduction in flowering shrubs and possible collapse of rodent burrows due to the use of machinery. In total, between the two action alternatives, approximately 4,050 – 4,111acres of the Ursus project could impact bumblebee habitat within the Deep Canyon watershed.

The Bend Municipal Watershed Fuels Reduction and the Bear Wallow Fire Wood Projects are primarily associated with montane mixed conifer habitat and lodgepole pine, totaling approximately 910 acres. Both projects affect bumblebee habitat within 150 feet on either side of roads scheduled for treatment. Since these projects focus on the removal of dead trees they would have limited impacts to bumblebee habitat and the majority of the impacts would be short term by crushing of flowing plants and shrubs as a result of removing standing dead and down snags and logs. The proposed actions under Melvin Butte would not have additive effects.

Determination

Alternative 2 would have the greatest potential to impact western bumblebees because of the larger acreage of forested habitat that would be treated by harvest and fuels activities, creating a higher potential to destroy nest/hibernation burrows and reducing the amount of food source available by crushing plants during harvest treatments and mastication of fuels. Alternative 3 would have the least impact. However, 20% of the project area (including harvest and fuels activities and depending upon the alternative chosen) would remain unchanged, including a majority of the Deep Canyon watershed retained in roadless and

Wilderness areas. It is assumed species presence would still be maintained with either of these alternatives. Based on these assumptions, the Melvin Butte project ***May impact individuals or habitat, but would not likely contribute to a trend toward federal listing for the western bumblebee***.

Fringed myotis and Pallid bat

Measure: Roosting and foraging habitat impacted

Existing Condition

The Northwest Forest Plan calls for retaining snags, decadent trees, and green tree recruitment for roosting bats in Matrix and Adaptive Management Areas (Page B-7, Stand Management):

"Adequate numbers of large snags and green trees are especially critical for bats because these trees are used for maternity roosts, temporary night roosts, day roosts, and hibernacula. These should be well distributed throughout the matrix because bats compete with primary excavators and other species that use cavities. Day and night roosts are often located at different sites, and migrating bats may roost under bark in small groups. Thermal stability within a roost site is important for bats, and large snags and green trees provide that stability. Individual bat colonies may use several roosts during a season as temperature and weather conditions change. Large, down logs with loose bark may also be used by some bats for roosting."

Snag densities are poorly known for most species of bats but some research indicates that snag density requirements may be higher than those needed for woodpeckers (Lacki et al. 2008). Bats frequently switch roosts to escape predation and avoid parasites (Lewis 1995, Barclay and Kurta 2007).

Two sensitive bat species have potential habitat in the project area.

Fringed Myotis

The following information is summarized from the Western Bat Working Group Species Account for the Fringed myotis (Western Bat Working Group 2005a).

The fringed myotis is a small bat distributed patchily throughout the west. It occurs at 3,900 to 6,900 feet and is most common in drier woodlands (oak, pinyon-juniper, ponderosa pine) but can also be found in desert scrub, mesic coniferous forest, grassland, and sage-grass steppe. It roosts in large decadent trees and snags, crevices in buildings, underground mines and caves, rocks, cliff faces, and bridges. It is likely that structural characteristics (e.g. height, decay stage) rather than tree species play a greater role in selection of a snag or tree as a roost. The two most commonly reported orders in its diet are beetles and moths. This species is adapted for foraging within the forest interior and along forest edges.

Threats include loss or modification of roosting snag habitat, closure or renewed activity at abandoned mines, recreational caving and mine exploration, replacement of buildings and bridges with non- bat friendly structures, loss of clean, open water, and loss of prey species due to pesticides/chemicals.

No winter records of this species in caves on the Deschutes National Forest have been documented. One record during summer surveys with the use of mist-nets was documented at the south end of the Bend-Ft. Rock Ranger District in 1992. Summer surveys have not occurred on the Sisters Ranger District. This species potentially occurs in snags in the project area.

Pallid Bat

Pallid bats day and night roosts include crevices in rocky outcrops and cliffs, caves, mines, trees (*e.g.*, basal hollows of coast redwoods and giant sequoias, bole cavities of oaks, exfoliating ponderosa pine and

valley oak bark, deciduous trees in riparian areas, and fruit trees in orchards), and various human structures such as bridges, barns, porches, bat boxes, and human-occupied, as well as, vacant buildings (Western Bat Working Group 2005b). Roosts generally have unobstructed entrances/exits, and are high above the ground, warm, and inaccessible to terrestrial predators (Western Bat Working Group 2005b). Although year-to-year and night-to-night roost reuse is common, they may switch day roosts on a daily (1 to 13 days) and seasonal basis (Western Bat Working Group 2005b).

Recent research in northern California in the Plumas National Forest showed that pallid bats used cavities in large diameter trees and snags (>21 inches dbh) in mixed coniferous forests at elevations greater than 3,800 feet (Baker et al. 2008). The diet of pallid bats is varied including such insect taxa as beetles, centipedes, crickets, moths, scorpions, and termites. The pallid bat has only been documented once on the Deschutes National Forest on the Sisters Ranger District. The documentation was within low elevation late and old Structure ponderosa pine habitat. The majority of documented species have occurred on adjacent Bureau of Land Management lands in the southeastern corner of the Bend-Ft. Rock Ranger District.

Snag Habitat and Snags Associated with Post Fire Habitats

Bats use of trees and snags includes cavities in hollow trees, cracks or crevices in trees or snags, or behind exfoliating (sloughing) bark. They may be less likely to use heavily charred/sooty fire-killed trees if a sufficient number of roost trees are available in the surrounding area. The 2012 Pole Creek fire that is within and adjacent to the Melvin Butte project likely removed some roost habitat while creating additional roost habitat.

A small portion of the project area (approximately 642 acres) is associated with the Pole Creek Fire along the western edge of Forest Road 16. Burn severity is variable along the road ranging from a light underburn to stand replacement fire. Little is known about the roosting ecology of bats and their prey in burned forests. Limited research has focused on short-term bat foraging activity in burned areas with varying types of severity (Hayes 2009, Buchalski et al. 2013). In general, low intensity wildfires and prescribed fire create relatively few snags (Horton and Mannan 1988) and many are small diameter, which are of less use for most roosting bat species which usually prefer large-diameter (>21 inches dbh) roost trees (Barclay and Kurta 2006). For species that avoid foraging in dense forests, bat activity may increase in post-fire areas due to increased insect productivity and more open foraging conditions at least for the first year after the fire (Buchalski et al. 2013). During this one year post-fire study, Buchalski et al. (2013) show that bat activity was either neutral or positive regardless of the intensity of the fire.

Lacki et al. (2012) monitored 301 roost snags of long-legged myotis in Oregon, Washington, and Idaho. This is one of the most common bat species occurring on the Deschutes National Forest. Overall, persistence rates declined with increasing roost-years across study areas. Roost snags in Washington showed a lower persistence rate 1 year post-discovery than did roost snags in Oregon and Idaho. Estimates of the percentage of snags still standing 10 years post-discovery were highest for ponderosa pine (6.8%), slightly less for Douglas-fir (5.3%), and lowest for grand fir (0.9%). They found half-lives of roost snags to be <3 roost-years, much shorter than other published values for half-lives of snags of multiple species of conifers (Russell et al. 2006, Angers et al. 2010), and the overall average of roost snag persistence 10 years post-discovery across snag species was 4.3%. Replenishment of snags suitable for long-legged myotis on an annual basis is likely needed to ensure adequate habitat of this bat species, especially given the frequency of roost switching within years shown by many bats (Lewis 1995, Barclay and Kurta 2007) and the short-term reuse of tree roosts among years.

Large trees and snags would be retained in all treatment areas. Thinning from below would reduce dense forest patches but improve foraging conditions for bats at least in the short-term, particularly where viable roosting habitats occur within close proximity to water.

The project area provides suitable naturally occurring and post fire snag habitat for Pallid Bat and Fringed Myotis.

Alternative 1 – No Action (Ecological Trend)

Under the No Action Alternative no treatments would occur within Melvin Butte project area. Development of future old growth within second growth ponderosa pine and mixed conifer stands would be prolonged and the existing old trees within stands would continue to be stressed, decreasing their longevity. However, stands would continue to provide habitat in the short-term. In the long-term, in the absence of a stand replacement fire or an insect outbreak, stands containing disease would continue to die and the multi-storied structure would diminish along with any remnant old growth trees. As a result, snags would be recruited for roosting, but overstory canopy would diminish, changing the stand structure bats depend on for foraging. Due to stand densities within the project area and increases in mortality overtime, the risk of large scale stand replacement fire across the Melvin Butte project area increases over time, potentially impacting bat habitat.

Overall, high stand densities would result in a decrease in tree vigor among all size classes. The most significant effect of high stand densities would be lack of canopy closure and the loss of the existing historic large-tree component which is likely to occur at a much higher rate than if stand densities were reduced to more sustainable levels. Suitable forested habitat for these species consist of late and old structure forests with low densities of large snags. This forest type provides ample canopy closure under which bats can forage on insects, additionally providing large snags with sloughing bark that provide high quality day roosting habitat. In the short-term higher densities of snags would exist with little canopy closure rather than slowly recruiting larger snags overtime that provide better roosting habitat for both the Pallid and Fringed Myotis bat species. In the long-term the area would lack large tree structure and suitable day roost sites for these species.

Alternative 2 and 3 - Direct and Indirect Effects

Thinning From Below (HTH), Mixed Conifer Thinning with Group Openings (MCGO), Mixed Conifer Thinning without Group Openings (MC-without openings), Non-commercial Thinning (P), Prescribed Burning (B) and Scenic Views Enhancement.

Commercial thinning (HTH) and Mixed Conifer Thinning with and without group openings (MCGO and MC - without openings) would consist of primarily thinning from below removing trees >8”dbh. Treatments would focus on maintaining the overstory trees in pure ponderosa pine and mixed conifer stands providing overstory large tree structure. Treatments would retain and promote the development of overstory ponderosa pine by reducing site competition. Within mixed conifer treatments these stands are dominated by small trees and would focus on reducing stand densities primarily removing second growth lodgepole pine and white-fir, favoring healthy white-fir and ponderosa pine. This treatment would result in the accelerated growth of residual trees while reducing the fire hazard. Long-term beneficial impacts of small tree thinning would be the reduction of habitat fragmentation by promoting the development of LOS habitat which include large snags at an accelerated rate. Short-term beneficial impacts would be seen in the reduction of risk to existing suitable habitat. This treatment would beneficial to the Pallid and Fringed Myotis bats by creating large snags over the long-term that may be utilized as day roost habitat. Prescribed burning would occur as a follow up treatment. Some large tree mortality is likely to occur from prescribed burning, creating some roosting habitat in the short-term. However, it is likely that there would be an incidental loss of large snags as result of prescribed burning reducing some existing roosting habitat on a site specific basis.

Non-commercial thinning (P) would occur within ponderosa pine plantations that are approximately 20 to 40 years old. Treatments would consist of removing material primarily <8”dbh and occasionally up to

12" dbh material. These plantations do not currently provide high quality habitat for the Pallid and Fringed Myotis bats. In the long-term, thinning would reduce stand densities promoting the development of LOS ponderosa pine, recruiting large snags, and creating more highly suitable day roost and foraging habitat in these areas.

The Scenic Views Enhancement Treatment was developed to meet the scenic views objectives for the Forest Road 16 corridor. Treatments would remove small (<8 in. dbh) dense patches of fire killed trees to enhance the visual quality of Foreground areas. Treatment would retain all live trees and large snags to benefit scenic quality and maintain existing habitat. Treatments would not reduce roosting or foraging habitat.

The objective of prescribed fire is to reduce fuel loading to create a continuous mosaic of burned and unburned habitat. Treatments may unintentionally burn existing snags; however new snags could also be recruited through this process. Mortality of snags in ponderosa pine habitat during prescribed fire treatments in Arizona and California ranged from 20% (Randall-Parker and Miller 2002), 45% (Horton and Mannan 1988), and 56% (Bagne et al. 2008). All three studies found that larger diameter ponderosa pine trees were least likely to die, at least in the short-term. Horton and Mannan (1988) found a 20-fold increase in abundance of snags < 15 cm dbh. Several studies showed that the highest snag losses were in areas where a long period of fire exclusion had occurred (Bagne et al. 1988, Holden et al. 2006). Bagne et al. (2008) and Horton and Mannan (1988) found that re-entry burns had a much lower mortality rate for snags, presumably because the trees that did not burn during the first entry were more resilient. Loss of snags from prescribed fire was partially mitigated by the creation of new snags (Horton and Mannan 1988, Bagne et al. 2008).

Table 88 summarizes the amount of habitat associated with treatments under each action alternative for the Melvin Butte project.

Table 88: Total acres of habitat associated with each treatment type by alternative.

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
B	253	253
HTH	310	336
MC – No Group Opening	-	36
LPI	27	27
MCGO	36	-
P	493	493
Scenic Views Enhancement	41	41
Total Acres.	**1,160**	**1,186**

Overall, approximately 1,160 acres of habitat are associated with treatments identified under Alternative 2 and approximately 1,186 acres under Alternative 3. Alternative 2 is the most proactive on the landscape and provides the best opportunities to address fuel continuity while maintaining large tree habitat.

Overall, implementation of the action alternatives would maintain existing habitat conditions for the Palid and Fringed Myotis bats by maintaining and enhancing the development of large tree structure across the project area. Treatments reduce the risk of losing existing roosting and foraging habitat to stand replacement fire. Under Alternative 2, through thinning, small openings would be created by removing white-fir that are succumbing to insects and disease. Trees removed on average are approximately 14 inches dbh and would not likely provide roosting habitat. However, this treatment would create small openings among fully stocked forest stand canopies and could enhance foraging opportunities. Treatments would not preclude use of the project area by these species and would increase as contiguous stands of LOS habitat develops across the project area over the long-term (>30 years). These changes would result in more sustainable habitat conditions across the landscape and move habitat conditions closer to

historical conditions. Fire suppression has created denser conditions than historically occurred which have resulted in a decline in large tree open stand structures on the landscape.

The project area and habitat varies greatly from north to south due to the increase in elevation, the rain gradient associated with the change in elevation, and the site potential associated with the inherent soil quality within this north to south pattern. To capture the importance of habitat variation across the project area, the project area was broken up into 3 areas containing high, medium and low site potential based on inherent soil quality. The retention strategy identified a range of retentions levels across the project area. Within stands containing low site productivity, untreated stands would be retained at a 10% level; in the areas with moderate site productivity dispersal untreated stands would be retained at a15% level; and in areas that have the highest site productivity dispersal untreated stands would be retained at the 20% level. Retention would occur on a stand by stand basis to retain areas that contain the highest densities of contiguous habitat with a stand average of a minimum of 11 inches dbh and exceeding 40% canopy closure. These untreated areas were identified to maintain habitat connectivity between thinned stands associated with project treatments.

Overall the action alternatives do not propose to remove any large snag habitat. However, due to prescribed burning in old growth ponderosa pine stands and thinning from below in multi-storied stands (B, HTH, MC, and MCGO) there is the potential for loss of some large snags (snags may also be felled as OSHA safety hazards) that provide roosting habitat on approximatley 599 acres under Alternative 2 and approximately 589 acres under Alternative 3.

See snag analysis for complete summary of impacts to snag habitat.

Alternative 2 and Alternative 3 – Cumulative Impacts

Activities identified in Table 14 and the wildlife report were reviewed to assess whether in combination with the likely impacts of the Melvin Butte project there would be any cumulative impacts to the Pallid and Fringed Myotis bat roosting and foraging habitat. The Deep Canyon and Whychus Watersheds are used as the scale for analysis for these species. The potential cumulative impacts are discussed below.

Two large wildfires have occurred within or partially within the Deep Canyon and Whychus watersheds – Pole Creek and the Two Bulls Fire. Approximately 54 acres of the Pole Creek Salvage are ongoing and approximately 250 acres are being salvaged in association with the Two Bulls Fire. Danger tree removal occurred on these fires resulting in a reduction of potential roost sites in stand replacement areas along main roads.

The Ursus Hazardous Fuels Reduction, the Bend Municipal Watershed Fuels Reduction, and the Bear Wallow Firewood Projects have occurred or may occur in suitable habitat. These projects focus primarily on removing dead lodgepole pine within green stands to reduce fuel loading; some of the activities are also associated with mixed conifer habitat. Overall, treatments would reduce the risk of loss of existing habitat from future large-scale disturbances. There are approximately 21,507 acres associated with these projects within the Deep Canyon watershed.

Overall, implementation of the Melvin Butte action alternatives as well as other projects within the watersheds should result in improved habitat conditions for those species dependent on open canopy forest habitats which could lead to increased populations in the long term. Cumulatively, there would be a decrease in dense understory habitat; these changes would result in more sustainable habitat conditions across the landscape and move habitat conditions closer to historical conditions.

Although treatments would thin stands that are currently suitable roosting and foraging habitat the project does not propose to remove large snags that provide roosting habitat. The Melvin Butte project would

have minimal impacts to roosting and foraging within the Watershed or on the Deschutes National Forest for the Pallid and Fringed Myotis bats.

These projects are not expected to result in cumulative effects in combination with the Melvin Butte project and they would not have no impact on the Pallid and Fringed myotis habitat. No short or long-term bat population decrease would occur; therefore, additive cumulative impact are not anticipated.

Determination

Cumulatively, with the ongoing forest management projects within the Deep Canyon and Whychus watersheds, the Melvin Butte project does not propose to remove large snags within the mixed conifer and ponderosa pine habitat types except those posing hazards to operations under OSHA guidelines and snags lost incidentally to prescribe fire operations. Implementation of the project would not have measurable impacts to Pallid or Fringed Myotis bat habitat.

Based on these assumptions, the Melvin Butte project ***May impact individuals or habitat, but would not likely contribute to a trend toward federal listing for the Pallid and Fringed Myotis bats.***

Pacific Fisher Region 6 Sensitive

Measure: Effects to denning habitat and dispersal habitat

Existing Condition

The Pacific fisher primarily uses mature, closed-canopy coniferous forests with some deciduous component, frequently along riparian corridors (Csuti et al. 2001). In Ruggiero et al. (1994), it is suggested fishers prefer closed-canopy (greater than 60%), late-successional forests with large physical structures (live trees, snags, and logs), especially if associated with riparian areas. A 2004 Species Assessment by the US Fish and Wildlife Service documents key aspects of fisher habitat as those associated with late-successional forests (i.e. high canopy closure, large trees and snags, large logs, hardwoods, and multiple canopy layers). Distribution of fishers is limited by elevation and snow depth (Krohn et al. 1997); deep snowpack is largely avoided by fishers (Olson et al. 2014). Fishers generally avoid areas of high human disturbance, primarily high road density or recreational developments. Fishers are fairly large, weighing 3 to 13 lbs and 29 to 47 inches long. This may suggest a need of larger log sizes for dens than other animals with similar needs (e.g. marten). In southwest Oregon Aubry and Raley (2006) found fishers were denning and resting at 4,000 feet elevation, more than 80% canopy closure, and more than 16 snags and 67 logs at least 20” DBH per acre supporting the suggestion that this species utilizes large to very large structure. Denning and resting sites were also observed in large live trees (mostly Douglas-fir) with mistletoe brooms, limb clumping, rodent nests, or some other deformity. Fishers have been shown to avoid dry habitat types, which are frequently dominated by ponderosa and lodgepole pine; they are associated with montane mixed conifer and riparian habitat (Olson et al 2014). They also found fishers were preying upon woodpeckers, jays, grouse, quail, squirrels, hare, porcupine, and skunks. Most of these prey species can be found in the watershed.

The Melvin Butte project area is moderate to low elevation. The mixed conifer plant association associated with the project is dominated by ponderosa pine, white-fir, and lodgepole pine. No Douglas-fir exists within the project area. The project area contains two developed snow parks and receives intensive recreation use in the winter months; snowmobile routes and Nordic routes exist within the project area.

Carnivore monitoring was conducted within the project area and within the watershed from 2012 to 2014 (McFadden and Hiller 2014). Monitoring was completed in conjunction with the Oregon Department of Fish and Wildlife. No Fishers were identified using the project area or the watershed as a result of the

monitoring. Ongoing carnivore monitoring is occurring in the watershed; to date there has been no fisher detections.

Conclusion

There is no habitat for this species in the Melvin Butte project area, therefore there is ***No Effect*** to the fisher or its habitat. No further analysis is required.

North American Wolverine

Measure: Effects to denning habitat

Existing Condition

The wolverine is a Regional Forester Sensitive Species and a Deschutes National Forest Management Indicator Species. On February 4, 2013, the FWS proposed the wolverine for listing as a threatened species under the ESA primarily due to shrinking mountain spring snowpack as a result of climate change (USDI Fish and Wildlife Service 2013). On August 13, 2014 the Fish and Wildlife Service withdrew the proposed rule to list the distinct population segment of the North American wolverine occurring in the U.S. as a Threatened species.

Wolverines are primarily scavengers but also depend on a variety of prey items. In winter, they tend to den in the ground under snow or in rocky ledges or talus slopes (Ingram 1973). However, Copeland (1996) found they tended to prefer montane coniferous forest habitats during the winter. Wolverines make little use of young, thick timber and clear-cuts (Hornocker and Hash 1981).

Hornocker and Hash (1981) concluded that wolverine populations should be treated as regional rather than local whereas Edelman and Copeland (1999) suggested that wolverine populations move along corridors of mountainous habitats and that features such as the Columbia River Gorge and shrub-steppe habitats serve as barriers to dispersal. They also concluded that sightings occurring across the arid mountains of Central Oregon may suggest a movement corridor from the Cascade Mountains to the Wallowa Mountains.

Several historic sightings have been documented on the Sisters Ranger District near Suttle Lake and within the Mt. Jefferson and Mt. Washington Wilderness areas. Two aerial flights were conducted in the Three Sisters, Mt. Washington, and Mt. Jefferson Wilderness areas and adjacent roadless areas on the Sisters Ranger District in 1998 and 1999. There were no detections during the two flights. Baited camera systems placed near the wilderness boundary from 1997 through 1999 did not detect wolverine presence.

During the winter of 2012/2013 and 2013/2014 a research monitoring project using motion-detection cameras at bait stations and a hair snag system to collect samples for genetic analysis occurred on the Deschutes and Willamette National Forests. Target forest carnivores included the wolverine, the American marten, and a montane subspecies of red fox (Vulpes vulpes sp.). No wolverines were detected during this six month study.

A habitat assessment for the wolverine on the Deschutes National Forest was completed in 2012. Denning habitat was modeled from the Forest GIS Plant Association Group (PAG) layer including the alpine dry, alpine meadow, glacier and rock, and north aspect of 0-22.5 degrees and 337.5-360 degrees. The results from this were clipped using only the acres above 5500 feet in elevation. Of the 1,656 acres of wolverine denning habitat modeled for the Deschutes National Forest, 64 acres are in the Deep Canyon watershed. All of these acres are within designated Wilderness areas, primarily in the Three Sisters Wilderness area, with small areas in the Mount Jefferson Wilderness area. No denning habitat occurs in the Melvin Butte project area.

Wolverines appear to be extremely wide-ranging and unaffected by geographic barriers such as mountain ranges, rivers, reservoirs, highways, or valleys. Wolverines were documented using burned areas in Idaho (Copeland 1996) from immediately after the fire to up to several years after the event, presumably following ungulate herds. On the Deschutes National Forest, wolverine may travel through and or forage infrequently at lower elevations on the district but utilize higher elevations for most of their needs. Potential dispersal habitat occurs within the project area.

Alternative 1- No Action (Ecological Trend)

Under Alternative 1 (No Action) current Forest plans would continue to guide management of the project area; no thinning from below, mistletoe treatments, mowing or prescribed burning would take place to reintroduce natural fire back into these ecosystems, as well as reduce fuel loadings in the project area. In addition, no road closures or road decommissioning would occur to reduce disturbance to wolverine prey species.

Habitat conditions would remain constant in the short-term. Stand densities would continue to increase due to fire suppression. With increased stand densities comes increased risk of loss from disturbance events (insects, disease, or fire). These events would likely impact the densest stands the greatest due to the stand conditions and result in reduced availability of suitable habitat for prey species that utilize the project area.

Overall, since the project is not associated with wolverine habitat, the continuing ecological trend would not impact the wolverine or its habitat. The no action alternative could reduce available prey for the wolverine by reducing habitat for rodent populations in the project area. However, disturbance events such as wildfire could improve habitat for larger prey such as deer by increasing forage availability, post fire.

Direct and Indirect Impacts—Alternatives 2 and 3

The action alternatives would not remove any suitable habitat for the wolverine. Habitat identified within the watershed is not associated with the project area; therefore there would be no direct or indirect impact to the wolverine or its habitat.

Approximately 14 miles of road are proposed to be closed and decommissioned under the action alternatives. This action would reduce road densities in the project area from 5.98 mile/sq. mile to 4.66 miles/sq. mile. Road closures are not associated with suitable habitat; however, by reducing road densities it would reduce the amount of motorized disturbance to the project area. Road closures could potentially enhance the ability for wolverine to disperse through the project area.

There would be ***No Impact*** to the wolverine or its habitat under Alternatives 2 or 3.

Cumulative Impacts—Alternatives 2 and 3

The cumulative effects area for the wolverine is the Deep Canyon watershed. Because there are no direct or indirect impacts to the wolverine from the Melvin Butte project there would be no cumulative impacts to the wolverine. Therefore the Melvin Butte project would not contribute to a negative trend in viability on the Deschutes National Forest for the wolverine

Determination

The Melvin Butte project would have no direct and indirect impact to the wolverine or its habitat. There are no ongoing or reasonably foreseeable cumulative impacts to the wolverine. The Melvin Butte project would have ***No Impact*** to the wolverine or its habitat.

Lewis's woodpecker

Existing Condition

Formerly widespread, this species is common year-round only in the white oak ponderosa pine belt east of Mt. Hood. Habitat for the Lewis' 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' 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 average 17 to 44 inches (Saab and Dudley 1998, Wisdom et al. 2000). Known breeding has been documented in low numbers along Whychus Creek (Marshall et al. 2003) and in recent burned areas across the Deschutes National Forest.

In evaluating landscape predictor variables for the Lewis's woodpecker, Saab et al. (2002) found a negative relation to burned ponderosa pine/Douglas-fir stands with high crown closure (>70%) but was positively associated with low snag densities overall. However, although it selects for more open stands, this species selected nest sites with higher densities of large snags (>20"dbh) (Saab and Dudley 1998). Lewis' woodpeckers are different than other woodpeckers. They are aerial insectivores during the breeding season and use lower densities of smaller snags but rely more heavily on large snags (Saab and Dudley 1998). Habitat for Lewis' woodpecker will increase 5-10 years after in fire areas as smaller snags fall.

The Lewis' woodpecker is declining throughout its range. Threats to this species include the loss of suitable habitat, competition for nest trees, and the effects of pesticides on insects.

Abele et al. (2004) completed a Technical Conservation Assessment for the Rocky Mountain Region of the Forest Service. During the Assessment perceived threats to the conservation of the Lewis' woodpecker were identified:

1. The loss of breeding and wintering habitats in burned pine forests, park-like pine forests, riparian cottonwood stands, and woodlands.
2. Natural disturbances and management activities associated with them. For example a wildfire followed by salvage logging.
3. Fire Suppression within pine forests that have increased canopy cover (including increase of white fir) and reduced shrub and grass understories, which reduces insect populations that Lewis' woodpecker forage on and reduced aerial foraging areas.
4. Water regulation, which has altered riparian woodlands in the last two centuries.
5. Cattle grazing by altering the historic fire regimes with a reduction of understory vegetation. In addition, altering understory can influence the composition and abundance of prey.
6. Firewood cutting by reducing potential nest sites.
7. Competition with European starling and other cavity nesting species for nest sites.

Through the Forest wide assessment completed for MIS, Lewis' woodpecker reproductive habitat was mapped across the entire Deschutes National Forest. Habitat assessed for the Lewis woodpecker is associated with both green stands and post fire habitats. Approximately 122 acres of habitat occurs within Melvin Butte project area, 10,622 acres in the Deep Canyon and Whychus Watersheds, and approximately 85,015 acres of habitat occurs across the Deschutes National Forest. Table 89 displays Lewis woodpecker habitat in the Melvin Butte project area. Deep Canyon and Whychus watersheds, and across the Deschutes National Forest.

Table 89: Lewis woodpecker habitat within the Melvin Butte project area, Deep Canyon and Whychus Watersheds, and across the Deschutes National Forest.

Acres of Habitat in the Melvin Butte project area	Acres of Habitat in the Deep Canyon and Whychus Watersheds	Acres of Habitat Across the Deschutes National Forest
122 acres	10,622 acres	85,015

For the detailed assessment on the Lewis' woodpecker for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

There are no known Lewis' woodpecker nest sites within Melvin Butte project area.

Measure: Lewis' woodpecker habitat change in quality due to thinning and removal of fire killed trees in Scenic Views corridor.

Alternative 1 – No Action (Ecological Trend)

Under the No Action Alternative no treatments would be prescribed within Melvin Butte project area. Without treatment the development of future old growth within second growth ponderosa pine and mixed conifer stands would be prolonged and the existing old trees within the would continue to be stressed, decreasing their longevity. However, stands would continue to provide habitat in the short-term. In the long-term, in the absence of a stand replacement fire or insect outbreak, the stands containing disease would continue to die and the multi-storied structure would diminish along with any remnant old growth trees. Due to stand densities within the project area and increases in mortality overtime, the risk of large scale stand replacement fire across the Melvin Butte project area would increase.

Overall, high stand densities would result in a decrease in tree vigor among all size classes. The most significant effect of high stand densities would be the gradual loss of the existing historic large-tree component/nesting habitat which is likely to occur at a much higher rate than if stand densities were reduced to more sustainable levels.

Areas that currently provide suitable Lewis habitat would persist in the short-term, since this species prefers open ponderosa pine stands or post fire environments. Without treatments to thin from below within multi-storied ponderosa pine and mixed conifer stands, stand densities and the associated intraspecific competition among trees in the stands would reduce the longevity of residual old growth and large tree structure that occurs in these stands. In the long-term, available nest trees would be limited and the future development of large nest trees would be prolonged. In high density stands of second growth ponderosa pine containing mistletoe, in the short-term the mistletoe would reduce the resiliency of these stands against bark beetle attack. In the long-term, the second growth stands would likely contain bark beetle outbreaks and high densities of small snags that result in lack of recruitment of large tree structure over time, limiting suitable nesting habitat.

Alternative 2 and 3 - Direct and Indirect Effects

Thinning From Below (HTH)

The action alternatives propose thinning from below in Lewis' woodpecker habitat. Existing habitat in second growth ponderosa pine stands are an advanced stage of development where the majority of trees are beginning to reach maturity. In addition, there are residual old growth stands of ponderosa that would be thinned from below; these areas provide the most suitable habitat and would be greatly enhanced by thinning. On average trees identified for thinning would be approximately 12-14 inches dbh with secondary non-commercial treatments removing trees 8 inches dbh and less. Thinning from below would

retain the largest trees in the stand. These treatments would reduce stand densities, minimizing the risk of mountain pine beetle outbreaks and stand replacement fire. Treatment aids in the maintenance of large trees by reducing their susceptibility to fire and insects while reducing competition for growing space and nutrients. Due to density reduction in the understory, stands would be more open accelerating the development of LOS ponderosa pine and the recruitment of large snags over the next 30+ years.

Prescribed Fire (Burn)

Primary and secondary treatments include burning and mowing. Mowing is designed to reduce shrub densities that contribute to ladder fuels and breakdown residual thinning slash. Similarly, burning is also designed to reduce shrub densities and thinning slash that contributes to ladder fuels; burning may risk losing existing large snags that provide nesting habitat. Burning operations could potentially provide additional snags for nesting habitat in the short-term. Prescribed Burn Only treatments would not be commercially thinned or mowed. There is no difference in effects to habitat as a result of either treatment since both treatments have the potential to recruit snags from burning operations providing habitat in the short-term for Lewis' woodpecker. However, prescribed burning has the potential to remove large soft snags that provide suitable Lewis' woodpecker nesting habitat in the short-term.

See the DecAid snag and down wood analysis in the Wildlife Report for a summary of the dead wood habitat assessment.

Table 90 displays the total number of Lewis' woodpecker habitat by alternative and treatment type.

Table 90: Total Acres of Lewis' Woodpecker Habitat Associated by Treatment Type and Alternative

Treatment Type	Alternative 2 (acers)	Alternative 3 (acres)
HTH	13	13
B	96	96
Total Acres	**109**	**109**

Affects to Lewis' woodpecker habitat are similar under Alternatives 2 and 3. The outcome or long-term benefits to habitat as a result of the effects of each treatment type is also similar across the action alternatives.

Alternatives 2 and 3 similarly address the risk of insect, disease, and stand replacement fire by burning and mowing to maintain existing open ponderosa pine stands that need minimal thinning. Both alternatives would promote Lewis' woodpecker habitat by using prescribed fire to create individual fire killed trees which woodpeckers prefer for nesting, while maintaining habitat continuity across the project area, and promoting the development of future fire resistant stands of LOS ponderosa pine containing future nesting habitat. Although treatments would enhance habitat, not every fire killed trees greater than 17 inches dbh (minimum snag diameter for Lewis woodpecker) would provide suitable nesting habitat. Habitat is highly dependent on the spatial arrangement of suitable snags for nesting and their proximity to open areas that the Lewis' woodpecker needs for foraging. Treatments prescribed under both alternatives would promote spatial heterogeneity retaining the largest trees in the stands by providing a mosaic of tree densities. Residual trees would contain a variety of size classes providing residual foraging habitat as well as maintaining late and old structure to provide nesting habitat where it exists.

Overall, approximately 109 acres of Lewis' woodpecker reproductive habitat are associated with treatments identified under Alternatives 2 and 3. Treatments would not target the removal of large trees or snags and therefore would not impact habitat in the short-term. Burning associated with treatments could potentially recruit some large snags providing nesting habitat in the long-term as snags decay. Loss of snags in ponderosa pine habitat during prescribed fire treatments in Arizona and California ranged from 20% (Randall-Parker and Miller 2002), 45% (Horton and Mannan 1988), and 56% (Bagne et al. 2008).

All three studies found that larger diameter ponderosa pine trees were least likely to die, at least in the short-term. Horton and Mannan (1988) found a 20-fold increase in abundance of snags < 15 cm dbh. Several studies showed that the highest snag losses were in areas where a long period of fire exclusion had occurred (Bagne et al. 1988, Holden et al. 2006). Bagne et al. (2008) and Horton and Mannan (1988) found that re-entry burns had a much lower mortality rate for snags, presumably because the trees that did not burn during the first entry were more resilient. Loss of snags from prescribed fire was partially mitigated by the creation of new snags (Horton and Mannan 1988, Bagne et al. 2008).

Similar outcomes are expected with the Melvin Butte project. The majority of these stands have not been burned for decades and this would be the first entry with prescribed fire. The goal of the project is to promote and enhance LOS ponderosa pine habitat within stands identified as Lewis' woodpecker habitat. However, only approximately 2% of the project area is associated with Lewis woodpecker habitat treatments.

Cumulative Impacts —Alternatives 2 and 3

Activities identified in Table 14 and the full wildlife report were reviewed to assess whether in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to Lewis' woodpecker reproductive habitat. The Deep Canyon and Whychus Watersheds is used as the scale for analysis for this species. The potential cumulative impacts are discussed below.

The Pole Creek Fire and the Two Bulls Fire Timber Salvage Projects and associated danger tree removal are ongoing within the Deep Canyon and Whychus watersheds. The Pole Creek Fire Timber Salvage is approximately 54 acres of ongoing fire salvage. Treatments were designed to retain 6 snags per acre that would provide the most suitable habitat for woodpeckers. Approximately 250 acres are proposed for salvage within stand replacement fire areas of the Two Bulls Fire, retaining 3 snags per acre as well as all snags greater than 21 inches in diameter to provide habitat for woodpeckers.

The Ursus Hazardous Fuels Reduction, the Bend Municipal Watershed Hazardous Fuels Reduction, and the Bear Wallow Firewood Projects focus primarily on removing dead and live lodgepole pine, as well as white-fir among green stands to reduce fuel loadings. There are approximately 6,810 acres associated with these projects; neither of these projects propose to reduce habitat elements associated with Lewis woodpecker habitat.

Approximately 10,622 acres of Lewis' woodpecker reproductive habitat exists within the Deep Canyon and Whychus watersheds. Alternatives 2 and 3 would treat approximately 109 acres of suitable reproductive habitat.

Although treatments would not reduce suitable nest trees, treatments are proposed within 1% of the total Lewis' woodpecker habitat within the Deep Canyon and Whychus watersheds; habitat for this species would be retained within the 109 acres associated the Melvin Butte project. Habitat quality and utility would be enhanced for this species by promoting the development of large soft snags that are highly suitable for nesting; create open stands that allow birds a clear view of avian predators from nest sites; and open up stands to allow birds to more effectively forage on the wing. With the ongoing forest management projects within the Deep Canyon and Whychus watersheds there would be less than a 1% reduction in the overall habitat for the Lewis" woodpecker across the Deschutes National Forest.

Determination

Cumulatively, with the ongoing forest management projects within the Deep Canyon and Whychus Watersheds, this project impacts less than 1% of suitable habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The impacts to habitat

would be minimal at the Forest scale. The Melvin Butte Project is consistent with the Forest Plan, and thus continued viability of the Lewis' woodpecker is expected on the Deschutes National Forest.

Based on these assumptions, the Melvin Butte project ***May impact individuals or habitat, but would not likely contribute to a trend toward federal listing for the Lewis' woodpecker.***

Landbird Conservation Strategy Consistency

Biological objectives are all based on "where ecologically appropriate" meaning actions must occur within the proper habitat addressed in order to be consistent or not.

Species	Biological Objectives	Consistent Yes, No, or NA	Rationale
Lewis' Woodpecker **In Ponderosa Pine Stands:**	Through natural events or management, maintain >1% of landscape as post-fire old ponderosa pine forest habitat	NA	There are no treatments associated with post fire ponderosa pine habitats
	Through natural events or management, maintain >50% of the post-fire landscape as unsalvaged	NA	There are no post-fire salvage treatments associated with the project.
	Where salvage is occurring in post-fire old ponderosa pine forest, (in burns >100 acres) salvage <50% of the standing and down dead	NA	This is not a salvage logging project.
	Where salvage is occurring in post-fire old ponderosa pine forest, (in all burns) retain all trees/snags >20"dbh and >50% of those 12-20" dbh	NA	This is not a salvage logging project.
Lewis' Woodpecker **In Ponderosa Pine Stands**	In all burns, snags should be clumped and hard and soft decay classes left to lengthen period of suitable habitat	NA	Project does not propose to remove snags in Lewis woodpecker habitat.
	In old forest habitat, provide 24 snags/acre >9"dbh and of these 6 snags/acre should be >20"dbh	Not Applicable	No snags will be removed in old forest ponderosa pine habitat.
	In old forest habitat, provide recruitment snags especially in areas of high risk stand replacement fire	Meets	In old forest ponderosa pine habitat, all residual green old growth will be retained
	In old forest habitat, provide shrub understory of >13% cover	Meets	Wildlife retention will occur with this habitat type that will remain untreated.

White-headed Woodpecker

Existing Condition

White-headed woodpeckers are uncommon permanent residents in forests east of the Cascades. They use habitat with large open ponderosa pine, low shrub levels and large snags. Dixon (1995) found white-headed woodpecker densities increased with increasing old-growth ponderosa pine trees and showed a positive association with large ponderosa pine. The white-headed woodpecker is a primary cavity excavator of soft snags. This woodpecker is the only woodpecker species to rely heavily on seeds of ponderosa pine for food (Marshall et al. 2003 p. 364).

White-headed woodpeckers may require dynamic landscapes with both burned and unburned habitat for the long-term persistence of populations (Hollenbeck et al. 2010). Wightman et al. (2010) studied existing open-canopied ponderosa pine forests before a fire and a mosaic of burn severities within 1 kilometer of nests to characterize nest sites on the Fremont-Winema NF. They found the presence of

larger, more decayed snags and fewer live trees near a snag (within 1 hectare) after fire were important factors for nest selection; however this didn't influence nest survival. Open-canopied pine forests with mature, cone-producing trees within proximity of burns were also important in identifying white-headed woodpecker habitat as long as most of the landscape was not subjected to stand replacement fires (Wightman et al. 2010). A mosaic of burn severities across the landscape may improve white-headed woodpecker habitat by opening forest canopies in higher severity burned areas while retaining decayed snags created before wildfire and live cone-producing trees in unburned or low severity burned areas (Wightman et al. 2010).

A long term study on the white-headed woodpecker occurred on the Deschutes and Winema National Forests from 1997-2004 with several Deschutes study sites occurring in the Metolius Basin area. Frenzel (2000) calculated the mean diameter for white-headed woodpecker nest trees to be 26.2"dbh while Dixon (1995) found similar results (mean diameter of 25.6"dbh). Frenzel (2003) found nests at sites with a high density of large diameter trees had a higher survival rate than nests in recently harvested sites. Unharvested sites or sites with greater than 12 trees per acre >21"dbh had a success rate of 63.1% while nests at previously harvested sites or lower densities of large trees had a success rate of 39.8%. Therefore, white-headed woodpeckers were positively associated with higher densities of large trees. On the Winema National Forest, white-headed woodpeckers were found to be using small-diameter trees, logs in a slash pile and upturned roots (6-13"dbh) where large snags were uncommon (Frenzel 2002).

White-headed woodpeckers roost in ponderosa pine habitats with an average canopy closure of 57.4 + 1.9% canopy closure (Dixon 1995). In addition, most (65%) roost sites were located on flat ground and found on the lower one-third of the slope or bottom slope (89%) with slopes ranging from 0-40% and an average of 7 + 1% (Dixon 1995). Roost site elevations ranged from 2900-4311 feet with an average elevation of 3382 + 39 feet (Dixon 1995).

Snags and live trees used for roosts were greater than snags and live trees found within plots (Dixon 1995). Roost trees diameters averaged 24 + 1" dbh and ranged from 7 to 45" dbh while heights ranged from 6 to 164 feet and averaged 66 + 3 feet tall (Dixon 1995). Tree diameter at cavity height ranged from 2 to 30" in diameter and averaged 17 + 2" dbh while cavity heights averaged 8.6 + 1 feet tall and ranged from 5.5 to 20 feet (Dixon 1995).

Dixon (1995) found white-headed woodpeckers did not use the same kind of tree for nesting as they did for roosting. Nest trees were typically dead, had broken tops, were shorter in height, contained more cavities, and had a higher percentage of bark present than roost trees. She also found they used different decay stages for nesting than roosting. Table 91 provides a comparison of decay classes used for nesting and roosting found by Dixon (1995).

Table 91: Nest and Roost Tree Decay Class Comparison for White-headed Woodpecker (Dixon 1995).

Decay Class	Nest Tree Percentage	Roost Tree Percentage
Decay Class 1 (Recently Dead)	25%	11%
Decay Classes 2-3 (Moderately Decayed)	51%	34%
Decay Classes 4-5 (Advanced Decay)	25%	55%

Foraging habitat is usually found in association with nesting habitat. Kozma (2011) surmised because white-headed woodpeckers are primarily bark gleaners and feed on ponderosa pine seeds throughout the winter, large diameter and old-growth ponderosa pine may be more important to white-headed woodpeckers because these trees have a greater bark foraging area, higher insect abundance, and greater and more frequent cone production than smaller trees.

Dixon (1995) found 42% of over 2,000 foraging observations were on branches, 23% on the upper trunk, 22% on the mid-trunk, and 13% on the lower trunk with an average foraging height of 62 feet on large diameter live ponderosa pine trees. Dixon (1995) also showed that white-headed woodpeckers gleaned 35%, fed on cones 31%, pecked 24%, and fed on sap 7% with males foraging slightly higher in trees and feeding on cones more than females.

White-headed woodpeckers feed on tree sap (Dixon 1995, Kozma 2010) as well as insects and seeds. White-headed woodpeckers are weak excavators and this may explain the use of smaller trees for sap feeding. It may be easier for them to drill wells in thinner bark of smaller ponderosa pine compared to thicker, furrowed bark of larger pine (Kozma 2011). Table 92 provides a comparison of sap and non-used tree for the white-headed woodpecker.

Table 92: Comparison of Sap and Non-used Trees for White-headed Woodpecker (Kozma 2010).

Trees	Mean Height (feet)	Height Range (feet)	Mean Diameter (dbh inches)	Diameter Range (dbh inches)
Sap Trees	44	44.6 – 72.5	8.8	2.4 – 14.6
Non-used Trees	54	9.1 – 96.4	12.2	2.0 – 23.3

Threats to this species include increased stand densities in ponderosa pine due to fire suppression, loss of large, old ponderosa pine trees and snags, wildfire, and increased shrub densities. Increased shrub densities may be factors leading to increased mammalian nest predation and increased risk of avian predation on adults (Frenzel 2000).

White-headed woodpecker nest monitoring occurred from 2003 to 2011 in similar treatment types associated with the Metolius Basin project (DNF 2011) as are prescribed in the Melvin Butte project. The monitoring found that resident birds were not displaced by short-term impacts associated with the implementation of treatments resulting in nests that were successful. In addition, due to stand density reductions, nests were more successful due to the increase in suitable habitat.

The NatureServe status for the white-headed woodpecker is apparently secure at the global and national levels (G4 and N4) and imperiled at the state level (S2).

Through the Forest wide assessment completed for MIS, white-headed woodpecker reproductive habitat was mapped across the entire Deschutes National Forest. Habitat assessed for the white-headed woodpecker is associated with both green stands and post fire habitats. Habitat for the white-headed woodpecker occurs sparingly throughout the Deschutes National Forest in the following plant associations –ponderosa pine, Douglas-fir, white fir, and Shasta red fir in open stands where average tree size is 20”dbh or greater. Approximately 316 acres of habitat currently exists within the Melvin Butte project area. Approximately 21,025 acres of habitat occurs within the Deep Canyon Whychus Watersheds and approximately 198,330 acres of habitat across the Deschutes National Forest. (Table 93).

Table 93: White-headed Woodpecker Reproductive Habitat within the Melvin Butte Project Area, Deep Canyon and Whychus Watersheds, and Across the Deschutes National Forest.

Acres of White-headed Woodpecker Habitat in the Melvin Butte project area	Acres of White-headed Woodpecker Habitat in the Deep Canyon and Whychus Watersheds	Acres of White-headed Woodpecker Habitat Across the Deschutes National Forest
316 acres	21,025 acres	198,330 acres

For the detailed assessment on the white-headed woodpecker for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

There have been four documented observations of white-headed woodpeckers from 1999 to 2002 in the project area. During the 2010 field season, two nest sites were located in the Melvin Butte project area as a result of nest survey conducted during the 2010 Hollenbeck et al. white-headed woodpecker research project that occurred on the Sisters Ranger District.

Measure: White-headed woodpecker habitat change in quality due to thinning and prescribed burning operations.

Alternative 1 – No Action (Ecological Trend)

Stand resilience to insects and disease is measured by the Upper Management Zone (UMZ). The UMZ relates to the density of trees (basal area, trees per acre, etc.) a forest stand can support without significant mortality from bark beetles. The upper management zone is the density level at which trees begin to come under significant stress and can become susceptible to bark beetles and other insects and diseases. Forest stands managed below the upper management zone are more resilient. UMZ can also be used to estimate which stands are more susceptible to stand replacing fire by identifying those stands that are above the Upper Management Zone. Approximately 4,456 acres that have the potential to receive vegetation treatment. Under the No Action, alternative 92% of these stands are above the Upper Management Zone and are at risk or could currently be impact by insects and disease due to high stand densities. Under the No Action Alternative, no treatments would occur within Melvin Butte project area. However, the "ecological trend" in the short-term stands would continue to remain suppressed and at risk of a stand-replacement wildfire.

Due to stand densities and increases in mortality the risk of large scale stand replacement fire across the project area increases overtime, potentially impacting high density stands. In the short-term, fire events could provide some nesting and foraging habitat but the majority of the areas would not. Since these stands are predominantly 60-80 year old second growth ponderosa pine, snags recruited from the fire would be small with an average diameter of 14 inches. Since the majority of burned trees would of small diameters most of the fire killed trees would fall in the first 10 years and many areas would be void of nesting habitat in the long-term. If nesting habitat existed it would be limited on the landscape.

Currently, high stand densities would result in a decrease in tree vigor among all size classes. The most significant effect of high stand densities would be the gradual loss of the existing historic large-tree component/nesting habitat which is likely to occur at a much higher rate than if stand densities were reduced to more sustainable level.

Areas that currently provide suitable white-headed woodpecker habitat would persist in the short-term since this species prefers open ponderosa pine stands. Without treatments such as prescribed fire and thinning from below in multi-storied ponderosa pine and mixed conifer stands, stand densities would reduce the longevity of residual old growth and large tree structure that occurs in these stands. In the long-term, available nest trees would be limited and the future development of larger nesting trees would be prolonged. In high density stands of second growth ponderosa pine containing mistletoe, in the short-term mistletoe would reduce the resiliency of these stands against bark beetle attack. In the long-term, the second growth stands would likely contain bark beetle outbreaks and high densities of small snags. Therefore there would be a lack of recruitment of large tree structure over time, limiting suitable nesting habitat for the white-headed woodpecker.

Alternative 2 and 3- Direct and Indirect Effects

There are 316 acres of suitable habitat in residual stands of late and old structure ponderosa pine at mid elevation in the northern portion of project area. Most of the ponderosa pine stands within the project area typically are unsuitable because densely stocked second growth "black bark" stands lack soft snags which provide nesting habitat.

Thinning From Below (HTH)

Thinning in suitable reproductive habitat would occur in both second growth ponderosa pine and multi-storied ponderosa pine and mixed conifer stands. Thinning (from 8" dbh and up) from below would favor the largest ponderosa pine in pure pine stands. In mixed conifer stands, thinning would favor ponderosa pine and healthy white-fir. A basal area of 40 – 120 square feet would remain on average in each stand. Treatment would maintain large trees by reducing their susceptibility to fire and insects by reducing competition for growing space and nutrients. Thinning decreases stand densities and allows for faster growth of residual trees while reducing risk of stand replacing fire (removal of ladder fuels). Due to density reduction in the understory, stands would be more open accelerating the development of LOS ponderosa pine and recruit large snags that the white-headed woodpecker specifically select for nest sites over the long term.

Within mixed conifer stands, thinning would favor ponderosa pine focusing removal on smaller diameter white-fir and lodgepole pine. Favoring ponderosa pine would promote more fire resilient stands in the future, reducing the risk of insects and disease that are common to white-fir and lodgepole pine by reducing the abundance of these species in the stands. Although the treatments promote ponderosa pine, residual green white-fir and lodgepole pine would exist in these stands; however they are both short-lived species compared to ponderosa pine and typically recruited as snags at a higher rate due to their susceptibility to insects and disease. It is likely the lodgepole pine and white-fir more readily provide nesting habitat over the long-term as large ponderosa pine develop and are recruited as nesting habitat in the future.

Overall residual trees would retain a variety of seral classes providing foraging habitat as well as maintaining late and old structure to provide nesting habitat. Treatments would promote heterogeneity in these stands, retaining the largest trees and providing a mosaic of tree densities. Treatments would be beneficial to the white-headed woodpecker by opening stands adjacent to available nest sites and would allow for greater predator avoidance and promote higher nest success.

Prescribed Fire (Burn)

Secondary fuels treatments include mowing and burning to reduce shrub densities and residual thinning slash in the understory. Mowing would potentially reduce rodent populations, promoting the likelihood of nest success. Similarly, burning would also reduce rodent habitat, but would also recruit snags in the short-term providing potential nesting habitat. However, since white-headed woodpecker are weak excavators and dependent on soft snags for nesting, the utility of newly created snags would be limited until they decay to a point that is conducive to excavation. Within second growth black bark ponderosa pine stand that are 60 to 80 year second growth, snags recruited from prescribed burning would range between 14-20 inches dbh. Although these newly created snags are on the small end for nesting, snag densities are low in these stands and very few snags exist over 21 inches dbh. Currently use due to the lack of nest site availability these newly created small diameter snags may provide the only available nesting habitat in the short-term.

Non-commercial Thinning (P)

In addition, ponderosa pine plantations would be thinned that contain individual large diameter ponderosa pine trees that provide some foraging habitat for the white-head woodpecker. These plantations would be thinned to reduce inter-tree competition and accelerate individual tree development. White-headed woodpeckers primarily forage by gleaning insects from under the bark of large ponderosa pine but would also excavate sap wells in second growth or young ponderosa pine (Dixon 1995, Kozma 2010). These treatments would reduce some foraging habitat, but fully stocked stands would remain after treatment. Treatments are intended to reduce stocking density promoting the development of overstory stands and

reduce the likelihood of losing these trees to bark beetle infestation. Treatment would retain residual foraging opportunities.

Scenic Views Enhancement

Habitat associated with this treatment type occurs in the mixed conifer and lodgepole pine plant association group (the majority of habitat is associated with lodgepole pine). This treatment occurs in stands along the Forest Road 16 corridor that were burned in the 2012 Pole Creek fire. Treatments would focus on the removal of dense stands of dead lodgepole pine to reduce dead wood densities that create a fuel hazard in the future. Ponderosa pine is limited in this area and exists primarily as individual trees. This area provides both nesting and foraging options due to its post fire habitat. Where large dead ponderosa pine exists they would be retained for wildlife habitat. No green trees of any species would be removed within this treatment area. Treatments would remove small dead trees from the vicinity of large dead ponderosa pine. The treatment would primarily focus on the removal of trees that are small in size and do not provide nesting utility of the white-headed woodpecker and therefore would not remove habitat.

See DecAid snag and down wood analysis in the Wildlife Report for a summary of the dead wood habitat assessment.

Table 94 provides a summary of the total treatment acres associated with to suitable white-headed woodpecker habitat by alternative.

Table 94: Total Acres of Reproductive Habitat Associated with Each Treatment Type by Alternative for the Melvin Butte Project Area

Treatment Type	Alternative 2	Alternative 3
B	83	83
HTH	29	34
P	151	151
Scenic Views Enhancement	39	39
Total Acres.	**302**	**302**

Affects to white-headed woodpecker habitat are similar under Alternatives 2 and 3. The outcome or long-term benefits to habit as a result of the effects of each treatment type is also similar across both action alternatives.

Alternatives 2 and 3 similarly address the risk of insects, disease, and stand replacement fire, as well as promote stand level heterogeneity. Both alternatives promote habitat diversity due to the variety of stand densities stands that would be thinned with the objective of promoting habitat for a variety of species associated with ponderosa pine and mixed conifer dry plant association groups. Both alternatives create a landscape mosaic of thinned and un-thinned habitats, maintaining habitat continuity across the project area, while promoting the development of future fire resistant stands of LOS ponderosa pine. Residual trees would retain a variety of seral classes providing residual foraging habitat as well as maintaining late and old structure to provide nesting habitat where it exists.

To assist with promoting diversity and variability on the landscape within the ponderosa pine and mixed conifer dry plant association groups, approximately 33 % of the project area would be left untreated. Residual untreated areas would be left as entire stands with an occasional small aggregate patch.

Overall approximately 302 acres of white-headed woodpecker reproductive habitat are associated with treatments identified under Alternatives 2 and 3.

Cumulative Effects—Alternatives 2 and 3

Activities identified in Table 14 and the wildlife report were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to white-headed woodpecker habitat which is associated with ponderosa pine and mixed conifer stands containing late and old structure ponderosa pine. These activities were reviewed across the Deep Canyon and Whychus Watersheds to determine cumulative impact to the white-headed woodpecker.

The Pole Creek Fire and Two Bulls Fire Timber Salvage Projects and associated danger tree removal are ongoing within the Deep Canyon and Whychus watersheds. The Pole Creek Fire Timber Salvage is associated with approximately 54 acres of ongoing stand replacement fire areas being salvage logged. Treatments were designed to provide woodpecker habitat by retaining 6 snags per acre to provide the most suitable habitat for the woodpeckers. Approximately 250 acres are proposed for salvage within stand replacement areas associated with the Two Bulls Fire, retaining 3 snags per acre as well as all snags greater than 21 inches in diameter to provide habitat for woodpeckers.

The Ursus Hazardous Fuels Reduction, the Bend Municipal Watershed Fuels Reduction, and the Bear Wallow Firewood Projects are primarily associated with montane mixed conifer habitat and lodgepole pine; these project total approximately 6,810 acres. These projects are not likely associated with white-headed woodpecker habitat and therefore would not likely contribute to cumulative effects.

The Three Creeks Personal Use Firewood Cutting Area also occurs in the watersheds. This area occurs in both Eastside Mixed Conifer and lodgepole pine habitat types. Firewood cutting is not wide spread and primarily occurs where dead trees can be accessed from open roads. Although snags are cut and removed, removal occurs on an individual tree basis versus across the entire designated area. The area is approximately 3,029 acres. The majority of firewood removed is associated with beetle killed lodgepole pine; impacts to white-headed woodpecker would be incidental from firewood gathering.

The thinning and burning identified with Alternatives 2 and 3 are associated with approximately 302 acres or <1% of the total habitat within the Deep Canyon and Whychus watersheds. Habitat quality for white-headed woodpecker would remain throughout the Melvin Butte project area.

White-headed woodpecker habitat is predicted to increase as treatments are focused on ponderosa pine restoration to develop open grown forests with frequent underburned fires, creating sustainable white-headed woodpecker habitat over the long term.

Determination

Cumulatively, with the ongoing forest management projects within the Deep Canyon and Whychus Watersheds, this project impacts less than 1% of suitable habitat across the Forest; the overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The loss of habitat would be insignificant at the Forest scale. The Melvin Butte Project is consistent with the Forest Plan and thus continued viability of the white-headed woodpecker is expected on the Deschutes National Forest.

Based on these assumptions, the Melvin Butte project ***May impact individuals or habitat, but would not likely contribute to a trend toward federal listing for the white-headed woodpecker*.**

Landbird Conservation Strategy Consistency

Biological objectives are based on “where ecologically appropriate” meaning actions must occur within the proper habitat addressed in order to be consistent or not.

Species	Biological Objectives	Consistent Yes, No, or	Rationale

		NA	
White-headed Woodpecker **In Ponderosa Pine Stands:**	Provide a mean of 10 trees/acre >21”dbh and at least 2 trees >31”dbh	Meets	Within suitable white-headed woodpecker habitat, residual stand densities will exceed biological objectives
	Provide a mean of 1.4 snags/acre >8”dbh with 50% >25”dbh in a moderate to advanced state of decay	Meets	The project does not propose to remove snag in ponderosa pine stands.
	Provide a mean canopy closure of 10-40%	Meets	Mean residual canopy closure within suitable white-headed woodpecker habitat will be 30%.
	In predominantly old-growth, provide >350 acres of contiguous habitat	Not Applicable	All old growth habitat will be retained.
	In 26-75% old-growth, provide >700 acres of contiguous habitat	Not Applicable	All old growth habitat will be retained.

Johnson’s hairstreak

Existing Condition

This small, three-quarter inch uncommon butterfly ranges from southern British Columbia, south through eastern and western Washington, and western Oregon, to central and south California. Isolated populations exist in northeastern Oregon to central Idaho. In Oregon, it has been found sparsely in the Cascades, Coast Range, Siskiyou Mountains, Blue Mountains and Wallowa Mountains (Pyle 2002). Elevations range from sea level to 6,000 feet. Most of the 52 records for Oregon are above 2,000 feet (Hinchliff 1996). This butterfly species depends on coniferous forests that contain dwarf mistletoes (genus *Arceuthobium*) found in western hemlock, red fir, and Jeffrey pine (NatureServe 2012). Although these tree species found in the proposed project area, the area does contain mistltoe infected white fir, ponderosa pine, and lodgepole pine.

Measure: Acres of Dwarf Mistletoe Affected

Alternative 1 – No Action (Ecological Trend)

The No Action Alternative would result in no immediate impact to Johnson’s hairstreak because no vegetation management actions would occur to reduce mistletoe populations. Potentially suitable habitat would be maintained based on the widespread presence of mistletoe across the project area.

Direct and Indirect Impacts—Alternatives 2 and 3

Alternative 2 would result in the specific reduction of infected mistletoe trees on about 160 acres. On average, about 97% of the project area would contain varying levels of mistletoe post treatment. This retention, plus leaving about 906 acres in untreated stands and not removing all mistletoe trees (only trees with the highest damage ratings would be removed), would provide Johnson’s hairstreak habitat widely distributed across the entire project area.

Alternative 3 removes less mistletoe than Alternative 2. Alternative 3 does not propose specific mistletoe treatments; thinning would occur with the objective of reducing stand densities by thinning from below. Alternative 3 would retain more trees with mistletoe and would have a lower potential to remove Johnson’s hairstreak habitat.

Cumulative Impacts—Alternatives 2 and 3

For this species cumulative effects were bounded by the Deep Canyon watersheds based on the limited scale of the proposed actions in relation to the size of the watersheds and availability of habitat outside of

timber harvest areas and mechanized use (e.g. wilderness and roadless areas). Past actions have been considered in the existing condition of habitat and the cumulative effects ongoing and reasonably foreseeable actions were analyzed.

The Bend Municipal Watershed Fuels Reduction and the Bear Wallow Fire Wood Projects are primarily associated with montane mixed conifer habitat and lodgepole pine totaling approximately 910 acres. These project both primarily occur within 150 feet of open roads. These projects are not likely associated with Johnson's hairstreak habitat and primarily propose to remove beetle killed lodgepole pine; therefore the projects would not likely contribute to cumulative effects.

The Three Creeks Personal Use Firewood Cutting Area also occurs in the watersheds. This area occurs in both Eastside Mixed Conifer and lodgepole pine habitat types. Firewood cutting is not wide spread and primarily occurs where dead trees can be accessed from open roads. The area is approximately 3,029 acres. The majority of firewood removed is associated with beetle killed lodgepole pine; the proposed action under Melvin Butte would not have additive impacts associated with personal use firewood cutting.

The Ursus project has the potential to impact Johnson hairstreak habitat. On average about 31%-32% of the project area (and depending upon the alternative chosen) would remain unchanged, plus a majority of the Tumalo Creek and Deep Canyon watersheds would be retained in the roadless and wilderness areas retaining the presence of mistletoe throughout the watersheds. It is assumed species presence would still be maintained with either of these alternatives.

Determination

Alternative 2 would have the greatest potential to impact Johnson hairstreak because of the direct treatment of mistletoe on 160 acres. Alternative 3 would have the least impact but would thin stands throughout regardless of mistletoe; incidental removal would still occur under Alternative 3. Although both alternatives would remove mistletoe, Alternative 3 would retain a higher density of mistletoe since it would not intensively treat areas that are the most heavily infected. On average about 97% of the stands would still contain mistletoe post treatment. Mistletoe at various levels would continue to occupy the majority of the project area providing habitat for the Johnson's hairstreak. Under both alternatives the project proposes to remove those with the highest damage ratings to reduce the rate of spread. The majority of the Deep Canyon watershed would remain untreated in inventoried roadless and Wilderness areas insuring the presence of mistletoe throughout the watershed. It is assumed species presence would be maintained with either of these action alternatives. Based on these assumptions, the Melvin Butte Project *May impact individuals or habitat, but would not likely contribute to a trend toward federal listing for the Johnson's hairstreak*.

Management Indicator Species

The Deschutes National Forest Land and Resource Management Plan (LRMP) (USDA 1990) identified a group of wildlife species as Management Indicator Species (MIS). These species were selected because they represent other species with similar habitat requirements. Management Indicator Species can be used to assess the effects of management activities for a wide range of wildlife species with similar habitat needs (FSM 2620.5). Those species selected for the Deschutes National Forest include the bald eagle, northern spotted owl, golden eagle, red-tailed hawk, osprey, northern goshawk, Cooper's hawk, sharp-shinned hawk, great gray owl, great blue heron, woodpeckers (cavity nesters), peregrine falcon, California wolverine, elk, mule deer, American marten, Townsend's big-eared bat, and waterfowl. In addition, habitats and wildlife species identified in the Northwest Forest Plan are addressed.

Some of the MIS species have been discussed in the Threatened, Endangered, or Sensitive (TES) Species report. Effects of the project to TES species can be located in the Melvin Butte Wildlife Biological Evaluation (BE). Species discussed in the BE that are also MIS are the northern bald eagle, northern

spotted owl, peregrine falcon, Lewis' woodpecker, white-headed woodpecker and California wolverine. The list of MIS species are found in Table 95 and Appendix D. MIS species that are also Northwest Forest Plan species with specific management recommendations are: black-backed woodpeckers, white-headed woodpeckers, and Townsend's big-eared bats. MIS species that have not been previously addressed in other sections that are addressed here include the Cooper's hawk, sharp-shinned hawk, northern goshawk, great blue heron, great gray owl, golden eagle, osprey, red-tailed hawk, waterfowl, woodpeckers, American marten, mule deer, and elk. Habitats addressed include snags, down wood and log associated species and special and unique habitat associated species.

Table 95: Management Indicator Species Summary.

Species	Habitat	Presence
Birds		
Coopers Hawk (*Accipiter cooperi*)	Mature forests with high canopy closure/tree density	Potential habitat but no known nesting
Sharp-shinned Hawk (*Accipiter striatus*)	High canopy closure and large trees in addition to young, dense, even-aged stands	Potential habitat but no known nesting
Northern Goshawk (*Accipiter gentiles*)	Mature and old-growth forests; especially high canopy closure and large trees	Known presence and known nesting
Great Blue Heron (*Ardea herodias*)	Riparian edge habitats including lakes, streams, marshes and estuaries	No habitat
Great Gray Owl (*Strix nebulosa*)	Mature and old growth forests associated with openings and meadows	No habitat
Golden Eagle (*Aquila chrysaetos*)	Open ponderosa pine or mixed conifer	No habitat
Osprey (*Pandion haliaetus*)	Large snags associated with fish bearing water bodies	No habitat
Red-tailed Hawk (*Buteo jamaicensis*)	Large snags, open country interspersed with forests	Known presence but no known nesting
Waterfowl (See appendix A for species)	Lakes, ponds, streams	No habitat
Woodpeckers (See appendix A for species)	Snags and Down Wood	Known presence
Mammals		
American Marten (*Martes americana*)	Montane, mixed conifer and lodgepole pine habitats at higher elevations.	Potential habitat but no known presence
Elk (*Cervus elephas*)	Mixed habitats	Known presence
Mule Deer (*Odocoileus hemionus*)	Mixed habitats	Known presence
Townsend's big-eared Bat (*Corynorhinus townsendii*)	Mines, Caves, or Buildings	No habitat
Habitats		
Snags, Down Wood and Log Associated Species	Dead Wood Habitat	Associated with cavity nesters and marten
Special or Unique Habitat Associated Species	Springs, Seeps, cliffs, and talus slopes	Known presence

Appendix D identifies species documented on USFS administered lands within the Melvin Butte project area.

Those MIS species containing no habitat will not receive further analysis in this document. The Townsend's big-eared bat is analyzed with TES species.

Survey and Manage Species and Other Species Analyzed

Survey and Manage species are managed by the Deschutes National Forest Land and Resource Management Plan (LRMP), as amended. Management of these species occurs within the range of the northern spotted owl under the Northwest Forest Plan. These species were addressed where they occur under another category (i.e. TES, MIS, BCC etc.) if they were not they were addressed individually and listed as Northwest Forest Plan species.

In addition to MIS species, impacts need to be assessed for a number of wildlife species deemed as "species of concern" and habitats of concern either through the Northwest Forest Plan or through other directives (example Birds of Conservation Concern and the Landbird Strategic Plan). These habitats and species are listed in Table 96.

Table 96: Survey and Manage and Other Species Analyzed Summary for the Melvin Butte Project Area

Species	Habitat	Presence
Invertebrates		
Evening fieldslug	Wet areas: riparian, meadows, marshes	No Impact. Addressed in Sensitive species section
Crater Lake tightcoil	Perennially wet areas	No Impact. Addressed in Sensitive species section
Birds		
Birds of Conservation Concern-Landbird Strategy	Various Habitats	Known Presence
Great Gray Owl	Meadows and openings adjacent to densely treed habitat	No Habitat – addressed as MIS species
Mammals		
Roost Sites for Bats	Caves, Mines, Wooden Bridges, Buildings	Known presence

Birds – MIS

Northern Goshawk

Existing Condition

Source habitats for goshawk are old forest and unmanaged young forests in montane, lower montane, and riparian woodland communities. Important habitat attributes of goshawk prey species include snags, down logs, woody debris, large trees, openings, herbaceous and shrubby understories and an intermixture of various forest structural stages (Wisdom et al. 2000). During winter some goshawks may travel short distances to lower elevations and more open habitats in all upland woodland types (Wisdom et al. 2000) (USFS 2012).

From Wisdom et al. 2000 – "Goshawks nest in various forest structural conditions …nest stands are generally characterized by large trees and the densest canopy cover available within the area (Reynolds et al. 1992) but are occasionally located in small-diameter trees (Hayward and Escano 1989, Squires and Ruggiero 1996)." 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 (Hargis et al. 1994) (USFS 2012).

In general, goshawk nest areas are unique in structure, with large trees, dense canopies, and high canopy closure. Goshawk nesting habitat in eastern Washington and Oregon is generally composed of mature and older forests (McGrath et al. 2003). Nest stands are typically composed of a relatively high number of large trees, high canopy closure (>50%), multiple canopy layers, and a relatively high number of snags and downed wood (Finn 1994, McGrath et al. 2003) (USFS 2012).

The data from the BBS (Breeding Bird Survey) for the state of Oregon and the Great Basin Bird Conservation Region (BCR 9), due to the low detectability of this species using BBS methods, their relative abundance is low. The population trend for the BCR is "Possible to moderate population decrease." Partners in Flight (PIF) provides a population estimate database which provides estimates at a continental scale (including global or range-wide population estimates for North American species), population estimates for Bird Conservation Regions (or State portions), estimates for individual states and provinces, and estimates where BCRs overlap with states and provinces (Blancher et al. 2007). The Oregon portion of BCR 9 has only about 0.1% of the total global population and only 14% of the total BCR 9 population of northern goshawks. The detection rate is low (.0.01) for the BBC routes. However, the routes are generally along roads and simply record species observed. As noted earlier, goshawks are difficult to detect and prefer closed canopy forest where they are difficult to observe (USFS 2012).

The following is a potential list of threats due to habitat alteration (USFS 2012):

- Timber harvest is the principal threat to breeding goshawk populations (Squires and Reynolds 1997) due to their reliance on mature and old-growth timber, especially for nesting, although not exclusively (Marshall et al. 2006).
- Fire suppression may lead to increased susceptibility of stand-replacing fire and insect and disease outbreaks, which can result in the deterioration or loss of nesting habitat (Graham et al. 1999 as cited in NatureServe 2011, Wisdom et al. 2000).
- Loss of foraging habitat due to dense conifer understory as a result of fire suppression. Dense understories may obstruct flight corridors used by goshawks to hunt prey (Wisdom et al. 2000).
- Predation on goshawk by other raptors including Red-tailed hawk (*Buteo jamaicensis*), great horned owl (*Bubo virginianus*), and long-eared owl (*Asio otus*) which invade habitat following canopy reduction by logging (Crocker-Bedford 1990).
- Falconry - Goshawks can legally be taken for falconry in various states, including Oregon. Take by falconers is considered low; therefore it is thought to be a negligible threat.

In addition to habitat alteration, threats from disturbance due to logging activities conducted near nests during the incubation and nestling periods can cause nest failure due to abandonment (NatureServe 2011, Squires and Reynolds 1997). Also, high road densities may result in loss of snag and down wood habitat important to goshawk prey (Wisdom et al. 2000) (USFS 2012).

Surveys were complete using the Northern Goshawk Inventory and Monitoring Technical Guide (USDA 2006) within the Melvin Butte project area in 2009-2014. One active nest was located as a result of the surveys. Two historic nest sites occur within the project area and were active between 1998 and 2005 (NRIS Wildlife Database). One active goshawk nest site is documented within the project area. A 30+ acre nest core was identified around the nest tree that would be excluded from treatment. A 400 acres of post fledging area was also identified adjacent to the nest core

Through the Forest wide assessment completed for MIS, goshawk reproductive habitat was mapped across the entire Deschutes National Forest. Approximately 3,347 acres habitat occurs within the Melvin Butte project area, 5,346 acres within the Deep Canyon watershed, and 446,557 acres of habitat occurs across the Deschutes National Forest. Table 97 summarizes these acreages:

Table 97: Northern Goshawk Habitat within the Melvin Butte Project Area, Deep Canyon Watershed, and across the Deschutes National Forest.

Acres of Northern Goshawk Habitat in the Melvin Butte Project Area	Acres of Northern Goshawk Habitat in the Deep Canyon Watershed	Acres of Northern Goshawk Habitat Across the Deschutes National Forest
3,347 acres 0.7% of all goshawk habitat on the Forest	5,346 acres 1% of all goshawk habitat on the Forest	446,557 acres 28% of the entire Deschutes National Forest

For the detailed assessment on the Northern Goshawk for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

Measure: Acres of reproductive habitat affected.

Alternative 1 – No Action (Ecological Trend)

Areas that currently provide suitable goshawk habitat would most likely have increased mortality due to tree stress. Continued high stand densities would reduce the longevity of residual large trees structure that occurs in these stands. In the long-term, available nest trees would be limited and the future development of larger nesting trees would be prolonged. In stands of second growth ponderosa pine, short-term affects from high stand densities reduce the resiliency of these stands against bark beetle attack. The long-term affects from beetle outbreaks include high densities of small snags within project area and as a result lack the recruitment of large tree structure over time. Lack of large tree structure within the project area and watershed has been identified as limiting through the historic range of variability analysis (HRV) (USDA 2009).

Due to stand densities and increases in mortality, the risk of large scale stand replacement fire across the project area increases over time, potentially impacting high density stands that provide goshawk habitat reproductive habitat.

Stand resilience to insects and disease is measured by the Upper Management Zone (UMZ). The UMZ relates to the density of trees (basal area, trees per acre, etc.) a forest stand can support without significant mortality from bark beetles. The upper management zone is the density level at which trees begin to come under significant stress and can become susceptible to bark beetles and other insects and diseases. Stands above UMZ that are susceptible or show sign of insect and disease are typically high density, and therefore also typically at risk wildfire. Forest stands managed below the upper management zone are more resilient and less susceptible to wildfire. There are approximately 4,456 acres that have the potential to receive vegetation treatment. Under the existing condition 92% of these stands are above the Upper Management Zone and are at risk or currently be impact by insects and disease due to high stand densities.

High intensity crown fire has been a major cause of habitat reduction for the northern goshawk across the Sisters Ranger District over the last 10 years.

Overall, high stand densities would result in a decrease in tree vigor among all size classes. The most significant effect of high stand densities would be the gradual loss of the existing large-tree component/nesting habitat which is likely to be at a much higher rate than if stand densities were reduced to more sustainable levels.

Alternative 2 and 3- Direct and Indirect Effects

Thinning From Below (HTH), Mixed Conifer with Group Opening (MCGO), Mixed Conifer without Group Opening

These three treatment types all thin from below, but occur within different seral classes, plant associations, and geographical locations within the project area. Treatments associated with HTH are

commercial thinning from below and occur in ponderosa pine and mixed conifer stands. These stands contain mature or over-mature overstories with advanced stages of regeneration in the understory. HTH treatments would thin from below removing trees 8 inches dbh and larger.

MCGO and MC No Group Openings Treatments would commercially thin from below; removing trees 8 inches dbh and larger in the understory of mature ponderosa pine. Thinning would focus on removing white-fir and lodgepole pine understories to reduce the potential risk of crown fire. Within MCGO treatments, where the overstory is dominated by white-fir and lodgepole pine, small group opening would be created less than 3 acres in size and planted to ponderosa pine. This treatment would promote the development of future fire resistant stands. Group openings could be created in up to 30% of a given stand.

Thinning in suitable goshawk habitat would occur in both second growth ponderosa pine and multi-storied ponderosa pine and mixed conifer stands containing residual large trees. Thinning from below in HTH treatments would favor the largest ponderosa pine in pure pine stands. In MCGO and MC no group openings, thinning would favor ponderosa pine and healthy white-fir. The objective is a target basal area of 60 square feet but would vary across these stands. Different thinning scenarios exist depending on the existing basal area, site productivity, and stand structure objectives as well as differing slightly by alternative. This treatment aids in maintaining large trees by reducing their susceptibility to fire and insects by removing competition for space and nutrients. Thinning decreases stand densities and allows for faster growth of young trees while reducing risk (removal of ladder fuels). However, canopy cover is reduced overall resulting in more open stands which enhances foraging habitat. Negative impacts may result from the MCGO treatment due to overstory fragmentation associated with creating small group openings from the removal of all lodgepole pine and white-fir. However, due to the edge associated with the openings and the promotion of herbaceous vegetation rodent and ground nesting bird habitat would increase, potentially increasing a more diverse variety of foraging opportunities for the goshawk. In addition, beneficial impacts should result from reducing risk to existing suitable habitat and facilitate the development of future habitat by planting group openings to ponderosa pine.

Mowing and Burning Only (B)

Underburning would occur in stands with a more fire resistant overstory and fewer small (<9” dbh) trees than in small tree thinning units. Some thinning of small trees (up to 8” dbh) may be needed as a pre-treatment prior to using prescribed fire. Mowing of brush may also occur where existing brush density and height would contribute to undesirable fire behavior. This treatment aids in maintaining the overstory by reducing the susceptibility to wildfire and would favor longer-lived, more fire resistant species such as ponderosa pine. Beneficial impacts should result in more stable habitat over the long term. Negative impacts may result in the potential degradation of prey species habitat with the consumption/loss of some softer snags, down woody material, and brush.

Lodgepole Pine Improvement (LPI)

These treatments are primarily focused on the removal of lodgepole pine; however some white-fir exists and could potentially be removed as well. These treatments would remove trees with fading crowns and succumbing to beetle attacks or disease or both. The treatment would retain all trees with healthy crowns and the future stand would depend on understory regeneration. Goshawk reproductive habitat is not wide spread in this area with habitat found in small patches. Treatment would remove habitat but would reduce stand densities and the risk of beetle attack to the understory. Treatment would accelerate the development of even aged lodgepole pine over a 100 year period and although goshawks tend to prefer mixed conifer and ponderosa pine plant association groups for nesting, within this time period some areas could potentially provide some small inclusions of nesting habitat in the long-term.

Table 98 summarizes the amount of goshawk reproductive habitat affected by the action alternatives identified for the Melvin Butte project.

Table 98: Total Acres of Goshawk Reproductive Habitat Associated with Each Treatment Type by Alternative for the Melvin Butte Project.

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
B	492	492
HTH	802	907
MC – No Group Opening	-	442
LPI	135	135
MCGO	453	-
Total Acres.	**1,882**	**1,976**

Affects to goshawk habitat are similar under Alternatives 2 and 3. The outcome of the effects to goshawk habitat as a result of each treatment type is similar across both action alternatives; the only element that changes by alternative is the total acres of habitat treated. Treatments would reduce insect and disease levels and the risk of stand replacement wildfire.

Overall, approximately 1,882 acres of goshawk reproductive habitat are associated with treatments identified under Alternative 2 and approximately 1,976 acres under Alternative 3.

Loss of the large tree component would be slowed on treated acres as trees respond to the increased growing space resulting from thinning from below.

Overall within the LOS stands overstory structural diversity would remain, but understory complexity would be reduced through thinning, mowing, and burning. Although prey habitat would be reduced in the short-term residual habitat would remain providing foraging opportunities for the goshawk. Long-term benefits of treatments would be a reduction in stress to the overstory promoting longevity, but also promote the development of future old growth in the stands that would provide long-term nesting habitat.

There are approximately 4,456 acres would receive vegetation treatments. As a result of both action alternatives, 90% of these stands would be below the Upper Management Zone. Treatment would greatly increase stand resiliency to insects, disease, and wildfire through stand density reductions.

Alternative 2 and Alternative 3 - Cumulative Impacts

Activities identified in Table 98 were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to northern goshawks. The Deep Canyon watershed is being used as the scale for analysis for the northern goshawk. Based on that review, the potential cumulative impacts are discussed below.

Approximately 54 acres of ongoing fire salvage are associated with the Pole Creek Fire. Reasonably foreseeable fire salvage is also proposed for the Two Bulls fire totaling approximately 250 acres. These projects do not remove northern goshawk reproductive habitat.

The Ursus Hazardous Fuels Reduction Project is approximately 5,900 acres in size and affects approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to disrupt fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project would impact up to 1,839 acres of habitat, approximately 6% of the available habitat in the watershed, and 0.6% of the available habitat on the Deschutes National Forest.

The Bend Municipal Watershed Fuels Reduction and the Bear Wallow Fire Wood Projects are primarily associated with montane mixed conifer habitat and lodgepole pine, totaling approximately 910 acres. These projects are not likely associated with goshawk habitat and primarily propose to remove of beetle killed lodgepole pine and would not likely contribute to cumulative effects.

The Three Creeks Personal Use Firewood Cutting Area also occurs in the watersheds. This area occurs in both mixed conifer and lodgepole pine habitat types. Firewood cutting is not wide spread and primarily occurs where dead trees can be accessed from open roads. Although snags are cut and removed, removal occurs on an individual tree basis versus across the entire designated area. The area is approximately 3,029 acres. The majority of firewood removed is associated with beetle killed lodgepole pine and impacts to the goshawk would be incidental from firewood gathering.

Although treatments would enhance long-term habitat and would retain habitat connectivity throughout the project area, treatments are proposed within 35% of the total goshawk habitat within the Deep Canyon watershed. With the ongoing forest management projects within the Deep Canyon watershed there would be less than a 1% reduction in the overall habitat for the goshawk across the Deschutes National Forest. Table 99 provides a summary to northern goshawk reproductive habitat within the Melvin Butte, the Deep Canyon watershed, and across the Deschutes National Forest.

Table 99: Summary of impacts to Northern Goshawk reproductive habitat within the Melvin Butte project area, the Deep Canyon Watershed, and across the Deschutes National Forest ("Forest").

	Acres of Northern Goshawk Habitat in the Project Area	Acres of Northern Goshawk Habitat in the Deep Canyon Watershed	Acres of Northern Goshawk Habitat Across the Deschutes National Forest
Existing	3,347 acres 0.6% of all goshawk habitat on Forest	5,346 acres 7% of all goshawk habitat on Forest	446, 557 acres 28% of the entire Deschutes National Forest
Alternative 2 Alternative 3	-1,882 acres -1,976 acres -0.4% of all goshawk habitat on Forest	-1,882acres -1,976 acres -34-36% of all goshawk habitat in Watersheds	-0.4 % (Ursus) -0.4% (Melvin Butte) Of all habitat on Forest
Cumulative Total			0.8% reduction in goshawk nesting habitat on Forest

Conclusion

Cumulatively, this project impacts less than 1% of suitable habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The loss of habitat would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan, and thus continued viability of the goshawk is expected on the Deschutes National Forest.

Consistency with the Deschutes LRMP

Wildlife standards and guidelines WL-6, WL-10, and WL-11 will be assessed. The project is consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-6 – Nesting habitat for at least 40 goshawk pairs will be provided in mixed conifer, mtn. hemlock, and ponderosa pine forests outside wilderness.	Meets	Habitat is available across the Forest.
WL-10 – Locating new roads within nest	Not Applicable	No new road construction is proposed for

site stands will be avoided.		this project.
WL-11 – Nests will be protected within ¼ mile from disturbing activities.	Meets	Mitigation measures are in place for seasonal restriction around known nest sites and in the event a new nest site is found.

Cooper's and Sharp-shinned Hawks

Existing Condition

Cooper's Hawk

The Cooper's and sharp-shinned hawks are considered MIS species in the Deschutes LRMP. They often use dense cover in which to hunt and nest. In Oregon, Reynolds and Wight (1978) studied Cooper's hawk distribution, nest density, and productivity in 3 sub regions: 1) the Coast Range and the west slope of the Cascade Range, a moist, densely forested region with a mild maritime climate referred to as western Oregon; 2) southwestern Oregon, which includes the Siskiyou Mountains, characterized by relatively warm, wet winters and hot, dry summers; and 3) eastern Oregon (including the east slope of the Cascade range), a high elevation and more dry region with affinities to the Rocky Mountain forests. The tree species composition in the Bly study area (eastern Oregon) varied from pure stands of ponderosa pine at lower elevations, to mixed stands of ponderosa pine and white fir at mid-elevations, to mixed and pure stands of white fir and lodgepole pine at high elevations. Stands of all age classes in each timber type were represented; however the most common type was mature ponderosa pine overstory with mixed understory of ponderosa pine and white fir. As part of Reynolds and Wight's study from 1978, Reynolds et al. (1982) further studied Cooper's hawk habitat within the same geographic reference: Coast Range and eastern Oregon, including the west and east slopes of the Cascades, and the Wallowa, Blue, Ochoco, Bly, and Steen's mountains in eastern Oregon. Vegetational and physiographic characteristics of nest sites were obtained and the analysis concluded that this species nests in stands that resembled the even-aged, 2nd-growth stands in larger older trees (30-60 years old in the northwestern region and 50-70 years old in eastern Oregon), and have deep crowns. In northwestern Oregon, all nests except one (ponderosa pine) were in Douglas-fir stands, whereas in eastern Oregon ten nests were in ponderosa pine stands, five were in white fir stands, and three were in Douglas-fir stands. Also, Cooper's hawk nests in both regions were on horizontal limbs against the trunk (a few were out on limbs or in crotches of double trunks) and were either immediately below the nest-tree crown or in the lower portion of the crown. Nests in eastern Oregon were commonly in deformed trees infected by dwarf mistletoe and that had heavy foliage, witches brooms, or double trunks. Nest height and nest-tree height were nearly the same in both regions.

Based on the literature reviews in the state of Oregon, there are many similarities in the vegetation on the Deschutes National Forest (Forest) and nest-site selections of these characteristics are occurring. Differences are also apparent between study areas (i.e. the study area in eastern Oregon has more streams and creeks, and the topography is steeper versus some areas on the Forest; and southern Oregon has large expanses of oak where it is non-existent on the Forest), but similarities in forest composition occur. It is important to take this variability into account when making inferences about habitat use on the Forest from studies at other locations. (USFS 2012).

Only a few studies have investigated the foraging habitat of Cooper's hawks (Fischer 1986, Mannan and Boal 2000, Murphy et al. 1988). We know little of preferences for stands of differing densities, ages, tree sizes, or edge versus deep forests by Cooper's hawks (Reynolds 1989). However, they appear to use available forests opportunistically provided that the available types are not too dense for flight below or within the canopy (Reynolds 1989). (USFS 2012).

Nature Serve identified Cooper's hawk as secure at the global and national scale, and apparently secure in the state of Oregon. It was not identified on the Federal and State Sensitive species list, *Birds of Conservation Concern list*, Oregon Conservation Strategy, or the Partners in Flight lists. (USFS 2012).

The following is a potential list of threats due to habitat alteration for the Cooper' hawk (USFS 2012):

- Timber harvest - Treatments such as commercial and non-commercial thinning, shelterwood and clearcut harvesting, where it reduces crown cover and dense forest. Impacts to habitat will be unique from site to site due to the varying structure of the forest.
- Recreation - Habitat loss from developed and dispersed recreation, as well as new transportation routes associated with new facilities.
- Livestock grazing-Annual removal of prey habitat from grazing.
- Mining - Habitat loss from removal of forest in developing the mine. Disturbance to adjacent habitat from operations.
- Prescribed fire - Prescribed burns simulate natural forms of disturbance that occur periodically across the landscape. These forms of disturbance are likely to be important in providing future nest sites for Cooper's hawks.
- Fire suppression - Results of fire suppression include an increase in tree density and an increased likelihood of crown fires. How increased tree density affects Cooper's hawks should depend on the degree that tree density increases. If tree density is too high, it could interfere with the ability of the Cooper's hawk to fly and hunt. However, increased tree density in some areas might improve the quality of the habitat for nesting. High-intensity crown fires are presumed to be the most deleterious consequence of fire suppression. Crown fires result in vast stand-replacing disturbances with significant habitat loss in ponderosa pine cover types, but especially in lodgepole pine cover types and in mixed conifer.
- Invasive plant establishment - Cheatgrass (Bromus spp.) could be a problem for Cooper's hawk and their prey species. This species invades areas after a disturbance and leads to the rapid accumulation of highly flammable fuel, shortening the fire-free interval. Fires occur more frequently, causing a decline in some perennial grass species, further favoring cheatgrass expansion. The result is a loss in the heterogeneity of the landscape, potentially lowering prey diversity and availability.
- Fuelwood harvest - Fuelwood harvest could adversely affect habitat if snags are removed that are used as perch sites or prey species habitat or cause disturbance during the breeding season.
- Falconry - Cooper's hawks can legally be taken for falconry in various states, including Oregon. Take by falconers is considered low; therefore it is thought to be a negligible threat.

Sharp-shinned Hawks

As part of Reynolds and Wight's study from 1978, Reynolds et al. (1982) further studied sharp-shinned hawk habitat within the same geographic reference: Coast Range and eastern Oregon, including the west and east slopes of the Cascades, and the Wallowa, Blue, Ochoco, Bly, and Steen's mountains in eastern Oregon. All nest sites in eastern Oregon were in even-aged stands of white fir (7), Douglas-fir (1), ponderosa pine (1), or aspen (1). The vegetative structure was essentially the same as in the even-aged nest sites in northwestern Oregon, with the exception that tree density and diameter were less uniform in eastern Oregon. The analysis concluded that this species nested in stands of 3 different vegetative structures: most nests (81%) were in young (25-50 years), even-aged conifer stands with single-layered canopies; 2 nests (13%) were in old-growth (200+years) stands of conifers with multilayered canopies; and 1 nest was in a dense stand of stunted quaking aspen. Sharp-shinned hawk nests in both regions were placed in the denser portion of the lower canopy against the trunk or in a crotch of a double or split trunk. (USFS 2012)

Based on the literature reviews for the state of Oregon there are many similarities in the vegetation on the Deschutes National Forest (Forest), including the characteristics of nest-site selections. Differences are also apparent between study areas (i.e. the study area in eastern Oregon has more streams and creeks, and the topography is steeper versus some areas on the Forest; and southern Oregon has large expanses of oak where it is non-existent on the Forest), but similarities in forest composition occur. It is important to take this variability into account when making inferences about habitat use on the Forest from studies at other locations. (USFS 2012)

Few telemetry studies have been performed on sharp-shinned hawks, therefore little information is available on foraging habitat. From observations of prey species deliveries to nests, Reynolds and Meslow (1984) estimated that sharp-shinned hawks foraged primarily in the upper canopy zone. However, Clarke (1984) and Joy (1990) observed that sharp-shinned hawks did forage near the ground. Joy et al. (1994) reported that of 11 sharp-shinned hawk nest sites, mature aspen was the most common (8 of 11) vegetation within a 2 km circle around the nest, mixed aspen-conifer was the most common "secondary" habitat (9 of 11), and conifer forest was the most "limited" habitat type. Platt (1973) monitored a male sharp-shinned hawk with radio-telemetry and observed that the male primarily hunted in a clonal-oak grassland community. The author suggested the males' attraction to this community was related to high food availability. (USFS 2012)

Nature Serve identified sharp-shinned hawk as secure at the global and national scale, and apparently secure in the state of Oregon. It was not identified on the Federal and State Sensitive species list, Birds of Conservation Concern list, Oregon Conservation Strategy, or the Partners in Flight lists. (USFS 2012).

Threats to the sharp-shinned hawk are similar to those addressed for the Coopers' hawk (USFS 2012).

Comparisons Of Sharp-Shinned Hawk, Cooper's Hawk, and Northern Goshawk Habitat

Several studies have compared nesting habitat use between coexisting Accipiter's in North America (Fischer 1986, Kennedy 1988, Moore and Henny 1983, Reynolds et al. 1982, Reynolds 1983, Siders and Kennedy 1996, Trexel et al. 1999, Wiggers and Kritz 1991). Where these species coexist, a relationship occurs in which tree height and DBH of nest trees increases in proportion to Accipiter body size (Kennedy 1988, Reynolds et al. 1982, Siders and Kennedy 1996). For example, sharp-shinned hawk nest sites in Oregon were characterized as dense, 40 to 60-year-old even-aged conifer stands while Cooper's hawk nest sites were 50 to 80year-old conifer stands with somewhat larger, more widely spaced trees, and goshawk nest sites were dense, mature conifer stands with varying densities of mature, overstory trees (Reynolds et al. 1982). However, high interspecific overlap occurs between the species in the use of nest site characteristics such as basal area, canopy cover, and tree density (Kennedy 1988, Moore and Henny 1983, Siders and Kennedy 1996). Siders and Kennedy (1996) observed large overlaps between Cooper's hawk and goshawk nest site characteristics while Moore and Henny (1983) reported large overlaps between Cooper's hawk and sharp-shinned hawk nest site characteristics. (USFS 2012)

Surveys were conducted during goshawk monitoring. No detections or nests were identified within the project area. No historic nest sites were identified within the project area. There is one data base record identifying a general observation of a Cooper' hawk within the project area. (NRIS Wildlife Database)

Through the Forest wide assessment completed for MIS, Cooper's and sharp-shinned hawk reproductive habitat was mapped across the entire Deschutes National Forest.

Approximately 1,824 acres of Cooper's hawk habitat exists within the project area. Approximately 11,026 acres of habitat occur within the Deep Canyon watershed, and approximately 275,340 acres of habitat occurs across the Deschutes National Forest.

Approximately 2,215 acres of sharp-shinned hawk habitat exists within the project area. Approximately 14,304 acres of habitat occur within the Deep Canyon watershed, and approximately 426,138 acres of habitat occurs across the Deschutes National Forest.

Table 100 and Table 101 summarize habitat acreages for both Cooper's and sharp-shinned hawks:

Table 100: Cooper's Hawk Habitat within the Melvin Butte Project Area, Deep Canyon watershed, and Across the Deschutes National Forest

Acres of Cooper's Hawk Habitat in the Melvin Butte Project Area	Acres of Cooper's Hawk Habitat in the Deep Canyon Watershed	Acres of Cooper's Hawk Habitat Across the Deschutes National Forest
1,824 acres 0.6% of all the Coopers' hawk habitat on the Forest	11,026 acres 4% of all the Coopers' hawk habitat on the Forest	275,340 acres 17% of the entire Deschutes National Forest

Table 101: Sharp-shinned Hawk Habitat within the Melvin Butte Project Area, Watershed, and Across the Deschutes National Forest

Acres of Sharp-shinned Hawk Habitat in the Melvin Butte Project Area	Acres of Sharp-shinned Hawk Habitat in the Deep Canyon Watershed	Acres of Sharp-shinned Hawk Habitat Across the Deschutes National Forest
2,215 acres 0.5 % of all the sharp-shinned hawk habitat on the Forest	14,304 acres 3% of all the sharp-shinned hawk habitat on the Forest	426,138 acres 26% of the entire Deschutes National Forest

For the detailed assessment on the Cooper's and sharp-shinned hawk for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

Measures: Acres of reproductive habitat affected.

Alternative 1 – No Action (Ecological Trend)

Habitat conditions would remain the same in the short-term. Stand densities would continue to increase due to fire suppression. This would increase the amount of potential reproductive habitat for both species over time due to increasing canopy closures. However, with increased stand densities comes increased risk of loss from disturbance events (insects, disease, or fire). These events would likely impact the densest stands the greatest due to the stand conditions which would result in reduced availability of suitable habitat in the project area.

Areas that currently provide suitable habitat would most likely have increased mortality levels due to tree stress in the long-term. Without treatments stand densities would reduce the longevity of residual old growth and large tree structure that occurs in these stands. In the short-term high density stands of second growth ponderosa pine and plantations with advanced regeneration, due to overstocking and high amounts of mistletoe, the mistletoe would reduce the resiliency of these stands against bark beetle attack. In the long-term, the second growth stands and plantations would likely contain bark beetle outbreaks and high densities of small snags would occur within the project area, and habitat would diminish.

Due to stand densities and increases in mortality overtime, the risk of large scale stand replacement fire across the project area increase over time, potentially impacting high density stands that provide Cooper's and sharp-shinned reproductive habitat.

Stand resilience to insects, disease, and wildfire is measured by the Upper Management Zone (UMZ). The UMZ relates to the density of trees (basal area, trees per acre, etc.) a forest stand can support without significant mortality from bark beetles. The upper management zone is the density level at which trees begin to come under significant stress and can become susceptible to bark beetles and other insects and diseases. Forest stands managed below the upper management zone are more resilient. There are approximately 4,456 acres that have the potential to receive vegetation treatment. Under the existing condition, 92% of these stands are above the Upper Management Zone and are at risk or currently be impacted by insects and disease due to high stand densities and as a result low resiliency.

Over the long term high stand densities would result in a decrease in tree vigor among all size classes reducing canopy closure and nesting habitat for both the Cooper's and sharp-shinned hawks.

Alternative 2 and 3- Direct and Indirect Effects

Thinning From Below (HTH), Mixed Conifer Thinning From Below with and without Group Opening (MCGO and MC without openings), Non-commercial Thinning (P), Lodgepole Improvement (LPI), and Scenic Views Enhancement

Thinning in suitable habitat would occur in both second growth ponderosa pine and multi-storied mixed conifer stands. Thinning (8" dbh and up) from below would favor the largest ponderosa pine in pure pine stands. In mixed conifer stands, thinning would favor ponderosa pine and healthy white-fir. The objective is an average basal area of 40 to 120 square feet in these stands. Different thinning scenarios exist depending on the existing basal area, site productivity, and stand structure objectives. These treatments aid in maintaining the largest trees where they exist and reduce their susceptibility to fire and insects by removing competition for space and nutrients. Thinning decreases stand densities and allows for faster growth of young trees while reducing risk (removal of ladder fuels). However, canopy cover is reduced overall resulting in more open stands which may directly impact the Coopers' and sharp-shinned hawk habitat by removing reproductive habitat.

Within mixed conifer stands with group openings treatments, although the residual basal area would range between 40 and 120 square feet, in areas dominated by white-fir and impacted by insects and disease, small group openings would be created from 1-3 acres in size. This has the potential to reduce nesting habitat but could provide added foraging opportunities due to edge habitat and openings that would enhance rodent and ground nesting bird prey bases. Group openings would be planted to ponderosa pine, creating more contiguous block of fire resilient and sustainable mixed conifer stands in the long-term.

Within the Scenic Views Enhancement and LPI Treatments primarily dead and dying trees are targeted for removal. The Scenic Views Treatment is designed to enhance scenic quality the Forest Road 16 corridor. The treatment would not reduce suitable reproductive habitat but remove individual fire killed trees (<8 in dbh), addressing fuel conditions created by the 2012 Pole Creek Fire. The LPI Treatment would not remove reproductive habitat but would remove disease and insect ridden trees within green stands; the objective is to slow insect and disease spread to residual green stands that remain after the last beetle outbreak in the area. Residual reproductive habitat would be retained.

Mowing and Burning Only (B)

Underburning would occur in stands with a more fire resistant overstory and fewer small (<9" dbh) trees than in small tree thinning units. Some thinning of small trees (up to 8" dbh) may be needed as a pre-treatment to fire. Mowing (mastication) of brush may also occur where existing brush density and height would contribute to undesirable fire behavior. These treatments would reduce fuels associated with thinning and overall fuel loadings to acceptable levels. Fuel treatments would reduce fire risk and would reduce competition to established trees, further increasing the stands resiliency to wildfire. Mowing and

burning would be utilized as a primary stand treatment as well as a secondary follow up treatment where thinning is needed. Fuels treatments would reduce the understory complexity which may result in a change or reduction in potential prey species for both Cooper's and sharp-shinned hawks. However, adjacent untreated areas may be able to provide the structural complexity for prey species that would maintain and provide potential foraging opportunities for both Cooper's and sharp-shinned hawks.

Table 102 provides a summary of the amount of Coopers' hawk reproductive habitat affected by the action alternatives identified for the Melvin Butte project. Table 103 provodes a summary of the amount of Sharp-shiined reproductive habitat affectd by the action alternatives identified for the Melvin Butte project.

Table 102: Total Acres of Coopers' Hawk Reproductive Habitat Associated with Each Treatment Type by Alternative for the Melvin Butte Project.

Treatment Type	Alternative 2 (acers)	Alternative 3 (acres)
B	186	186
HTH	342	390
MC – No Group Opening	-	301
LPI	104	104
MCGO	309	-
P	310	310
Scenic Views Enhancement	162	162
Total Acres	**1,413**	**1,453**

Table 103 Total Acres of Sharp-shinned Hawk Reproductive Habitat Associated with Each Treatment Type by Alternative for the Melvin Butte Project.

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
B	236	236
HTH	381	432
HTH – No Group Opening	-	403
LPI	133	133
MCGO	415	-
P	355	355
Scenic Views Enhancement	175	175
Total Acres	**1,695**	**1,734**

Affects to Cooper's and sharp-shinned hawk habitat are similar under Alternatives 2 and 3. The outcome of the affects to habitat as a result of each treatment type is the same across both action alternatives; the only element that changes by alternative are the total acres of habitat treated. Alternative 3 was developed to address the key issues of mixed conifer thinning with small group openings and removal of large overstory trees containing dwarf mistletoe. As a result, there is a net decrease in the total acres of Cooper and sharp-shinned hawk reproductive habitat that is treated in Alternatives 3. Therefore affects to reproductive habitat by alternative is similar, since the same prescriptions would be implemented under each alternative. Total acres of reproductive habitat treated would change by alternative.

The project area and habitat varies greatly from north to south due to the increase in elevation, the rain gradient associated with the change in elevation, and the site potential associated with the inherent soil quality within this north to south pattern. To capture the importance of habitat variation across the project area, the project area was broken up into 3 areas containing high, medium and low site potential based on inherent soil quality. A habitat retention strategy for interior forest species was defined using a standard based on spotted owl dispersal habitat. This criteria retains a minimum tree size and canopy cover to provide nesting habitat for all accepters. The retention strategy identified a range of retentions levels for dispersal habitat across the project area. Within stands containing low site productivity, untreated stands

would be retained at a 10% level; in the areas with moderate site productivity untreated stands would be retained at a15% level; and in areas that have the highest site productivity untreated stands would be retained at the 20% level. Retention would occur on a stand by stand basis to retain areas that contain the highest densities of contiguous habitat with a stand average of a minimum of 11 inches dbh and exceeding 40% canopy closure.

Overall, approximately 1,413 acres of Coopers' hawk reproductive habitat are associated with treatments identified under Alternative 2, and approximately 1,453 acres under Alternative 3.

Overall, approximately 1,695 acres of sharp-shinned reproductive habitat are associated with treatments identified under Alternative 2, and approximately 1,734 acres under Alternative 3.

All treatments described would aid in the development of a more disturbance resilient landscape.

The Cooper's and sharp-shinned hawks are smaller accipiter' and therefore can utilize younger stands that offer seclusion and structure for nest support than the much larger goshawk which needs larger trees for nest support and overhead canopy to make the larger bird more discreet. Potential nesting habitat for both species would most likely develop within proposed units within 20-40 years. In the short-term, untreated stands would provide dispersal, foraging, and potential nesting habitat.

Foraging habitat would not necessarily decrease in acreage, but would decrease in quality due to mechanical shrub treatment or prescribed fire. For Cooper's and sharp-shinned hawks, the reduction of shrubs from mowing activities can impact prey species like ground dwelling small mammals and shrub/ground nesting passerines. These ground dwelling species depend on the shrubs for nesting and hiding cover from predators. This activity would reduce the amount of available habitat for some Cooper's and sharp-shinned hawk prey species, potentially reducing areas utilized by them for foraging as well as minimizing the availability of prey within suitable nesting areas.

In the short-term, Alternative 2 affects the fewest number of acres of habitat for sharp-shinned hawk and Cooper's Hawk and provides a complexity of treatment types to develop more fire resistant mixed conifer and ponderosa pine stands while retaining both nesting and foraging habitat.

Alternative 2 and Alternative 3 - Cumulative Impacts

Activities identified in Table 14 and the wildlife report were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to Cooper's or sharp-shinned hawks. The Deep Canyon watershed is used as the scale for analysis for these two species. Based on that review, the potential cumulative impacts are those discussed below.

The Pole Creek Fire Timber Salvage is currently salvaging 54 acres within the Deep Canyon watershed as well as the ongoing salvage of danger trees associated with major routes. In addition, the Bend Ft. Rock Ranger District is proposing to salvage approximately 250 acres within the Two Bulls Fire area. Salvage is occurring or would occur within stand replacement fire areas. Therefore, no Coopers' or sharp-shinned hawk habitat would be affected by either project.

The Ursus Hazardous Fuels Reduction project is approximately 5,900 acres in size and approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to disrupt fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project would impact up to 1,464 acres of habitat for the Coopers hawk and up to 2,837 acres of habitat for the Sharp-shinned hawk. Approximately 7% of the available Coopers hawk habitat and up to 10% of the available sharp-shinned hawk habitat could be impacted at the watershed level; however not all of which occur in the Deep Canyon Watershed. Overall, the Ursus project could potentially impact approximately 0.5% of

the available Coopers hawk and 0.6 % of the available Sharp-shinned hawk habitat on the Deschutes National Forest.

Activities proposed under the Bend Municipal Watershed Fuels Reduction and the Bear Wallow Firewood Projects have occurred or may occur in suitable habitat. Fuels reduction treatments focus on removing dead lodgepole pine among green stands to reduce fuel loading. Overall, treatments proposed would reduce the risk of loss of existing habitat from future large-scale disturbances. However, stand density reduction would occur over approximately 910 acres within these projects and could reduce suitable habitat.

The Three Creeks Personal Use Firewood Cutting Area also occurs in the watersheds. This area occurs in both mixed conifer and lodgepole pine habitat types. Firewood cutting is not wide spread and primarily occurs where dead trees can be accessed from open roads. Although snags are cut and removed, removal occurs on an individual tree basis versus across the entire designated area. The area is approximately 3,029 acres. The majority of firewood removed is associated with beetle killed lodgepole pine and impacts to the Coopers and sharp-shinned hawks would be incidental from firewood gathering.

An estimated 11,026 acres of potentially suitable Coopers' hawk reproductive habitat and approximately 14,304 acres of potentially suitable sharp-shinned hawk reproductive habitat exist within the Deep Canyon watershed remain after the impacts of the fires and ongoing vegetation management projects are taken into account

Although treatments would enhance long-term habitat, the Melvin Butte project does propose treatments within currently suitable Coopers' and sharp-shinned hawk reproductive habitat. Under the Alternatives 2 and 3 treatments are associated within approximately 12%-13% of Cooper's hawk and sharp-shinned hawk habitat in the Deep Canyon watershed. With the ongoing forest management projects within the Deep Canyon watershed, there would be less than a 1% reduction in the overall habitat for the Cooper's and sharp-shinned hawk across the Deschutes National Forest. Table 104 provides a summary of reproductive habitat effects for Copper's hawk and sharp-shinned hawk at varies scales.

Table 104: Summary of impacts to Cooper's hawk and sharp-shinned reproductive habitat within Melvin Butte Vegetation Management project area, and Deep Creek watershed, and across the Deschutes National Forest

	Acres of Habitat in the Project Area	Acres of Habitat in the Watersheds	Acres of Habitat Across the Deschutes National Forest
Existing Copper's hawk Sharp-shinned hawk	1,824 acres 2,215 acres	11.026 acres 14,304 acres	275,340 acres 426,138 acres 17%-27% of the entire Deschutes National Forest, respectively
Alternative 2 Cooper's hawk Sharp-shinned hawk	-1,413 acres -0.5% of all habitat on Forest -1,695 acres -0.6% of all habitat on Forest	-1,413 acres -12% of all habitat in Watersheds -1,695 acres -12% of all habitat in Watersheds	-0.5% (Ursus) -0.5 % (Melvin Butte) -0.6% (Ursus) -0.4 % (Melvin Butte)
Alternative 3 Cooper's hawk	-1,453 acres	-1,435 acres	-0.6% (Ursus)

Sharp-shinned hawk	-0.5% of all habitat on Forest -1,734 acres -0.6% of all habitat on Forest	-13% of all habitat in Watersheds -1,734 acres -12% of all habitat in Watershed	-0.4% (Melvin Butte) -0.4% (Ursus) -0.6% (Melvin Butte)
Cumulative reduction in nesting habitat on Forest Coopers hawk Sharp-shinned hawk			1.0% 1.0%

Conclusion

Cumulatively, this project impacts less than 1% of suitable habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The loss of habitat would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan, and thus continued viability of both Cooper's and sharp-shinned hawk is expected on the Deschutes National Forest.

Wildlife standards and guidelines WL-13, WL-18, WL-19, WL-21, WL-27 and WL-28 will be assessed. The project is consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-13/21 – Nesting habitat for at least 60 pairs of Coopers hawks and 60 pairs of sharp-shinned hawks will be provided in mixed conifer and ponderosa pine forests outside wilderness.	Meets	Habitat is available across the Forest.
WL-18/27 – Locating new roads within nest site stands will be avoided.	Not Applicable	No new road construction is proposed for this project.
WL-19/28 – Nests will be protected within ¼ mile from disturbing activities.	Meets	Mitigation measures are in place for seasonal restrictions in the event a new nest site is found.

Great Gray Owl – Survey and Manage, NWFP, MIS

Existing Condition

This species was identified in the Northwest Forest Plan (NWFP) as a Survey and Manage species requiring surveys in 2001. A Regional survey protocol was developed in 1995 and was updated in January of 2004 (Version 3.0). An amendment to the NWFP occurred in 2001 which moved the great gray owl from a protection buffer species to a Category C species. This category contained uncommon species for which pre-disturbance surveys are practical.

Great gray owl (GGO) nest stands vary in stand type ranging from mixed stands of ponderosa pine and lodgepole pine to mixed conifer. Within these stands, optimum nesting habitat canopy cover ranges from 50-70%. Nest stands are generally associated with open forest containing canopy closure that ranges from 11-59% dominated with grasses, open grassy habitat, including bogs, selective and clear-cut logged areas, and natural meadows (Bull and Henjum 1990). The LRMP defines this owl's habitat as being: lodgepole pine dominated overstory, overstory tree density of 67 trees per acre for trees greater than 12 inches diameter at breast height, canopy cover of 60% (50-70%), and distance to nearest meadow 440 (63-1,070ft.) feet (LRMP WL-31). There is habitat within the proposed project area that is associated with grassy openings or natural meadows.

The NWFP states "the great gray owl, within the range of the northern spotted owl, is most common in lodgepole pine forests adjacent to meadows. However, it is also found in other coniferous forest types. Specific mitigation measures for the great gray owl, within the range of the northern spotted owl, include

the following: provide a no-harvest buffer of 300 ft. around meadows and natural openings and establish ¼ mile protection zones around known nest sites" (Page C-21). Great gray owls have a home range size of approximately 1,000-2,000 acres (Natureserve 2015).

No habitat occurs for the Great gray owl within the Melvin Butte project. The Melvin Butte would not affect the great gray owl. Therefore, the Melvin Butte project would not contribute to a negative trend in viability on the Deschutes national Forest.

Red-tailed Hawk

Existing Condition

The red-tailed hawk is an abundant species occupying a variety of open to semi-open habitat types and can tolerate ranging elevations, alpine to sea level. However, they generally avoid tundra and dense, unbroken forests (DeGraaf and Rappole 1995, Timossi and Barrett 1995). Preferred habitats are open to semi-open coniferous, deciduous and mixed forests, forest edges, grasslands, parklands, rangelands, river bottomlands, and agricultural fields with scattered trees (Gilligan et al.1993, Johnsgard 1990, Timossi and Barrett 1995, DeGraaf and Rappole 1995, Marshall et al. 2003, NatureServe 2011). Forest clearings, alpine meadows, estuaries, marshes, agricultural lands, clear cuts, sagebrush plains, and high elevation environments are also used, though less commonly (Gilligan et al.1993, Timossi and Barrett 1995, Marshall et al. 2003, NatureServe 2011). (USFS 2012)

Limiting factors in preferred habitat selection are availability of suitable perches and hunting grounds open enough to locate and catch ground prey (NaturerServe 2011, Fitch et al. 1946, Janes 1984, Janes 1994). Perches can be any object that provides an unobstructed view of a red-tailed hawk territory. These objects are usually high and can be natural (e.g. tree, snag, cliff, rock, or man-made, e.g. utility pole, tower, fence) (Janes 1984, Janes 1994, Fitch et al 1946, NatureServe 2011). In the Fitch et al. (1946) study, perches were an essential aspect in red-tailed hawk territories. The perches were used for foraging, roosting, resting, mating, and defending territories. The Janes (1984) study found pairs that establish territories with more perches tend to rear more young. (USFS 2012)

Nesting occurs in large mature trees, usually at a forest edge or near an opening in canopy (Fitch et al. 1946, Moorman et al. 1996, Timossi and Barrett 1995, DeGraaf and Rappole 1995). Nests are usually placed higher in trees verses other raptors, and are generally in the largest, tallest tree available or smaller deformed trees where branch structure supports this higher placement (DeGraaf et al. 1991, Timossi and Barrett 1995, DeGraaf and Rappole 1995, La Sorte et al. 2004). Red-tailed hawks seem to prefer nesting trees with open crowns. The placement of a nest is usually next to the trunk of a tree in a crotch or fork from 30 to 90 feet (9-27 m) above the ground (DeGraaf et al. 1991, Verner and Boss 1980, Timossi and Barrett 1995). Nests are often reused from year to year provided the nest is not occupied by earlier nesting raptors and is in suitable condition (Fitch et al. 1946, DeGraaf and Rappole 1995, Tesky 1994). In treeless areas, nests are built on artificial nest structures, the crossbars of utility poles, and towers (Timossi and Barrett 1995 DeGraaf and Rappole 1995, Marshall et al. 2003, NatureServe 2011). Occasionally, red-tailed hawks will use and add material to an existing raven, crow, gray squirrel, or large accipiter nest. La Sorte et al. (2004) found steep slopes are an important factor for a nest site. The steep slope allows for easy entry to the nest from above the canopy layer, allowing for unobstructed views of surrounding area and protection from the slope. Red-tailed hawks will use the same nest for multiple years, particularly if the nest is in suitable location and suitable condition (Fitch et al. 1946, Young 1989 in Tesky 1994). (USFS 2012)

On the Deschutes National Forest, past harvest activities had produced habitat conditions favorable for red-tailed hawks by clear-cutting stands adjacent to mature and late-seral stands. This provided open areas for foraging adjacent to potential roosting and nesting habitat. Due to the age of the clear cuts, many have grown in with trees and shrubs diminishing foraging availability of the red-tailed hawk.

The red-tailed hawk is not on any federal, state, or other conservation lists. Globally, the population is increasing and has no significant threats (NatureServe 2011). Nationally, the population is increasing or stable in most areas (NatuerServe 2011). In Oregon, the red-tailed hawks are secure; the population is not decreasing (NatureServe 2011). (USFS 2012)

Through the Forest wide assessment completed for MIS, red-tailed hawk reproductive habitat was mapped across the entire Deschutes National Forest. Approximately 1,048 acres of habitat exists within the project area. Approximately 2,424 acres habitat occurs within the Deep Canyon watershed, and approximately 192,492 acres of habitat occurs across the Deschutes National Forest. Table 105 summarizes these acreages.

Table 105: Red-tailed Hawk Habitat within the Melvin Butte Project Area, Deep Canyon Watershed, and Across the Deschutes National Forest.

Acres of Red-tailed Hawk Habitat in the Melvin Butte Project Area	Acres of Red-tailed Hawk Habitat in the Deep Canyon Watershed	Acres of Red-tailed Hawk Habitat Across the Deschutes National Forest
1,048 acres 0.5% of all the red-tailed hawk habitat on the Forest	2,424 acres 1% of all the red-tailed hawk habitat on the Forest	192,492 acres 12% of the entire Deschutes National Forest

For the detailed assessment on the red-tailed hawks for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

Measure: Acres of reproductive habitat affected.

Alternative 1 – No Action (Ecological Trend)

Under the No Action Alternative suitable nest trees that occur within dense stands would most likely have increased mortality due to tree stress. Without treatments in the second growth stands, stand densities will prolong the future development of larger nesting trees. These high density stands would remain susceptible to bark beetle activity and the susceptibility would increase over time. High stand densities would result in the overall decrease in tree vigor among all size classes. The most significant effect of high stand densities would be the gradual loss of the existing large-tree component/nesting habitat that is likely to occur as a faster rate than if the stand densities were reduced making stands more resilient to insects, disease, and wildfire.

Alternative 2 and 3- Direct and Indirect Effects

Thinning From Below (HTH), Dwarf Mistletoe (DM), Prescribe Burning (B), Non-Commercial Thinning (P)

These treatments would retain and enhance nesting habitat, and associated large tree structure (i.e. trees >21" dbh). Both alternatives have the potential to increase foraging areas for red-tailed hawks by thinning from below (under 21" dbh) and potentially increase access to prey at ground level. Thinning from below would decrease the stress to the larger overstory trees, thus retaining potential nest sites for the long-term (>20 years). Treatments in early and mid-seral stands would promote and accelerate the development of LOS.

Under Alternative 2 DM treatments would thin trees containing mistletoe to reduce the rate of spread on 63 acres of identified habitat. This treatment would occur in old plantation where 4-14 trees per acre greater than 21 inches dbh occur. Trees infested with dwarf mistletoe would be removed or girdled and left as snags. Approximately 4 snags per acre would be created from trees containing dwarf mistletoe, potentially retaining habitat within the 63 acres.

Non-commercial thinning would occur in plantations; thinning would reduce small tree densities (<8" inches dbh). Nesting habitat exists in stands that contain individual old growth trees retained as seed trees. No large trees would be removed from these areas. In its current condition foraging is very limited; thinning would enhance foraging habitat by allowing better access to the forest floor and rodent populations.

The reduction of shrubs from mowing and burning as a follow up to thinning and units identified as Prescribed Burning Only could impact prey species of ground dwelling small mammals (ground squirrels, cottontails, voles, and pocket gophers). These ground species depend on the shrubs for hiding cover from predators and forbs for food. This treatment would reduce the amount of available habitat for red-tailed hawk prey species, potentially reducing areas utilized for foraging as well as minimizing the availability of prey within nesting areas. Impact from mowing and burning are short in duration (<10 years) and would provide a high diversity of prey habitat (grasses, forb and shrubs).

In addition, during prescribed fire treatments incidental snags could be lost reducing large snags that provide nesting opportunities, but live trees may also be converted to snags due to burning. Mortality of snags in ponderosa pine habitat during prescribed fire treatments in Arizona and California ranged from 20% (Randall-Parker and Miller 2002), 45% (Horton and Mannan 1988), and 56% (Bagne et al. 2008). All three studies found that larger diameter ponderosa pine trees were least likely to die, at least in the short-term. Horton and Mannan (1988) found a 20-fold increase in abundance of snags <15 cm dbh. Several studies showed that the highest snag losses were in areas where a long period of fire exclusion had occurred (Bagne et al. 1988, Holden et al. 2006). Bagne et al. (2008) and Horton and Mannan (1988) found that re-entry burns had a much lower mortality rate for snags, presumably because the trees that did not burn during the first entry were more resilient. Loss of snags from prescribed fire was partially mitigated by the creation of new snags (Horton and Mannan 1988, Bagne et al. 2008). Table 106 displays the total acres of red-tailed hawk reproductive habitat associated with each treatment type and alternative.

Table 106: Total Acres of Red-tailed hawk Reproductive Habitat Associated with Each Treatment Type by Alternative

Treatment	Alternative 2 (acres)	Alternative 3 (acres)
B	201	201
DM	63	
HTH	374	438
P	160	160
Total Acres Affected	**798**	**799**

Impacts to habitat would be minimal but treatments would promote the development of LOS stands, providing large trees and red-tailed hawk habitat in the long-term. Affects to red-tailed hawk habitat are similar under Alternative 2 and 3. The outcome of the affects to habitat as a result of each treatment type is consistent across all action alternatives.

Alternative 2 and Alternative 3 – Cumulative Effects

Activities identified in Table 14 and the wildlife report were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to red-tailed hawk reproductive habitat. The Deep Canyon watershed is used as the scale for analysis for this species. Based on that review, the potential cumulative impacts are those discussed below.

The Pole Creek Fire Timber Salvage Project is ongoing and is salvage logging approximately 54 acres cumulative effects table for wildlife cumulative effects table for wildlife and the Pole Creek Fire Danger Tree Removal project is salvage logging incidental danger trees along major routes within the Deep

Canyon Watershed. These projects propose to remove large snags greater than 21 inches dbh but would retain 6 of the largest snag per acre within salvage units. The Two Bulls Fire Timber Salvage Project is ongoing, salvage logging approximately 250 acres. No large snags over 21 inches dbh and no suitable green nest trees over 21 inches dbh are proposed for removal.

The Ursus Hazardous Fuels Reduction Project is approximately 5,900 acres in size and includes approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project does not propose to treatment in red-tailed hawk reproductive habitat; therefor there are no cumulative effects associated with this project.

Activities proposed under the Bend Municipal Watershed Fuels Reduction project and the Bear Wallow Firewood projects have occurred or may occur in suitable habitat. Fuels reduction treatments focus on removing dead lodgepole pine among green stands to reduce fuel loading and do not propose to remove large trees >20 inches dbh that could provide suitable nest trees. The projects do not focus on removing large trees >20 inches dbh. Overall, treatments proposed would reduce the risk of loss of existing habitat from future large-scale disturbances over approximately 910 acres.

The Three Creeks Personal Use Firewood Cutting Area also occurs in the watersheds. This area occurs in both mixed conifer and lodgepole pine habitat types. Firewood cutting is not wide spread and primarily occurs where dead trees can be accessed from open roads. Although snags are cut and removed, removal occurs on an individual tree basis versus across the entire designated area. The area is approximately 3,029 acres. The majority of firewood removed is associated with beetle killed lodgepole pine. No large ponderosa pine snags can lawfully be removed. Impacts to the red-tailed hawk would be incidental from firewood gathering.

An estimated 2,424 acres of potentially suitable red-tailed hawk reproductive habitat exist within the Deep Canyon watershed after the impacts of the fires and ongoing vegetation management projects are taken into account

The Melvin Butte project proposes treatments within approximately 799 acres of suitable reproductive habitat that. All treatments would retain suitable habitat but would reduce tree densities by thinning from below. Within the DM treatments individual live trees >21 inches ponderosa pine could be removed across the associated 63 acres but would enhance long-term habitat by removing diseased trees that are infecting future stands. Populations are expected to increase within the Deep Canyon watershed as a result of treatments that reduce the risk of insects, disease, and stand replacement fire to existing suitable habitat. In addition, thinning from below would accelerate the development of future LOS enhancing habitat across the watershed in the long-term.

Although treatments would enhance long-term habitat, the Melvin Butte project would treat areas within currently suitable red-tailed hawk reproductive habitat. Treatments under Alternatives 2 and 3 would occur within approximately 32% of red-tailed hawk habitat in the Deep Canyon watershed. With the ongoing forest management projects within the Deep Canyon watershed, there would be less than a 1% reduction in the overall habitat for the red-tailed hawk across the Deschutes National Forest. Table 107 provides a summary of the impacts to red-tailed reproductive habitat in the Melvin Butte project area, the Deep Canyon watershed, and across the Deschutes National Forest.

Table 107: Summary of impacts to red-tailed hawk reproductive habitat within the Melvin Butte project area, Deep Canyon watershed, and across the Deschutes National Forest ("Forest").

	Acres of Red-tailed Hawk Habitat in the Project Area	Acres of Red-tailed Hawk Habitat in the Watersheds	Acres of Red-tailed Hawk Habitat Across the Deschutes National Forest
Existing	1,048 acres 0.5% of all nesting habitat on Forest	2,424 acres 1% of all nesting habitat on Forest	192,492 acres 12% of the entire Deschutes National Forest
Alternatives 2 & 3	-798 to 799 acres -0.4% of all nesting habitat on Forest	-798 to 799 acres -32% of all nesting habitat in Watersheds	-0.4% of all nesting habitat on Forest (Melvin)
Cumulative Total			Total (Melvin) 0.4% reduction in nesting habitat on Forest

Conclusion

The Melvin Butte project does not propose treatments that would highly degrade suitable red-tailed hawk reproductive habitat. Under Alternatives 2 and 3 ponderosa pine >21 inches dbh would be retained; thinning would focus on smaller trees as well as less desirable tree species. Cumulatively this project impacts less than 1% of suitable habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat in the short term. The loss of habitat would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan, and thus the continued viability of the red-tailed hawk is expected on the Deschutes national Forest.

Consistency with the Deschutes LRMP

Wildlife standard and guidelines WL-2 and WL-3 will be assessed. The project is consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-2 – Maintain forested character at least 300 feet surrounding active nest sites.	Meets	There are no known nests within the project area. If a nest is located, measures will be incorporated to meet this standard.
WL-2 – While timber management may occur, maintain at least 4 dominant overstory trees per acre suitable for nest and perch trees, favoring ponderosa pine.	Meets	Snag retention guidelines will be in place to provide for large snag structure. Large green trees expected to live will not be removed with this project.
WL-3 – Seasonal restrictions will be in effect for disturbing activities within ¼ mile of active nests.	Meets	Mitigation measures are in place in the event a nest site is found.

Big Game

Existing Condition

Deer: The most important deer habitats in Eastern Oregon are summer habitat, including areas needed for reproductive activities and winter habitat. Preferred summer habitat provides adequate forage to replace body reserves lost during winter and to maintain normal body functions. Summer habitat also includes areas specifically used for reproductive purposes. These areas must have an adequate amount of succulent vegetation, offering highly nutritional forage. In addition, areas used for reproduction should provide isolation from other deer, security from predators and minimal competition from other ungulates. Summer habitat areas are common throughout Eastern Oregon, and can be found in areas varying from lowland agricultural lands to high elevation mountain areas. Winter habitat is found predominately in lower elevation areas of Eastern Oregon. These areas usually have minimal amounts of snow cover and

provide a combination of geographic location, topography, and vegetation that provides structural protection and forage. Due to the low nutritive values of available forage during the winter, deer are forced to rely on their body reserves acquired during the summer for winter survival. (ODFW 2002). (USFS 2012).

The entire Melvin Butte project area is within mule deer summer range. Deer summer range was identified within the Land and Resource Management Plan in forested stands at higher elevations which mule deer occupy from late spring to late fall. High quality forage is essential in summer range, providing nutrients for antler growth, milk production for lactating does, providing energy for the breeding season in late fall and maintaining reserves to assist with winter survival. This type of high quality forage is provided by the development of nutrient rich early seral forbs and shrubs. High quality forage is produced by prescribed fire and wildfires, and tree thinning which open stands enhancing shrub and forb production by reducing shade.

Two primary standards and guidelines associated with summer range include hiding cover and open road densities. Hiding cover is a habitat attribute which provides escapement from predation as well as avoidance from harassment potential by hunters and other recreation use. Road densities are used to mitigate habitat impacts from vegetation management, and where hiding cover standards and guidelines cannot be met, road densities are used to further eliminate disturbance from an area. The guidelines for hiding cover states, "Hiding area must be present over 30% of National Forest Land in each implementation unit, resulting in 70% of each implementation unit existing as a hiding area or within 600 feet of a hiding area. Black bark stands will not be used to measure conformance." A separate set of guidelines are used to address "Black Bark Pine Management" which are second growth pine stands 60-80 years old. These stands provide very poor quality hiding cover due to the lack of horizontal structure and a single age class of trees. (USFS 2012)

The project is within the Upper Deschutes Wildlife Management Unit (WMU) designated by Oregon Department of Fish and Wildlife. The population objective for mule deer within this WMU is 2,200 wintering deer. Although there has been a precipitous drop in population from 1990 to 2011, buck to doe ratios continue to meet Management Objectives (M.O.) and therefore allowable harvest has not changed from 2,200 available tags. However, due to the decline in the population and low fawn recruitment, very minimal antlerless harvest occurs. (USFS 2012)

The conservation status based on the Nature Serve ranking indicate the mule deer is secure globally, nationally, and state wide. (USFS 2012).

The following is a potential list of threats to mule deer habitat identified within their range in the intermountain west as well as the Deschutes National Forest (USFS 2012):

- Vegetative species composition has been modified - Invasive plants replacing native shrubs.
- Vegetative structure has been modified - In the absence of fire, the expansion of juniper woodlands reducing diversity of understory grasses, forbs, and shrubs.
- Nutritional quality has decreased – as plants mature and are not regenerated through a disturbance, the nutritional quality also diminishes.
- Usable habitat has been lost and fragmented due to human encroachment and associated activities – due to urbanization, towns are expanded and developments are built within historic winter range areas. Gas and oil expansion also affects migration and habitat loss. On a local level, due to the size of the Central Oregon Community, motor vehicle collisions and traffic volume have created barriers to mule deer migration and removed segments of the population.

- Poaching- removal of individuals from the population due to poaching is the largest loss of deer above all in Central Oregon.

Table 108 addresses standards and guides outside of Deer Management Area 7 (Mule Deer Summer Range) specific to the management of functional summer range habitat:

Table 108: Deer Summer Range Standard and Guidelines.

Hiding Cover: 30% Suitable hiding cover must meet one of the following criteria.	**Open Road Densities**	**Black Bark: 10% of treated stand will be in clumps to provide visual screening throughout and meet the following criteria**
Six acre or larger stand capable of hiding 90% of a standing adult deer at 200 feet.	≤ 2.5 mi. per sq. mile	A minimum of ½ acre in size which have not been thinned or harvested for at least 20 years. Small clumps will be suitable in dense stands but larger (4 or 5 acre) clumps may be needed in more open stands.
Six acres or larger stand with an average height of 6 feet and has not been thinned in 15 years		Clumps will be dispersed throughout the unit so that visual screening is provided by the clumps in a combination with topographic features.
Residual clumps of ½ acre or larger stands within units with advanced regeneration and at least 12 greater than 7 dbh per acre remaining after harvest. Clumps should be located away from roads.		

Through the Forest wide assessment completed for MIS, mule deer hiding cover within the summer range was mapped across the entire Deschutes National Forest. Within the analysis area, approximately 3,394 acres of hiding cover occurs throughout the project area. Approximately 16,999 acres of hiding cover occurs within the Deep Canyon Watershed and approximately 715,226 acres of hiding occurs across the Deschutes National Forest. Table 109 summarizes these acreages.

Table 109: Mule Deer Hiding Cover within the Melvin Butte Project Area, Deep Canyon Watersheds, and Across the Deschutes National Forest.

Acres of mule deer hiding cover in the Melvin Butte Project Area	**Acres of hiding cover in the Deep Canyon Watershed**	**Acres of hiding cover Across the Deschutes National Forest**
3,394 acres 0.4% of all the mule deer hiding cover on the Forest	16,999 acres 2% all the mule deer hiding cover on the Forest	715,226 acres 44% of the entire Deschutes National Forest

The Melvin Butte project is associated with the Deep Canyon watershed. Within the summer range associated with the watershed, on average, open road densities are about of 3.04 miles per square miles.

Within the watershed, approximately 16,999 acres are identified as summer range. Approximately, 50% of the watershed exists as hiding cover.

Current open road densities within the Melvin Butte project area are about 5.98 miles per square mile.

Current hiding cover exists over 63% of the Melvin Butte project area.

For the detailed assessment on the Mule Deer for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

Elk: The Deschutes National Forest has one primary allocation for the management of elk habitat. Eleven Key Elk Habitat Areas (KEHAs) occur across the forest to provide optimum habitat conditions for both summering and wintering elk herds. No KEHAs occur within the Melvin Butte project area and therefore no specific standards and guides apply to the project. Although elk do occur within the project area they are very limited in number. Management of hiding cover and open road densities for mule deer would also provide cover and security for this small population of elk. No further analysis of elk habitat will be addressed in this document.

Measures:

1. ***Acres of hiding cover affected.***
2. ***Miles of open road densities reduced.***

Alternative 1 – No Action (Ecological Trend)

Sumer range habitat is the most important habitat since it provides the basis of building fat reserves for mule deer, keeping animals healthy and alive through the winter months.

Without treatment, it is expected that hiding cover would increase in the short-term due to increases in stand densities. In the long-term, as stands mature and stand densities increase so do the risks of insects, disease, and wildfire which has been identified as a major factor contributing to the loss of hiding cover across the Forest. Over the last 10 years, more than 100,000 acres of stand replacing fire has occurred on the Deschutes National Forest, severely impacting cover in the short-term. Disturbance species, such as ceanothus, provide increased forage opportunities. Forage is only beneficial to deer for approximately 10-15 years after which nutrient levels diminish and the forage is no longer beneficial. Shrubs begin to dominate burned stands and provide cover, but in many areas with broken terrain, shrubs are not robust enough to provide viable cover. In the long-term, viable forage in these burned areas can be drastically reduced if fire is not utilized to promote a continuous cycle of regenerating shrubs, and cover is reduced until regenerating stands are once again able to provide hiding cover.

Alternative 2 and 3- Direct and Indirect Effects

Ponderosa Pine Dwarf Mistletoe Treatments (DM), Non-commercial Thinning (P), Thinning From Below (HTH), Mixed Conifer Thinning From Below with Group Openings (MCGO), Mixed Conifer Thinning From Below without Group Openings (MC without openings)

Small tree thinning associated with non-commercial thinning in plantations and thinning understories in dwarf mistletoe treatment areas would reduce dense understories and result in a reduction of hiding cover. The size of hiding cover patches would be decreased and there would be greater distances between these patches. This may result in deer being more visible to predators and hunters and may result in higher mortality rates. It would also decrease the thermal cover properties of these patches by altering the microsite climate (warmer in the summer). However, treatments would open up the stands allowing more sunlight to hit the forest floor, which may stimulate herbaceous plant growth increasing summer foraging opportunities.

Thinning from below is associated with HTH and MC - Without Group Openings treatments and would result in similar impacts as non-commercial thinning. However, there would be additional removal of larger trees, which would reduce hiding cover. Reduction in overhead canopy would also result in increased snow depths making the transition to winter range slightly more difficult with early snows.

Mixed conifer thinning from below with group opening treatments would result in high edge to cover ratios, which is favorable to big game. This would result in forage being in close proximity to cover especially if openings are small (1 to 3 acres in size). Forage quality would be increased in the openings which would increase summer foraging opportunities.

Prescribed Burning (B)

Underburning, which may include mowing, may impact forage quality and quantity as well as hiding cover in the short-term. Mowing and burning in high shrub areas would reduce summer forage opportunities. However, mowing/underburning of shrubs would reduce the amount of late seral shrubs that have low nutrient levels, stimulating new growth and developing early seral vegetation rich in nutrients, aiding the mule deer in fat storage for the winter months. The project area contains predominantly late seral ceanothus in the higher elevations with inclusions of mid seral manzanita and bitterbrush at the lower elevations. Mowing/underburning would reset large areas to early seral shrubs of bitterbrush and ceanothus stimulating the growth of herbaceous plant material, increasing summer foraging opportunities for the next 10 years. This treatment may also reduce down logs across the project area. Down logs provide cover opportunities for bedding at night and security for fawns while does are away foraging.

Lodgepole Pine Improvement (LPI)

In these areas the mountain pine beetle has been active over the last 15 years. This treatment proposes to remove trees that have fading crowns and are dying from insects and disease reducing spread to adjacent green stands. The objective is to reduce the rate of spread of disease and insects, enhancing the longevity of the green stands. Activities would not remove hiding cover; however removing fading trees could potentially retain residual hiding cover for a longer period of time. Hiding cover would continue to develop in this area as the lodgepole pine regenerates over the next 10 years providing contiguous stands of hiding cover.

Table 110 summarizes the amount of deer hiding cover associated with each action alternative identified for the Melvin Butte project area.

Table 110: Total Acres of Mule Deer Hiding Cover Associated with each Treatment Type by Alternative.

Treatment Type	Alternative 2	Alternative 3
B	483	483
DM	65	-
HTH	587	653
MC – No Group Opening	-	662
LPI	184	184
MCGO	722	-
P	439	439
Total Acres.	**2,480**	**2,421**

Affects to deer hiding cover are similar under Alternatives 2 and 3. The outcomes of the affects to cover as a result of each treatment type are consistent across both action alternatives. Due to the changes in each alternative to address key issues, the ranges of treatments vary by alternative and directly reflect the total amount of deer cover that would be treated. The LPI Treatment would not remove cover and therefore would not contribute to the cover calculation by alternative.

Approximately 719 acres of hiding cover would be retained without treatment under Alternative 2 and approximately 779 acres under Alternative 3.

Overall, approximately 2,480 acres of hiding cover would be degraded under Alternative 2 which would maintain 13% hiding cover across the project area and approximately 2,421 acres would be degraded under Alternative 3 maintaining 14% hiding cover.

Lastly, approximately 6 miles of road are proposed to be decommissioned in the action alternatives. This would reduce road densities in the project area from 5.98 mile/sq. mile to 4.66 miles/sq. mile. Road decommissioning would reduce road densities limiting the amount of motorized disturbance to deer within the project area, maximizing habitat effectiveness in the newly created foraging areas.

Alternative 2 and Alternative 3 – Cumulative Effects

Activities identified in Table 14 and the wildlife report were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to big game. The Deep Canyon watershed is being used as the scale for analysis for big game, in particular mule deer summer range and the effects to cover. The potential cumulative impacts are discussed below.

The Pole Creek Fire Timber Salvage and the Two Bulls Timber Salvage Projects and associated danger tree removal are ongoing. The Pole Creek Timber Salvage Project ongoing logging is associated with approximately 54 acres and the Pole Creek Fire Danger Tree Removal project is salvage logging incidental danger trees along major routes. The Two Bulls Timber Salvage Project is ongoing and is associated with approximately 250 acres. No hiding cover would be removed under either of the salvage projects.

The Ursus Hazardous Fuels Reduction Project is approximately 5,900 acres in size and includes approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to break up the fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project would reduce up to 3,617 acres of hiding cover; however not all of hiding cover occurs within the Deep Canyon Watershed. Approximately 10% of the available hiding cover would be reduced within the associated watersheds, and approximately 0.5% of the available hiding cover would be reduced on the Deschutes National Forest.

Activities proposed under the Bend Municipal Watershed Fuels Reduction and the Bear Wallow Firewood Projects have occurred or may occur in areas containing suitable hiding cover. Fuels reduction treatments focus on removing dead lodgepole pine among green stands to reduce fuel loading and do not propose to thin dense stands of regenerating trees that provide the higher quality hiding cover.

The Three Creeks Personal Use Firewood Cutting Area also occurs in the watershed. This area occurs in both mixed conifer and lodgepole pine habitat types. Firewood cutting is not wide spread and primarily occurs where dead trees can be accessed from open roads. Although snags are cut and removed, removal occurs on an individual tree basis versus across the entire designated area. The area is approximately 3,029 acres. No hiding cover would be removed that is associated with firewood cutting.

Of the 3,394 acres of hiding cover identified within the project area Alternative 2 would treat approximately 2,480 acres and Alternative 3 would treat approximately 2,421 acres of hiding cover, reducing hiding cover in the watershed. Approximately, 42% of the watershed would exist as hiding cover under both alternatives post treatment, exceeding Forest Plan standards and guidelines of 30%.

Road densities are in excess of Forest Plan standards and guidelines for deer summer range. The project would decommission approximately 6 miles of road reducing road densities in the watershed. Although the average road density would still exceed Forest Plan standards and guidelines the project would

continue to move road densities toward those standards and guidelines. Table 111 provides as summary of mule deer hiding cover relative to the project.

Table 111: Summary of impacts to mule deer hiding cover within the Melvin Butte project area, Deep Canyon watershed, and across the Deschutes National Forest ("Forest')

	Acres of hiding cover in the Project Area	Acres of hiding cover in the Watershed	Acres of hiding cover across the Deschutes National Forest
Existing	3,394 acres 0.5% of all hiding on Forest	16,999 acres 2% of all hiding cover on Forest 50% of watershed is hiding cover	715,226 acres 45% of the entire Deschutes National Forest
Alternatives 2 and 3	-2,480 acres Alt. 2 -2,421 acres Alt. 3 -0.3% of all hiding cover On Forest	-2,489 acres Alt. 2 -2,421 acres Alt. 3 -14% of all hiding cover in watershed	-0.3% of all hiding cover on Forest -0.5% due to Ursus project
Cumulative Total		42% of the watershed is in hiding cover	0.8% reduction in hiding cover on Forest

Conclusion

The Melvin Butte project is within the Upper Deschutes herd management unit identified by the Oregon Department of Fish and Wildlife. Although the overall population of mule deer has dropped far below management objective, the buck to doe ratio annually meets ODFW objective of 15 bucks per 100 does. Limiting factors for mule deer population as identified within MIS Assessment for Mule Deer are provision of quality forage and hiding cover. Summer range habitat is critical for mule deer, where large areas of early seral browse in areas of limited disturbance is extremely important to build fat reserves needed to get deer through the rut and the directly following winter months. (USFS 2012)

The No Action Alternative could affect mule deer and their habitat due to lack of early seral forage within the project area and in the watershed. In the event of a wildfire, areas of early seral forage could be created, but due to road densities all security cover could be lost and deer would be more vulnerable to disturbance and predation.

The action alternatives have the potential to benefit mule deer summer habitat. Through prescribed fire treatments, thinning with group openings, and thinning from below with prescribed fire as a follow up treatment, treatments would open stands creating early seral vegetation providing new areas of summer forage. Hiding cover is maintained through project design, maximizing forage production and providing screening cover for animals to disperse through the project area. Lastly, existing road closures and road decommissioning would further reduce disturbance, increasing the habitat effectiveness of newly created foraging areas. In the long-term Alternative 2 is the most proactive in developing big-game habitat. Treatments are designed to provide long-term foraging opportunities while retaining existing hiding cover and developing future hiding cover throughout summer habitat.

Treatments associated with the Melvin Butte project would retain 42% of the hiding cover within the summer range associated with the Deep Canyon Watershed. This exceeds the Deschutes LRMP standards and guidelines. The overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The loss of habitat would be insignificant at the Forest scale. The Melvin Butte project is

consistent with the Forest Plan, and thus continued viability of the mule deer is expected on the Deschutes National Forest.

Consistency with the Deschutes LRMP

Wildlife standard and guidelines WL-52 through WL-59 will be assessed for deer. The project is consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-52 – Provide conditions to support at least 2200 deer within the Upper Deschutes Unit.	Meets	Closing roads to reduce human disturbance.
WL-53 – Target open road densities are 2.5 miles per square mile to achieve deer summer range habitat effectiveness targets.	Moving Towards	Resulting open road densities are still above the recommended densities. However, this project will continue to decommission 6 miles of roads contributing to road density reductions.
WL-54 – Hiding areas must be present over at least 30% of National Forest land in each implementation unit.	Meets	Hiding cover will exist over approximately 42% of the Deep Canyon Watershed.
WL-55 – Hiding areas will be dispersed throughout the implementation unit.	Meets	Residual untreated stands are retained throughout the project area.
WL-56 - Travel corridors will be provided by linking stands (to assist in meeting hiding cover needs).	Meets	Untreated stands were designated to provide connectivity throughout the project area.
WL-57 – Hiding areas are assumed to provide suitable thermal cover conditions on summer range.	Meets	Untreated stand exceed canopy cover and tree heights to provide thermal cover.
WL-58 – If possible, a narrow strip of trees should be left along roads to reduce view distances.	Meets	Thinning will be implemented in a mosaic fashion to retain small untreated clumps and will be integrated with retention stands. Therefore retaining screening along roads.
WL-59 – Approximately 10% of treated black bark pine stands will be in clumps that will provide visual screening throughout the area.	Meets	Mosaic thinning and untreated stands of black bark pine will be retained exceed the retention standards for black bark ponderosa pine. No wildlife clumps will be left within the 600' defensible space corridor along the private property boundary of Cascade Forest.

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 impact of their actions on migratory birds, and to take active steps to protect birds and their habitats. Federal agencies were required within two years 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 planning processes whenever possible. To meet this goal in part the U.S. Fish and Wildlife Service developed the Birds of Conservation Concern released in December 2002 (USFWS 2002) and an update to the original list was released in 2008 (USFWS 2008a).

Birds of Conservation Concern are species, subspecies, and populations of all migratory non-game birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973. Birds of Conservation Concern encompasses three distinct geographical scales – North American Bird Conservation Initiative (NABCI) Bird Conservation Regions (BCRs), USFWS Regions, and the National scale which represents species that have the highest conservation priorities in the United States, including the island "territories" in the Pacific and Caribbean.

Bird species considered for inclusion on lists in this report include non-game birds, game birds without hunting seasons, subsistence-hunted non-game species in Alaska, landbirds, shorebirds, waterbirds, and Endangered Species Act candidate, proposed endangered or threatened, and recently delisted species. While all of the bird species included in 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 conserve avian diversity in North America and includes preventing or removing the need for additional ESA bird listings by implementing proactive management and conservations actions (USFWS 2008a). The 2008 lists were derived from three major bird conservation plans: the Partners in Flight North American Landbird Conservation Plan, the United States Shorebird Conservation Plan, and the North American Waterbird Conservation Plan. Conservation concerns stem from population declines, naturally or human-caused small ranges or population sizes, threats to habitat, or other factors.

Bird Conservation Regions (BCRs) were developed based on similar geographic parameters and are the basic units within which all bird conservation efforts should be planned and evaluated (USFWS 2008a). One BCR encompasses the Melvin Butte project area – BCR 9, Great Basin. Table 112 provides a list of the bird species of concern for the area, the preferred habitat for each species, and whether there is potential habitat for each species within the Melvin Butte project area.

Table 112: BCR 9 (Great Basin) BCC 2008 list

Bird Species	Preferred Habitat	Habitat within the Melvin Butte Project Area (Y or N)
Greater Sage Grouse (Columbia Basin DPS)	Sagebrush dominated Rangelands	No
Eared Grebe (non-breeding)	Open water intermixed with emergent vegetation	No
Bald Eagle	Lakeside with large trees	No
Ferruginous Hawk	Elevated Nest Sites in Open Country	No
Golden Eagle	Elevated Nest Sites in Open Country	No
Peregrine Falcon	Cliffs	No
Yellow Rail	Dense Marsh Habitat	No
Snowy Plover	Dry Sandy Beaches	No
Long-billed Curlew	Meadow/Marsh	No
Marbled Godwit	Marsh/Wet Meadows	No
Yellow-billed Cuckoo	Dense riparian/cottonwoods	No
Flammulated Owl	Ponderosa pine forests	Yes
Black Swift	Cliffs associated with waterfalls	No
Calliope Hummingbird	Open mountain meadows, open forests, meadow edges, and riparian areas	No
Lewis's Woodpecker	Ponderosa pine forests	Yes
Williamson's Sapsucker	Ponderosa pine forests /Mixed Conifer Large Snags	Yes
White-headed Woodpecker	Ponderosa pine forests	Yes
Loggerhead Shrike	Open country with scattered trees or shrubs	No

Pinyon Jay	Juniper, juniper-ponderosa pine transition, and ponderosa pine edges	No
Sage Thrasher	Sagebrush	No
Virginia's Warbler	Scrubby vegetation within arid montane woodlands	No
Green-tailed Towhee	Open ponderosa pine with dense brush	No
Brewer's Sparrow	Sagebrush clearings in coniferous forests/bitterbrush	No
Black-chinned Sparrow	Ceanothus and oak covered hillsides	No
Sage Sparrow	Unfragmented patches of sagebrush	No
Tricolored Blackbird	Cattails or Tules	No
Black Rosy Finch	Rock outcroppings and snowfields	No

Landbird Strategic Plan

The Forest Service prepared a Landbird Strategic Plan (USDA 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 with the Oregon-Washington Chapter of Partners in Flight participated in developing publications 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), A Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Oregon and Washington was published in March 2000 (Altman and Holmes 2000), and A Conservation Strategy for Landbirds in the Northern Rocky Mountains of Eastern Oregon and Washington was published in May 2000 (Altman 2000). These documents outline conservation measures, goals and objectives for specific habitat types found on the east-slope of the Cascades and the focal species associated with each habitat type. These documents provide recommendations for habitat management. The East-Slope Cascades Strategy covers the Deschutes National Forest and the Melvin Butte project and the Forest is contained within the Central Oregon subprovince. Table 113 provides a list for specific habitat types highlighted in these documents, the habitat features needing conservation focus and the focal bird species.

A Conservation Strategy for Landbirds of the East-slope of the Cascade Mountains in Oregon and Washington

Table 113: Priority habitat features and associated focal species for the East-Slope Cascade Strategy

Habitat	Habitat Feature	Focal Species for Central Oregon	Habitat within the Project Area (Y or N)
Ponderosa Pine	Large patches of old forest with large snags	White-headed woodpecker	Yes
	Large trees	Pygmy nuthatch	Yes
	Open understory with regenerating pines	Chipping sparrow	Yes
	Patches of burned old forest	Lewis' woodpecker	Yes
Mixed Conifer (Late-Successional)	Large trees	Brown creeper	Yes
	Large snags	Williamson's sapsucker	Yes
	Interspersion grassy openings and dense thickets	Flammulated owl	Yes
	Multi-layered/dense canopy	Hermit thrush	Yes

	Edges and openings created by wildfire	Olive-sided flycatcher	Yes
Lodgepole Pine	Old growth	Black-backed woodpecker	Yes
Whitebark Pine	Old growth	Clark's nutcracker	No
Meadows	Wet/dry	Sandhill Crane	No
Aspen	Large trees with regeneration	Red-naped sapsucker	No
Subalpine fir	Patchy presence	Blue Grouse	No

Cavity Nesters (Woodpeckers) on the Deschutes National Forest

In addition, the Deschutes LRMP identifies all Cavity Nesting Birds that occur on the Forest as a Management Indicator Species. There are 11 species of cavity nesters that occur on the Deschutes National Forest. Table 114 contains the list of bird species.

Table 114: Cavity Nesters (Woodpeckers)

Habitat	Species	Habitat Occurs in the Melvin Butte Project Area (Y or N)
Lodgepole pine - old growth	Black-backed woodpecker	Yes
Deciduous/mixed deciduous and conifer or riparian - Aspen or riparian cottonwood	Downy woodpecker	No
Ponderosa pine/mixed conifer - open stand open canopies	Hairy woodpecker	Yes
Ponderosa pine - burned forest	Lewis' woodpecker	Yes
Various conifer forest habitats - open stands large tree structure, forest edges	Northern flicker	Yes
Mixed conifer-Late seral Grand fir/white-fir type, multi-layered canopy	Pileated woodpecker	Yes
Aspen with ponderosa pine - Riparian aspen or cottonwood	Red-breasted sapsucker	No
Aspen - large trees with regeneration	Red-naped sapsucker	No
Sub-alpine and alpine forests- old forests of lodgepole pine, grand-fir/white-fir, Engelmann spruce/subalpine fir, whitebark pine, and mountain hemlock. Also post fire habitats	Three-toed woodpecker	No
Ponderosa pine - old growth forest with large snags	White-headed woodpecker	Yes
Mixed Conifer - large trees	Williamson sapsucker	Yes

Following effects analysis address potential impacts to Bird of Conservation Concern, Land Bird Focal Species and MIS woodpecker. The bald eagle, white-headed and Lewis' woodpeckers were addressed in Biological Evaluation for TES species and therefore would not be addressed in this effects analysis.

In order to use the best available science for analyzing effects to dead wood (snags and logs), at least 12,800 acres of a habitat type are necessary (see Appendix D). The overlapping Deep Canyon watershed does not contain this amount of lodgepole pine or eastside mixed conifer habitats; therefore a second watershed was added: the adjacent Whychus watershed. The Whychus watershed is very large, making up a large portion of the southern end of the Sisters Ranger District. Effects using this watershed would be focused on the lodgepole pine and eastside mixed conifer habitats. These watersheds comprise the habitat types the proposed actions are treating in scales that would meaningfully represent any cumulative effects (e.g. species territory size, connectivity to habitat across the Forest). Only National Forest System lands would be analyzed within the "zone of influence"; private lands are not managed for snag and log habitat nor Management Indicator Species. Habitat for each identified species associated with the project area would be discussed on a Forest wide basis to address species viability as it relates to Management Indicator Species.

Ponderosa Pine – Large Trees and Snags – Pygmy Nuthatch and Chipping Sparrow

Existing Condition

The pygmy nuthatch is a resident of ponderosa pine forests east of the Cascades but outside the breeding season, is found just outside the ponderosa pine zone. Pygmy nuthatch use cavities excavated by woodpeckers or those formed by decay in both live and dead trees for nesting and roosting, but nest primarily in live trees (Marshall et al. 2003). The Pygmy nuthatch is closely associated with mature or old growth ponderosa pine forests but may be found in mixed conifer forests dominated by ponderosa pine and excavate their own nest cavities. The Pygmy nuthatch forages on the outer branches in the upper canopy on needle clusters, cones, and emerging shoots with some limited foraging on bark. (Marshall et al. 2003). Risks to this species include loss of mature ponderosa pine forests, fire suppression resulting in overstocked stands and reduced snag recruitment, salvage logging, and chemical use (Marshall et al. 2003).

The chipping sparrow is an uncommon to common summer resident preferring open habitats with a shrub or grass component. Chipping sparrows prefer open coniferous forests or stands of trees interspersed with grassy openings or low foliage (Marshall et al. 2003 pp. 538-540). In central Oregon, good numbers of chipping sparrows can be found in juniper, ponderosa pine, and lodgepole pine communities but are not present in sagebrush (Marshall et al. 2003 pp. 540-542). This sparrow breeds in scattered locations in the Cascades and throughout higher elevations of eastern Oregon. The diet of this sparrow is not well known. A study conducted for central Oregon (Eastman 1960 in Marshall et al. 2003) shows a preference for weed seeds. Declines in populations have been noted from Breeding Bird Survey (BBS) results (1966-2000) for the chipping sparrow showing a 3.9% decrease per year. Some reasons for this decline includes habitat changes due to fire suppression resulting in closed canopy habitat, cowbird parasitism, and competition with house sparrows and house finches.

The conservation status based on the Nature Serve ranking indicate the pygmy nuthatch is secure at globally, nationally, and state wide. (USFS 2012)

The conservation status based on the Nature Serve ranking indicate the chipping sparrow is ranked as Least Concern globally, nationally, and state wide.

Habitat for these species occurs throughout the Deschutes National Forest. Approximately 316 acres of habitat exists within the project area. Approximately 21,025 acres of habitat occurs within the Deep Canyon and Whychus Watersheds and approximately 198,330 acres of habitat occurs across the Deschutes National Forest. Table 115 summarizes these acreages:

Table 115: Reproductive habitat for the pygmy nuthatch and chipping sparrow within the Melvin Butte project area, the watershed, and across the Deschutes National Forest

Acres of Habitat in the Melvin Butte Project Area	Acres of Habitat in the Deep Canyon and Whychus Watersheds	Acres of Habitat Across the Deschutes National Forest
316 acres 0.1% of all the nesting habitat on the Forest	21,025 acres 10% of all the nesting habitat on the Forest	198,330 acres 12% of the entire Deschutes National Forest

Measure: Acres of suitable reproductive habitat affected for the Nuthatches and Chipping Sparrow.

Alternative 1 – No Action (Ecological Trend)

The ecological trend is that snag habitat would continue to be provided in the short and long-term. Previously treated stands would continue to grow providing future late-structural habitat. Untreated dense stands would continue to see increased snag recruitment through tree mortality from natural disturbances such wildfire, wind events, insect and disease pathogens, and lightning. High tree density in some of the ponderosa pine and mixed conifer stands would not only retard the development of large diameter (>21" dbh) ponderosa pine and white-fir trees and future snags but also may hasten the development of smaller diameter snags and coarse woody material as a result of mortality from bark beetles, disease, or fire. Large snags and downed logs would continue to be limited for the nuthatches. The increased fire risk would also put these limited habitat features at risk. If a high intensity wildfire burns through the planning area, habitat for many of these species would be lost.

Habitat for species that are more dependent on closed canopies and dense understories (i.e. red-breasted nuthatch) would continue to increase over time. At higher elevations white-fir would continue to out compete ponderosa pine resulting in increased stand densities and loss of late successional conditions over time. This would eventually result in fewer large snags and down woody material on the landscape and fewer nesting sites. Loss of ponderosa pine results in fewer foraging opportunities for species like the pygmy nuthatch that need large diameter trees. High stand and brush densities increase the risk of loss which could further reduce the availability of habitat in the area for most late successional species. Increased stand densities is a major factor in the decline of chipping sparrow habitat, which can be directly tied to fire suppression over the last 100 years. Increases in stand density as a result of no action would continue to be a factor in habitat loss.

Alternative 2 and 3- Direct and Indirect Effects

Thinning From Below (HTH), Prescribed Burning (B) Non-commercial Thinning (P) and Scenic Views Enhancement

Thinning from below (HTH) would occur within both second growth "black bark" ponderosa pine stands as well as multi-storied ponderosa pine stands containing old growth. Within black bark pine stands thinning would promote heterogeneity by mosaic thinning. Thinning would occur on trees >8 inches dbh retaining the largest and healthiest trees in the stands. The objective of mosaic thinning is to replicate how the stand would be spatially arranged under natural fire scenarios, creating skips, gaps, and small clumps of unthinned trees. Within multi-storied stands, thinning from below would occur, reducing ladder fuels in the overstory, reducing the competition for site resources, promote the longevity of the old growth in the stand. Treatments would retain LOS characteristics and also recruit large trees into the overstory perpetuating old growth ponderosa pine habitat over time. Non-commercial thinning treatments would primarily remove material <8"dbh and in some cases up to 12" dbh material in advanced regeneration plantations.

Within the Scenic View Treatment the primary objective is to reduce the fuel loading associated with stand replacement mortality from the 2012 Pole Creek Fire. Treatments would retain individual snags throughout the Forest Road 16 corridor primarily removing pockets of burned lodgepole pine. Snags removal would focus on trees <8 inches in diameter.

The objective of prescribed fire is to reduce fuel loading to create a continuous mosaic of burned and unburned habitat. Treatments may unintentionally burn existing snags; however new snags could also be recruited through this process. Mortality of snags in ponderosa pine habitat during prescribed fire treatments in Arizona and California ranged from 20% (Randall-Parker and Miller 2002), 45% (Horton and Mannan 1988), and 56% (Bagne et al. 2008). All three studies found that larger diameter ponderosa pine trees were least likely to die, at least in the short-term. Horton and Mannan (1988) found a 20-fold increase in abundance of snags < 15 cm dbh. Several studies showed that the highest snag losses were in areas where a long period of fire exclusion had occurred (Bagne et al. 1988, Holden et al. 2006). Bagne et al. (2008) and Horton and Mannan (1988) found that re-entry burns had a much lower mortality rate for snags, presumably because the trees that did not burn during the first entry were more resilient. Loss of snags from prescribed fire was partially mitigated by the creation of new snags (Horton and Mannan 1988, Bagne et al. 2008).

Table 116 summarizes the amount of habitat associated with treatments under each action alternative for the Melvin Butte project.

Table 116: Total Acres of Habitat Associated with each Treatment Type by Alternative

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
B	83	83
HTH	29	34
P	151	151
Scenic Views Enhancement	39	39
Total Acres.	**302**	**307**

Overall, approximately 302 acres of habitat are associated with treatments under Alternative 2 and approximately 307 acres under Alternative 3.

Within ponderosa pine and mixed conifer stands dominated by ponderosa pine overstory, structural diversity would remain but understory complexity would be reduced through non-commercial thinning, mowing, and burning. Fuels treatments associated with harvest could potentially be beneficial in the long-term; treatments would reduce densities of small trees by thinning from below, opening up the understory, promoting more herbaceous understory which could potentially increase an insect prey base. Although foraging habitat for the chipping sparrow would be reduced through the removal of regenerating pines in the understory, some residual habitat would remain providing foraging opportunities. Since treatments are primarily thinning from below, habitat for the pygmy nuthatch would be retained. Although overall stand densities would be reduced, fully stocked over-story stands would remain post-treatment, continuing to provide foraging opportunities. Long-term benefits of treatments would be a reduction of stress to the overstory promoting the longevity of large tree structure and residual old growth but also promote the development of future old growth in the stand that would provide long-term reproductive habitat.

Similarly, in PCT units within ponderosa pine containing advanced regeneration, treatment would reduce some foraging habitat but would not remove any residual large trees. These stands are very homogenous and overstocked and treatments would promote stand heterogeneity through variable density thinning. Treatment would accelerate the development of large tree structure promoting the development of future nesting and foraging habitat for all these species, but could remove some foraging habitat for the chipping sparrow and pygmy nuthatch that use younger stands for foraging habitat in the short-term.

Overall 95%-97% of the habitat within the project area is proposed for treatment. No snags are proposed for removal; therefore no reproductive habitat would be degraded. Due to the thinning of small trees in these stand, the project may reduce foraging opportunities in the short-term.

In the long-term, treatments associated with Alternatives 2 and 3 are the most proactive in promoting the development of more fire resistant stands.

See DecAID Snag and Log Analysis for the projects effect to dead wood habitat and distribution.

Alternative 2 and Alternative 3 – Cumulative Effects

Activities identified in Table 14 were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to pygmy nuthatch and chipping sparrow. The Deep Canyon and Whychus watersheds would be used to assess cumulative impacts to these species.

Two ongoing timber salvage projects are associated with the watersheds. Approximately 54 acres of ongoing salvage is occurring within the Pole Creek Fire as well as the site specific salvage of fire killed danger trees along major routes. Approximately 250 acres of ongoing fire salvage are associated with the Two Bulls Fire. These two fire salvage projects are removing fire killed trees from stand replacement fire area. These areas did not provide habitat for the pygmy nuthatch or chipping sparrow.

The Ursus Hazardous Fuels Reduction Project is approximately 5,900 acres in size and includes approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to break up the fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. There is no habitat for pygmy nuthatch or chipping sparrow within the Ursus project area; therefore there are no cumulative impacts associated with this project.

Activities proposed under the Bend Municipal Watershed Fuels Reduction and the Bear Wallow Firewood Projects have occurred or may occur in suitable habitat. The Bear Wallow and the Bend Municipal Watershed Hazardous Fuels Reduction Projects focus primarily on removing dead lodgepole pine among green stands to reduce fuel loading. The majority of the activity would occur in lodgepole pine habitat but some occurs in mixed conifer. Overall, these projects primarily occur in approximately 910 acres of mixed conifer and lodgepole pine habitat types within the Deep Canyon watershed. These plant association groups do not provide highly suitable habitat for these species and therefore would minimally degrade habitat.

The Three Creeks Personal Use Firewood Cutting Area also occurs in the watersheds. This area occurs in both mixed conifer and lodgepole pine habitat types. Firewood cutting is not wide spread and primarily occurs where dead trees can be accessed from open roads. Although snags are cut and removed, removal occurs on an individual tree basis versus across the entire designated area. The area is approximately 3,029 acres. The majority of firewood removed is associated with beetle killed lodgepole pine within mixed conifer and pure lodgepole pine stands. These plant association groups do not provide highly suitable habitat, fire wood cutting occurs on an incidental basis, and is not expected to degrade habitat.

Of the 316 acres of reproductive habitat identified within the project area, about 302 acres are associated with Alternative 2 and about 307 acres are associated with Alternative 3.

Of the 21,025 acres of reproductive habitat within the watersheds, cumulatively Alternatives 2 and 3 are associated with approximately 1% of the total habitat.

The action alternatives would treat <1% of the total habitat across the Deschutes National Forest. See Table 117 for a summary of impacts to the pygmy nuthatch and chipping sparrow reproductive habitat within the Melvin Butte project area, Deep Creek and Whychus watersheds, and across the Deschutes National Forest.

Table 117: Summary of impacts to the pygmy nuthatch and chipping sparrow reproductive habitat within the Melvin Butte project area, Deep Creek and Whychus watersheds, and across the Deschutes National Forest.

	Acres of Pygmy Nuthatch and Chipping Sparrow Habitat in the Project Area	**Acres of Pygmy Nuthatch and Chipping Sparrow Habitat in the Watersheds**	**Acres of Pygmy Nuthatch and Chipping Sparrow Habitat across the Deschutes National Forest**
Existing	316 acres 0.1% of all nesting habitat on Forest	21,025 acres 10% of all nesting habitat in watersheds	198,330 acres 12% of the entire Deschutes national Forest
Alternatives 2 and 3	-302 to -307 acres -0.1% of all nesting habitat on Forest	-302 to -307 acres -1% of all nesting habitat in watersheds	-0.1% of all nesting habitat on Forest (Melvin)
Cumulative Total			Total (Melvin) 0.1% reduction in nesting habitat on Forest

Conclusion

Treatments associated with the ponderosa pine PAG would thinning from below, promoting the development of contiguous stands of late and old structure habitat that these species need for nesting and foraging. However, through project design treatments untreated stands would be maintained throughout the project area, providing small tree diversity that could also provide foraging opportunities.

Overall, implementation of the action alternatives as well as other projects across the district should result in improved habitat conditions for those species dependent on large ponderosa pine habitats which could lead to increased populations. Cumulatively there would be a decrease in dense understory habitat; these changes would result in more sustainable habitat conditions across the landscape and move habitat conditions closer to historical conditions. Fire suppression has created denser conditions than occurred historically which resulted in an increase in dense habitat species and a decline in open pine habitat species. Some snag habitat could be lost due to prescribed fire and the felling of snags that pose a safety hazard under OSHA standards.

Although treatments would thin stands that are currently suitable reproductive habitat, the Melvin Butte project would not contribute to a change in viability for the species within the Watershed or on the Deschutes National Forest for these species.

Cumulatively, with the ongoing forest management projects within the Deep Canyon and Whychus watersheds, the projects would not degrade pygmy nuthatch or chipping sparrow habitat. The Melvin Butte project is consistent with the biological objectives in the Landbird Conservation Strategy.

Landbird Conservation Strategy Consistency

Biological objectives are all based on “where ecologically appropriate” meaning actions must occur within the proper habitat addressed in order to be consistent or not.

Species	**Biological Objectives**	**Consistent Yes, No, or NA**	**Rationale**

In Ponderosa Pine Stands and Mixed Conifer Dominated by Ponderosa Pine: **Pygmy Nuthatch** **Chipping Sparrow**	PYGMY NUTHATCH		
	Provide a mean of 10 trees/acre >21”dbh and at least 2 trees >31”dbh	Yes	Treatment will not target large ponderosa pine except where diseased trees are hindering the development of future Late and Old Structure stands. In such a case sufficient large trees will be left to me this objective.
	Provide a mean of 1.4 snags/acre >8”dbh with 50% >25”dbh in a moderate to advanced state of decay	Yes	Due to the amount of mortality within the watershed sufficient snags will exist to meet this requirement as well as those retained in the project area.
	CHIPPING SPARROW		
	Interspersion of herbaceous ground cover w/shrub and regen pine patches	Yes	Within the low elevation ponderosa pine PAG and mid elevation ponderosa pine and mixed conifer dry PAG 10-20% of the project area associated with each PAG will be left in untreated patches as well as entire stands containing habitat
	20-60% cover in shrubs (including small trees) and >20% of shrub layer in regen saplings conifers, mean canopy cover 10-30%	Yes	Within the low elevation ponderosa pine PAG and mid elevation ponderosa pine and mixed conifer dry PAG 10-20% of the project area associated with each PAG will be left in untreated patches as well as entire stands containing habitat
	Ensure a mix of understory conditions such that 10 to 30% of the landscape meets site level conditions as describe above	Yes	10 to 20% of the project area will be retained in untreated stands and will meet site level conditions as described

Mixed Conifer, Edges and Openings Created by Wildfire – Olive-sided Flycatcher and Hairy Woodpecker

Existing Condition

The olive-sided flycatcher is a summer resident that breeds in low densities throughout coniferous forests of Oregon. The hairy woodpecker is a resident in forests throughout Oregon except for juniper. The olive-sided flycatcher, an aerial insectivore, prefers forest openings or edge habitats where forest meets meadows, harvest units, rivers, bogs, marshes etc. (Marshall et al. 2003). Similar to the flycatcher, the hairy woodpecker is found primarily in mixed conifer and ponderosa pine forests adjacent to deciduous stands but is most common in burns or areas infested with mountain pine beetles (Marshall et al. 2003). There is some preference for older stands for the hairy woodpecker and where old trees are absent, they prefer thinned stands. Nesting success for the flycatcher was highest within forest burns where snags and scattered tall, live trees remain (Marshall et al. 2003 and Wisdom et al. 2000 p. 215). Common features of nesting habitat include tall prominent trees and snags used as foraging and singing perches. The flycatcher forages from high prominent perches at the tops of snags or from the uppermost branches of

live trees and needs unobstructed air space to forage. It preys on flying insects and in particular, bees and wasps. (Marshall et al. 2003 pp. 374-375). The hairy woodpecker nests in dead trees with light to moderate decay and their diet consists of beetles, ants, spiders, and other insects (Marshall et al. 2003).

Population trends based on BBS data show highly significant declines with an Oregon statewide decline of 5.1% per year from 1966-1996 for the olive-sided flycatcher. Factors potentially contributing to population declines on breeding grounds include habitat loss through logging, alteration of habitat through management activities (e.g., clearcutting, fire suppression), and lack of food resources. (Marshall et al. 2003 p. 376). Wisdom et al. (2000 p. 218) also noted that where altered fire regimes result in fewer but larger fires, the juxtaposition of early and late seral habitats becomes less favorable. However, the Columbia Basin (Southern Cascades) shows increases of >60% for the olive-sided flycatcher compared to other areas. BBS data (1966-2000) for Oregon show no significant decline for the hairy woodpecker (0.5% decline per year).

The conservation status based on the Nature Serve ranking indicates the hairy woodpecker is secure globally, nationally, and state wide. (USFS 2012)

The conservation status based on the Nature Serve ranking indicates the olive-sided flycatcher is near threatened, through the International Union for Conservation of Nature (IUCN) Red List of threatened species.

Habitat for the olive-sided flycatcher and hairy woodpecker occurs throughout the Deschutes National Forest. Through the Forest wide assessment completed for MIS, hairy woodpecker reproductive habitat was mapped across the entire Deschutes National Forest and will be used as a surrogate for the olive-sided flycatcher. Approximately 1,398 acres of habitat exists within the project area. Approximately 24,633 acres of habitat occurs within the Deep Canyon and Whychus Watersheds and approximately 507,920 acres of habitat occurs across the Deschutes National Forest. Table 118 summarizes the reproductive habitat for the Olive-sided Flycatcher and Hairy Woodpecker within the Melvin Butte Project Area, the Deep Creek and Whychus Watersheds, and across the Deschutes National Forest.

Table 118: Reproductive habitat for the Olive-sided Flycatcher and Hairy Woodpecker within the Melvin Butte Project Area, the Deep Creek and Whychus Watersheds, and Across the Deschutes National Forest

Acres of Habitat in the Melvin Butte Project Area	Acres of Habitat in the Deep Canyon and Whychus Watersheds	Acres of Habitat Across the Deschutes National Forest
1,398 acres 0.2% of all the nesting habitat on the Forest	24,633 acres 4% of all the nesting habitat on the Forest	507,920 acres 31% of the entire Deschutes National Forest

For the detailed assessment on the hairy woodpecker for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

Measure: Acres of suitable habitat affected for olive-side flycatcher and hairy woodpecker.

Alternative 1 – No Action (Ecological Trend)

Overtime, stocking density in suitable habitat would continue to increase, thus decreasing natural openings and associated habitat components needed by the olive-sided flycatcher and hairy woodpecker. Existing dense stands would continue to degrade due to tree mortality, creating openings which may provide future habitat. This alternative would leave the stands in a dense condition, making them susceptible to fire, which could benefit the hairy woodpecker by providing the early post-fire habitat it needs. However, the olive-sided flycatcher needs a mosaic of burned and unburned habitat and there is a

risk that green trees would insufficient in number due to the intensity of the fire. Approximately, 40% of the Sisters Ranger District has been impacted by wildfire over that past 15 years where the majority of the wildfires have occurred in the mixed conifer plant association group. In the short-term, the hairy woodpecker has benefited from the pulses of high quality foraging habitat provided by fire. However, within five years post fire, the majority of the insect activity subsides and foraging greatly diminishes. Although the dead trees provide nesting habitat, hairy woodpecker densities greatly diminish in these post fire habitats due to the lack of foraging opportunities.

Alternative 2 and 3- Direct and Indirect Effects

Thinning From Below (HTH), Mixed Conifer Thinning with Group Openings (MCGO), Mixed Conifer Thinning without Group Openings (MC-without openings), Non-commercial Thinning (P), Prescribed Burning (B) and Scenic Views Enhancement.

Commercial thinning (HTH) and Mixed Conifer Thinning with and without group openings (MCGO and MC - Without Openings) would consist of primarily thinning from below removing trees >8”dbh. Treatments would focus on maintaining the overstory trees in pure ponderosa pine and mixed conifer stands providing overstory large tree structure for both olive-sided fly catcher and hairy woodpecker.

Treatments would retain and promote the development of overstory ponderosa pine by reducing site competition. Within mixed conifer treatments stands are dominated by small trees and the focus would be on reducing stand densities primarily by removing second growth lodgepole pine and white-fir, favoring healthy white-fir and ponderosa pine. This treatment would result in the accelerated growth of residual trees while reducing the fire hazard. Long-term beneficial impacts of small tree thinning would be the reduction of habitat fragmentation by promoting the development of LOS habitat which includes large snags at an accelerated rate which would promote nesting habitat for both olive-sided flycatcher and hairy woodpecker. Short-term beneficial impacts would be seen in the reduction of risk to existing suitable habitat to olive-sided flycatcher and hairy woodpecker. This treatment would be beneficial to the both species by creating large snags over the long-term to be utilized as nesting and beneficial to hairy woodpecker for foraging habitat. In addition, with Mixed Conifer Thinning with Group Openings, small group opening of approximately 1-3 acres in size would be created. These treatments would be beneficial to olive-sided flycatcher by creating small openings and associated edge for foraging on the wing. In addition, isolated large snags adjacent to openings would provide highly suitable nesting habitat for the olive-sided flycatcher.

Non-commercial thinning (P) would occur within ponderosa pine plantations that are approximately 20 to 40 years old. Treatments would consist of removing material primarily <8”dbh and occasionally up to 12” dbh material in advanced regeneration plantations. These plantations do not currently provide high quality habitat for the hairy woodpecker or olive sided flycatcher. However, due to overstocking isolated pockets of insect outbreaks occur providing some foraging habitat. In addition, small pockets of small snags between 6 to 12 inches dbh (approximately 1/2 acre to 1 acre in size) would provide some nesting opportunities. In the long-term, thinning would reduce stand densities promoting the development of LOS ponderosa pine by recruiting large snags and creating more highly suitable reproductive habitat in these area.

The Scenic Views Enhancement Treatment was developed to meet the scenic views objectives for the Forest Road 16 corridor. Treatments would remove small (<8In. dbh) dense patches of fire killed trees to enhance the visual quality of Foreground areas. Small diameter fire killed trees would be removed, retaining all live trees and large snags to benefit scenic quality and maintain existing habitat. Treatment would not reduce reproductive habitat; however treatment would minimally reduce some foraging habitat for both species by removing dense pockets of small fire killed trees.

The objective of prescribed fire is to reduce fuel loading to create a continuous mosaic of burned and unburned habitat. Treatments may unintentionally burn existing snags; however new snags could also be recruited through this process. Mortality of snags in ponderosa pine habitat during prescribed fire treatments in Arizona and California ranged from 20% (Randall-Parker and Miller 2002), 45% (Horton and Mannan 1988), and 56% (Bagne et al. 2008). All three studies found that larger diameter ponderosa pine trees were least likely to die, at least in the short-term. Horton and Mannan (1988) found a 20-fold increase in abundance of snags < 15 cm dbh. Several studies showed that the highest snag losses were in areas where a long period of fire exclusion had occurred (Bagne et al. 1988, Holden et al. 2006). Bagne et al. (2008) and Horton and Mannan (1988) found that re-entry burns had a much lower mortality rate for snags, presumably because the trees that did not burn during the first entry were more resilient. Loss of snags from prescribed fire was partially mitigated by the creation of new snags (Horton and Mannan 1988, Bagne et al. 2008). This treatment would be beneficial to both olive-sided flycatcher and hairy woodpecker. Treatments would create a mosaic of green and dead trees providing both foraging and nesting opportunities for both species.

Table 119 summarizes the amount of habitat associated with treatments under each action alternative for the Melvin Butte project.

Table 119: Total Acres of OIive-sided Flycatcher and Hairy Woodpecker Habitat Associated with each Treatment Type by Alternative.

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
B	253	253
HTH	310	336
MC – No Group Opening	-	36
LPI	27	27
MCGO	36	-
P	493	493
Scenic Views Enhancement	41	41
Total Acres.	**1,160**	**1,186**

Overall approximately 1,160 acres of habitat are associated with treatments identified under Alternative 2 and approximately 1,186 acres under Alternative 3. Alternative 2 is the most proactive on the landscape; this alternative disrupts fuel continuity and maintains large tree habitat adjacent to forest edges.

Overall, implementation of the action alternatives would maintain existing habitat conditions for olive-sided flycatcher and hairy woodpecker by maintaining and enhancing the development of large tree structure across the project area. Treatments reduce the risk of losing existing habitat to stand replacement fire. Under Alternative 2 thinning and small openings would create and provide some edge habitat while retaining a fully stocked overstory for perch trees. Treatments would not preclude use of the project area by the olive-sided flycatcher and hairy woodpecker. These changes would result in more sustainable habitat conditions across the landscape and move habitat conditions closer to historical conditions. Fire suppression has created denser conditions than occurred historically which result in an increase for dense habitat for some species and a decline for species requiring open pine habitat.

See DecAID Snag and Log Analysis for the projects effect to dead wood habitat and distribution.

Alternative 2 and Alternative 3 – Cumulative Effects

Activities identified in Table 14 and the wildlife report were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to the hairy woodpecker, or olive-sided fly catcher reproductive habitat. The Deep Canyon and Whychus Watersheds are being used as the scale for analysis for this species. The potential cumulative impacts are discussed below.

Approximately 54 acres of the Pole Creek Fire Timber Salvage and approximately 250 acre of the Two Bulls Fire Timber Salvage Projects are ongoing. Danger tree removal occurred on these projects to varying degrees, resulting in a reduction of potential nest sites in stand replacement areas along main roads. Fire salvage directly impacts hairy woodpecker nesting and foraging habitat by removing fire killed trees that provide high quality foraging habitat in the first 5 years post fire when bark beetles are highly active as well as removing suitable nest snags. Fire salvage can also remove suitable nesting habitat for olive-sided flycatcher when snags are removed along edge habitat directly adjacent to green unburned forests.

The Ursus Hazardous Fuels Reduction Project is approximately 5,900 acres in size and approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to break up the fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. There is no olive-sided flycatcher habitat associated with the project area. The project contains approximately 147 acre of suitable hairy woodpecker habitat. Project design avoids areas containing high densities of snags and limits the removal of snags ≥20inches dbh. Under Alternative 3 the project would remove white-fir snags ≥22 inches dbh. The project would retain approximately 6 snag/acres across all treatment units. The project would impact far less than 1% of the existing habitat on the Deschutes National Forest.

The Bend Municipal Watershed Fuels Reduction and the Bear Wallow Firewood Projects have occurred or may occur in suitable habitat. These projects focus primarily on removing dead and dying lodgepole pine among green stands to reduce fuel loading; some of the activity are also associated with mixed conifer habitat. Overall treatments would reduce the risk of loss of existing habitat from future large-scale disturbances. There are approximately 910 acres associated with these projects within the Deep Canyon and Whychus watersheds. Treatment within these area focus primarily on reducing stand densities by thinning from below and removing concentration of dead lodgepole pine that result from bark beetle outbreaks. Treatments in these project areas could reduce hairy woodpecker habitat by removing dead and dying lodgepole pine that provide foraging and nesting opportunities. Where these project thin around large green ponderosa pine and large ponderosa pine snags treatments would be beneficial to nesting and foraging habitat for the olive-sided flycatcher.

Overall, implementation of the action alternatives as well as other projects within the watershed should result in improved habitat conditions for those species dependent on open canopy forest habitats which could lead, over time, to increased populations. Cumulatively there would be a decrease in dense understory habitat; these changes would result in more sustainable habitat conditions across the landscape and move habitat conditions closer to historical conditions. Table 120 provides a summary of impacts to olive-sided flycatcher and hairy woodpecker reproductive habitat within the project area, Deep Canyon and Whychus watersheds, and across the Deschutes National Forest.

Table 120: Summary of impacts to olive-sided flycatcher and hairy woodpecker reproductive habitat within the Melvin Butte project area, Deep Canyon and Whychus watersheds, and across the Deschutes National Forest ("Forest").

	Acres of Olive-sided Flycatcher and Hairy Woodpecker Habitat in the Project Area	**Acres of Olive-sided Flycatcher and Hairy Woodpecker Habitat in the Watersheds**	**Acres of Olive-sided Flycatcher and Hairy Woodpecker Habitat Across the Deschutes National Forest**
Existing	1,398 acres 0.2% of all nesting habitat on Forest	24,633 acres 4% of all nesting habitat on Forest	507,920 acres 31% of the entire Deschutes National Forest
Alternatives 2 and 3	-1,160 to -1,186 acres	-1,160 to -1,186 acres	-0.2% of all nesting habitat

	-0.2% of all nesting habitat on Forest	-4% of all nesting habitat in watersheds	on Forest (Melvin) -0.01% (Pole Creek Fire Salvage) -0.02% (Ursus) -0.1% (Bend Municipal Watershed)
Cumulative total			Total 0.33% reduction in nesting habitat on Forest

Conclusion

Cumulatively, with the ongoing forest management projects within the Deep Canyon watershed, the projects do not propose to remove large snags within the mixed conifer and ponderosa pine habitat types except those that pose hazards to logging operations under OSHA guidelines. Because this project impacts 0.2% of suitable habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The loss of habitat would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan, and thus continued viability of hairy woodpecker is expected on the Deschutes National Forest.

Cumulatively, with the ongoing forest management projects within the Deep Canyon and Whychus watersheds the projects would not directly degrade olive-sided flycatcher habitat. The Melvin Butte project is consistent with the biological objectives in the Landbird Conservation Strategy.

Landbird Conservation Strategy Consistency

Biological objectives are all based on "where ecologically appropriate" meaning actions must occur within the proper habitat addressed in order to be consistent or not.

Species	Objective	Do Not Meet, Meets, Not Applicable	Rationale
Olive-sided Flycatcher **Other species to benefit from objectives:** **Hairy Woodpecker**	Where ecologically appropriate in mixed conifer through natural events or management maintain: >2% of landscape as post-fire habitat	Not applicable	This is not a post fire salvage project.
	Where ecologically appropriate in mixed conifer through natural events or management maintain: >40% of the post fire landscape as unsalvaged.	Not applicable	The project is not a fire salvage project.
	Where salvage is occurring in post fire old ponderosa pine forest maintain or provide: in burns >100 acres, salvage <50% of standing dead and down	Not applicable	The project is not a fire salvage project.
	Where salvage is occurring in post fire old ponderosa pine forest maintain or provide: retain all trees/snags >20"dbh and	Not applicable	The project is not a fire salvage project.

	>50% of those 12-20”dbh		
	Where salvage is occurring in post fire old ponderosa pine forest maintain or provide: retain all trees/snags >20”dbh and >50% of those 12-20”dbh	Not applicable	The project is not a fire salvage project.
	Where salvage is occurring in post fire old ponderosa pine forest maintain or provide: patches with a mix of live and dead trees/snags to provide potential nesting trees in context of potential foraging and perch trees	Not applicable	The project is not a fire salvage project.

Mixed Conifer, Large Trees and Snags –Pileated Woodpecker, Brown Creeper, Hermit Thrush, Flammulated Owl, and Williamson’s Sapsucker

Existing Condition

The brown creeper is the only North American bird that relies on both the trunk and bark of trees for nesting and foraging. The brown creeper is found predominantly in coniferous forests but can be located in hardwood stands as well. Brown creepers nest under loose, sloughing bark of large diameter snags with little to moderate decay. Creepers seem to be fairly common but forest management practices, especially the loss of large diameter snags and live trees, may cause a threat to this species. The mean diameter of nest trees range from 16” dbh to 42” dbh. In northeastern Oregon, creeper abundance was positively associated with the height of the canopy and density of trees. (Marshall et al. 2003 pp.453-456). Adams and Morrison (1993) found similar results with creepers being highly correlated with mature-aged stands with moderate overall stand density.

Pileated woodpeckers occur primarily in dense mixed conifer forests in late seral stages and are rarely found in pure ponderosa pine stands. Pileated woodpeckers need large diameter snags or live trees with decay for nesting and roosting sites, large diameter logs for foraging on ants and other arthropods, and dense canopy to provide cover. BBS data (1966-1991) for the pileated woodpecker shows no significant change. Risks include activities that eliminate or reduce the number of snags, logs, and cover. In addition, conversion of fir stands to pure ponderosa pine reduces suitable habitat. (Marshall et al. 2003).

The hermit thrush is an uncommon to common summer resident preferring mid to high elevation mature and old growth forests at mid to high elevations. The hermit thrush 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. Higher densities of hermit thrushes have been reported in old-growth riparian stands relative to other mature and young riparian stands. The hermit thrush nests on the ground or use small trees in the understory. They are ground foragers of insects; however fruits and berries may also be consumed especially during migration and in winter. Populations seem to be stable at this time. Microsites selected for foraging tend to have little to no vegetation or litter. Threats to the hermit thrush include the loss of mature forests and controlled burning of forest understories, especially spring burning. Hermit thrush responses have been known to decrease after fires (Sallabanks 1995). (Marshall et al. 2003 pp. 483-485 and 487-489).

Williamson’s sapsuckers are highly adaptable and are able to withstand considerable disturbance. Populations seem to be fairly stable however, snag removal remains the primary threat for this species (Marshall et al. 2003). Williamson’s sapsuckers are weak excavators and select for the soft and decayed wood for nest sites regardless of tree species (Marshall et al. 2003). Williamson’s sapsuckers are summer

residents east of the crest and are most often found in ponderosa pine during the breeding season (Marshall et al. 2003). However, east of the cascade the majority of mixed conifer forests are ponderosa pine dominated, and the Williamson's sapsucker is dependent on large ponderosa pine snags for nesting.

Flammulated owl habitat also includes dense patches of saplings or shrubs used for roosting. The flammulated owl forages exclusively at night primarily for nocturnal arthropods (USDA 1994b). Little is known on the population status of the flammulated owl to indicate significant population declines (Marshall et al. 2003).The flammulated owl is unique in the Pacific Northwest. It preys almost exclusively on insects and is a neotropical migrant. The flammulated owl and Williamson's sapsucker breed on the eastern slope of the Cascades and are found in mature to old growth forests with limited understories at mid to high elevations (Marshall et al. 2003).

The project area contains mixed conifer habitat having the large tree structure needed by these species. However, due to the small size of the project and proposed treatments there is limited effects to habitat as a result of proposed treatments.

The conservation status based on the Nature Serve ranking indicate the pileated woodpecker is secure globally, nationally, and state wide. (USFS 2012)

The conservation status based on Nature Serve ranking indicates the brown creeper, flammulated owl, and hermit thrush are "least concern" for these species.

The conservation status based on the Nature Serve ranking indicate the Williamson's sapsucker is secure at globally, nationally, and state wide. (USFS 2012)

Through the Forest wide assessment completed for MIS, Williamson's sapsucker and pileated woodpecker reproductive habitat was mapped across the entire Deschutes National Forest and will be used as a surrogate for the brown creeper, hermit thrush, and flammulated owl. Approximately 1,216 acres of habitat exists within the project area for the Williamson's sapsucker and approximately 356 acres for the pileated woodpecker. Cumulatively, approximately 25,439 acres habitat occurs for the Williamson's sapsucker and approximately 56,848 acres of habitat for the pileated woodpecker within the Deep Canyon and Whychus Watersheds. Overall, approximately 243,364 acres of Williamson's sapsucker habitat and approximately 180,017 of pileated woodpecker habitat occurs across the Deschutes National Forest. Table 121summarizes these acreages.

Table 121: Reproductive habitat within the Melvin Butte Project Area, Deep Canyon and Whychus Watersheds, and Across the Deschutes National Forest.

	Acres of Habitat in the Melvin Butte Project Area	Acres of Habitat in the Deep Canyon and Whychus Watersheds	Acres of Habitat Across the Deschutes National Forest
Williamson's Sapsucker	1,216 acres 0.4% of all the nesting habitat on the Forest	25,439 acres 10% of all the nesting habitat on the Forest	243,364 acres 15% of the entire Deschutes National Forest
Pileated Woodpecker	356 acres 0.1%	56,848 acres 31% of all the nesting habitat on the Forest	180,017 acres 11% of the entire Deschutes National Forest

For the detailed assessment on the Williamson's sapsucker and the pileated woodpecker for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

Measure: Acres of suitable habitat affected for pileated woodpecker, brown creeper, hermit thrush, flammulated owl, and Williamson's sapsucker.

Alternative 1 – No Action – Existing Ecological Trend

Under the No Action alternative stand densities would increase and perpetuate the loss of large structure over time, which these species require for suitable nesting and foraging habitat. In dense stands, increased competition for nutrients would prolong the development of large trees. Nest site availability for the pileated woodpecker, brown creeper, hermit thrush, and flammulated owl would be limited, increasing competition for existing sites leading to greater predation risks. Increased stand densities may also increase the risk of loss of habitat from fire.

The Williamson's sapsucker would see a decrease over-time as stands begin to deteriorate; this species is a weak excavator and feeds on sap wells of smaller diameter trees but utilizes large snags for nesting. Dense stands of large and small diameter green trees would deteriorate in the short-term. Due to stand densities very few large trees would develop over the long-term and large snags for nesting would be limited in the project area.

Alternative 2 and 3- Direct and Indirect Effects

Thinning From Below (HTH), Mixed Conifer Thinning From Below with and without Group Openings (MCGO and MC-without openings), Lodgepole Improvement (LPI), Scenic Views Enhancement

Direct impacts could potentially exist from the removal of green trees 21 inches and greater associated with thinning from below in mixed conifer/ponderosa pine (HTH, MCGO, and MC-without openings). Large trees identified for removal in these treatment types would primarily be white-fir competing with large diameter ponderosa pine for nutrients or are creating ladder fuels to overstory ponderosa pine. Treatments would also reduce habitat by removing overstory white-fir to break up fuel continuity in mixed conifer stands; the average tree diameter for removal is 14 inches dbh. Do to the fibrous nature of white-fir and how quickly it decays it tends to be a species that is commonly observed being excavated by pileated woodpecker on the district and provides nesting, roosting, and foraging habitat for the other previously mentioned species. Although treatments would favor ponderosa pine, residual white-fir would remain as clumps and individual trees in areas they are not competing with overstory ponderosa pine. In addition large snags are not targeted for removal but there is a possibility for incidental loss of snags during treatments. Incidental removal of snags may occur under OSHA regulations.

The LPI Treatment would treat some deteriorating white-fir. Treatments focus on removing unhealthy lodgepole pine from stands to reduce beetle mortality to green stands and promote residual tree vigor. Although treatments would remove commercial size trees they would primarily be smaller diameter trees: some minor impacts to reproductive habitat is expected. Minimal effects are anticipated due to the limited amount of habitat associated with this treatment type.

Prescribed burning would also occur. In the short-term these treatments would reduce activity fuels and overall fuel loadings to acceptable levels. Fuel treatments would reduce fire risk and would reduce competition to established trees, increasing stand resiliency to wildfire. The objective is to create a mosaic of burned and unburned areas, creating a discontinuous distribution of fuels throughout the project area. Due to the removal of shrubs from prescribed burning this treatment has the potential to reduce reproductive habitat for the hermit thrush. However, fuels treatments could also enhance flammulated owl foraging habitat by promoting grass/forb/shrub interactions which would increase insect production over the long-term.

The Scenic Views Enhancement Treatment was developed to meet scenic objectives associated with the Forest Road 16 corridor. As a result of the 2012 Pole Creek Fire this area received stand replacement fire; areas contain high densities of small (<8 in. dbh) dead trees that would be removed to enhance scenic

quality. All green trees and large snags that contribute to visual quality would be retained. This treatment would not likely reduce reproductive habitat or future habitat since all green trees and large snags would exist post treatment.

Approximately 45% of the project area was retained in untreated stands of mature multi-storied mixed conifer and ponderosa pine stands. The objective of the retention strategy is to provide habitat for species dependent on complex forest structures. In the remaining 45% of untreated habitat, there would continue to be an increased risk from disturbance, although breaking up the fuel continuity across the landscape would reduce the risk of a large scale disturbance event. In addition some of the areas identified for no treatment occur within higher site potential areas (i.e. Riparian Reserves); these sites are capable of producing large trees with greater canopy closure and are directly adjacent to the areas that are currently suitable habitat. These areas have the potential to provide additional habitat.

Table 122 and Table 123 summarizes the amount of habitat associated with treatments under each action alternative for the Melvin Butte project by species.

Table 122: Total Acres of Williamson's sapsucker Reproductive Habitat Associated with each Treatment Type by Alternative for the Melvin Butte Project.

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
B	278	278
HTH	357	417
MC – No Group Opening	-	52
LPI	18	18
MCGO	53	-
Scenic Views Enhancement	60	60
Total Acres	**766**	**825**

Table 123: Total Acres of Pileated Woodpecker Reproductive Habitat Associated with each Treatment Type by Alternative for the Melvin Butte Project.

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
B	45	45
HTH	78	88
MC – No Group Opening	-	47
LPI	17	17
MCGO	48	-
Scenic Views Enhancement	19	28
Total Acres	**207**	**225**

Overall approximately 766 acres of Williamson's sapsucker habitat are associated with Alternative 2 and approximately 825 acres are associated with Alternative 3. These areas are primarily multi-storied stands dominated by large trees.

Overall approximately 207 acres of Pileated woodpecker habitat are associated with Alternative 2 and approximately 225 acres are associated with Alternative 3. These areas are primarily multi-storied stands dominated by large trees; however these areas contain a much higher canopy cover which is highly selected for by the pileated woodpecker.

The Scenic View Treatment is associated with post fire habitat and therefore does not provide canopy cover preferred by the associated species; however habitat was identified due to the high density snags that provide foraging habitat within close proximity of green stands containing suitable structure and canopy cover.

In areas identified for thinning canopies would be opened up and stand densities reduced to lessen the risk of a large-scale disturbance event (insects, disease, or fire). Thinning would directly reduce canopy cover but would also reduce the fire risk to individual stands by breaking up the fuel continuity. Approximately 65% of the identified Williamson's sapsucker habitat and up to approximately 63% of Pileated woodpecker habitat is associated with vegetation treatments. However, treatments do not propose to remove large trees and snags that are important habitat components to these species. Treatment would not preclude use of habitat by these species. Overall, the treatments would aid in the development of a more resilient landscape as well as habitat to disturbance.

See DecAID Snag and Log Analysis for the projects effect to dead wood habitat and distribution.

Alternative 2 and Alternative 3 – Cumulative Effects

Activities identified in Table 14 were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to the cavity nesters that utilize mixed conifer habitat with large trees and snags. The Deep Canyon and Whychus watersheds would be used to discuss cumulative impacts to these species.

Approximately 54 acres of salvage logging are ongoing within the 2012 Pole Creek Fire and approximately 250 acres of salvage logging is ongoing within the Two Bull Fire. Danger tree removal has occurred or would occur to varying degrees resulting in a reduction of potential nest sites in stand replacement fire areas along main roads. These actions would create areas with limited nesting opportunities.

The Ursus Hazardous Fuels Reduction Project is approximately 5,900 acres in size and is associated with approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to break up the fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project contains approximately 738 acres of suitable pileated woodpecker and approximately 812 acres of suitable Williamson's sapsucker habitat, Project design avoids areas containing high densities of snags and limits the removal of snags $\geq$20inches dbh and Alternative 3 would limit the removal of white-fir snags $\geq$22 inches dbh. In addition, the project would retain 6 snags/acres across all treatment units. The project would impact far less than 1% of the existing habitat on the Deschutes National Forest. The Ursus project would negatively impact mixed conifer stands specifically tied to hermit thrush habitat which equates to 3% of the habitat in the associated watersheds. Through mixed conifer treatments the Ursus project would negatively impact flammulated owl and brown creeper habitat by removing large white-fir which equated to approximately 15% of the habitat in the associated watersheds. The Ursus project is consistent with the biological objectives for the flammulated owl, brown creeper, and hermit thrush.

Activities proposed under the Bend Municipal Watershed Fuels Reduction and the Bear Wallow Firewood Projects have occurred or may occur in suitable habitat. The Bend Municipal Watershed Hazardous Fuels Reduction and Bear Wallow Firewood Projects focus primarily on reducing fuel loads by removing dead lodgepole pine and white-fir among green stands; some of the activity could occur in mixed conifer habitat but would primarily occur in lodgepole pine habitat. Overall, treatments would reduce the risk of loss of existing habitat from future large-scale disturbances. There are approximately 910 acres associated with these projects; none of these projects propose to remove large snags within mixed conifer habitat.

Treatments associated with the mixed conifer plant association group would thinning from below, promoting the development of contiguous stands of late and old structure habitat that these species need for nesting and foraging. In mixed conifer habitat dominated by ponderosa pine, the project would manage stands by thinning from below, but would favor the ponderosa pine to develop a more fire

resistant stand containing large ponderosa pine as the dominant species. Treatment would maintain large white-fir in the overstory, except where it is the dominant species, then ponderosa pine would be promoted. Through project design criteria treatments would maintain untreated stands throughout the project area, providing small tree diversity that could provide foraging opportunities for species of birds associated with mixed conifer habitat.

Overall, implementation of the action alternatives as well as other projects across the district should result in improved habitat conditions for these species dependent on large tree mixed conifer habitat.

Cumulatively, these project primarily focus on the thinning dense understory stands; they do not propose to remove large snags and large trees, therefore minimal impacts would occur to habitat associated with pileated woodpecker, brown creeper, hermit thrush, and flammulated owl, and the Williamson's sapsucker. However, dead and dying trees in the medium size classes (averaging approximately 12 - 14 inches dbh) would be removed to reduce fuel concentrations, potentially removing some foraging opportunities. Medium sized snags would continue to provide some limited nesting opportunities. However, impacts to habitat would occur from the reduction of canopy cover by thinning from below, reducing the complexity of these multi-storied stands. All projects and associated treatments would maintain healthy ponderosa pine and white-fir, promoting a more fire resilient mixed conifer stand and minimize the risk of losing more of the landscape to wildfire, creating unsuitable habitat to the pileated woodpecker, brown creeper, hermit thrush, and the Williamson's sapsucker. Large untreated blocks of habitat have been retained throughout the project area to provide habitat connectivity as well as retention of habitat within each treatment unit. The project would promote long-term habitat for these species by reducing the risk of stand replacing fire and promote the development of large tree structure in mixed conifer stands.

Although treatments would thin stands that are currently suitable reproductive habitat, the Melvin Butte project does not propose to remove large trees and large snags that are associated with reproductive habitat within the watersheds or on the Deschutes National Forest for the pileated woodpecker, brown creeper, hermit thrush, Williamson's sapsucker, and the flammulated owl. The project has the potential to degrade 3% of the overall Williamson's sapsucker habitat and 0.3% of the overall pileated woodpecker habitat associated with the Deep Canyon and Whychus watersheds through the thinning of green trees Table 124 provides a summary of impacts to William's Sapsucker and Pileated Woodpecker reproductive habitat within the Melvin Butte project area, Deep Canyon and Whychus watersheds, and across the Deschutes National Forest.

Table 124: Summary of impacts to William's Sapsucker and Pileated Woodpecker reproductive habitat within the Melvin Butte project area, Deep Canyon and Whychus watershed, and across the Deschutes National Forest ("Forest").

	Acres of habitat in the Project Area	**Acres of Habitat in the Watersheds**	**Acres of Habitat Across the Deschutes National Forest**
Existing William's Sapsucker	1,216 acres 0.4% of all nesting habitat on Forest	25,439 acres 10% of all nesting habitat on Forest	243,364 acres 31% of the entire Deschutes national Forest ("Forest")
Pileated Wood pecker	356 Acres 0.1% of all nesting habitat on Forest	65,548 acres 31% of all nesting habitat on Forest	180,017 acres 11% of the entire Deschutes National Forest ("Forest")
Alternatives 2 and 3			

William's Sapsucker	-766 to – 825 acres -0.2% of all nesting habitat on Forest	-766 to – 825 acres -3.0% of all nesting habitat in watersheds	-0.2% of all nesting habitat on Forest (Melvin) -0.2% (Pole Creek Fire Salvage) -0.1% (Two Bulls Fire Salvage) -0.30 (Ursus)
Pileated Woodpecker	-207 to – 225 acres -0.1% of all nesting habitat on Forest	-207-225 acres -0.3% of nesting habitat in watersheds	-0.1% of all nesting habitat on Forest (Melvin) -0.02% (Pole Creek Fire Salvage) --0.4% (Ursus)
Cumulative Total			0.6% reduction in Williamson's Sapsucker nesting habitat on Forest 0.5% reduction in Pileated Woodpecker habitat on Forest

Conclusion

Cumulatively with the ongoing forest management projects within the Deep Canyon and Whychus watersheds, the projects do not propose to remove large trees and snags within the mixed conifer and ponderosa pine habitat types. Although the Melvin Butte project would treat approximately 65% of the suitable reproductive habitat for the Williamson's sapsucker and 63% of suitable habitat for the pileated woodpecker treatments would not target habitat components such as large trees and snags. The project has the potential to reduce habitat quality for these species by thinning green trees, reducing canopy cover, and the structural complexity of stands associated with reproductive habitat.

Cumulatively project is associated with 0.6% of the total suitable William's Sapsucker habitat and 0.5% of the total suitable Pileated Woodpecker across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The changes to habitat would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan, and thus continued viability of the Williamson's sapsucker and pileated woodpecker is expected on the Deschutes National Forest.

The Melvin Butte project is consistent with the biological objectives for the flammulated owl, brown creeper, and hermit thrush.

Landbird Conservation Strategy Consistency

Biological objectives are all based on "where ecologically appropriate" meaning actions must occur within the proper habitat addressed in order to be consistent or not.

Species	Objective	Do Not Meet, Meets, Not Applicable	Rationale
	BROWN CREEPER		
Brown Creeper **Hermit Thrush** **Flammulated Owl**	Where ecologically appropriate initiate actions in mixed conifer forests to maintain or provide: blocks of late-successional habitat >75 acres	Meets	The project will be a thin from below. Therefore, the larger trees will remain on the landscape post activity.
Williamson's Sapsucker	Where ecologically appropriate initiate actions in mixed conifer	Meets	The project will be a thin from below. Therefore, the

Other species to benefit from objectives:	forests to maintain or provide: >4 trees/acre >18”dbh with at least 2 trees >24”dbh		larger trees will remain on the landscape post activity.
	HERMIT THRUSH		
Pileated Woodpecker	Where ecologically appropriate initiate actions in mixed conifer to maintain or provide: patches of forest with multi-layered structure and a dense understory shrub layer	Meets	Patches of mixed conifer will remain untreated. In areas that are proposed for treatment the goal is to move stands towards historical condition.
	FLAMMULATED OWL		
	>10 snags/100 acres, >12in. dbh and >6ft. tall	Yes	No ponderosa pine snags will be targeted for removal in ponderosa pine thinning and Mixed conifer dry thinning
	>20 trees/8 acres, >21 in. dbh to function as recruitment snags	Yes	This project proposes to thin stand from below favoring ponderosa pine >20 in. dbh for retention where it occurs. The exception is ~200 acres of mixed conifer where overstory treatments focus on trees with an average diameter of 14 inches dbh. No large trees exist in these stands.
	WILLIAMSON’S SAPSUCKER		
	1 snag /acre, >18 in. dbh in ponderosa pine	Yes	Within ponderosa pine treatment, the focus will be thinning of green trees, no ponderosa pine snags are targeted for removal
	Mean canopy cover 25-75%	Yes	The project will thin stand from below, residual canopy closures will exist on the low end of the range, except within mixed conifer thinning with group openings. Group opening will occur at a level of 1-3 acres in size and will not exceed 30% of treatment units.

Coniferous Forests – Edges – Northern Flicker

Existing Condition

The northern flicker is a common resident throughout Oregon and is encountered in almost any terrestrial habitat. It is generally most abundant in open forests and forest edges adjacent to open country while they tend to avoid dense forest (Marshall et al. 2003). There is some evidence the flicker prefers older mature forests. Reinkensmeyer (2000 in Marshall et al. 2003) noted the preference for old growth versus mid-successional western juniper in central Oregon. Most nests in forested areas are found in older, open forests, along older forest edges, and in large diameter remnant snags (Marshall et al. 2003). They also

tend to nest in trees with moderate to heavy decay. The flicker diet consists of ants, beetles, crickets, other insects, fruits, and seeds and they prefer to forage on the ground (Marshall et al. 2003). BBS data (1966-2000) for Oregon show a non-significant decrease of 0.6% per year decline. The flicker requires open space and may gain foraging habitat from human caused changes but the presence of decayed wood is still required. (USFS 2012)

The conservation status based on the Nature Serve ranking indicate the Northern flicker is secure globally, nationally, and state wide level. (USFS 2012)

Approximately 365 acres of reproductive habitat exists within the project area. Approximately 24,379 acres of habitat occurs within the Deep Canyon and Whychus Watersheds and approximately 219,576 acres of habitat occurs across the Deschutes National Forest. Table 125 summarizes these acreages:

Table 125: Northern Flicker Reproductive Habitat within the Melvin Butte Project Area, Watershed, and Across the Deschutes National Forest

Acres of Habitat in the Melvin Butte Project Area	Acres of Habitat in the Deep Canyon and Whychus Watersheds	Acres of Habitat Across the Deschutes National Forest
365 0.1% of all the nesting habitat on the Forest	24,379 acres 11% of all the nesting habitat on the Forest	219,576 acres 13% of the entire Deschutes National Forest

For the detailed assessment on the northern flicker for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

Measure: Acres of suitable habitat affected for Northern flicker

Alternative 1 – No Action – Existing Ecological Trend

Increased stand densities perpetuates the loss of large tree structure over time from competition and disturbance events which this species requires for suitable nesting and foraging habitat. It also limits available nest sites, resulting in more competition for existing sites between species. Increased stand densities may increase the risk of loss of habitat from fire. This species requires snags for nesting and generally utilizes larger snags associated with older mature forests. In the event of fire existing snags are lost and replaced with hard snags. Currently there are a limited number of large trees available in the project area for potential use. Replacement large trees are a concern. Many of the future habitat trees are within overstocked stands which would increase the amount of time the trees need to achieve the desired size. In the short-term as over-stocked stands die and openings are created, flicker use could increase, but due to the lack of large trees, the longevity and utility of the small snags that would occur in these stands are limited. Individual large trees which provide potential habitat are often surrounded by dense patches of smaller trees with some shrubs in the understory. Competition for nutrients and water makes these trees more susceptible to insects and disease. In addition, large trees within densely stocked stands are more susceptible to wildfire, due to increased fuel loadings and ladder fuels from fire suppression. Large trees that provide existing habitat would continue to be at an increased risk due to insect, disease, and wildfire.

Alternative 2 and 3- Direct and Indirect Effects

Thinning From Below (HTH) Mixed Conifer Thinning From Below with and without Group Openings (MCGO and MC-without openings), Non-commercial thinning (PCT) Scenic Views Enhancement.

The northern flicker is a generalist in that it utilizes a variety of habitat types effectively and resides at varying elevations. It nests in mature late structure stands, and forages in open areas that provide insects, seeds, and fruiting plants. Flickers primarily forage on the ground, but will also excavate. Although they are an excavator they typically excavate for nesting. Past regeneration harvest created large openings that provided areas more likely to be utilized by the flicker; however these regeneration harvests are about 40 years old and understory stand densities have increased and no longer provide open habitat types. The thinning and fuels treatments proposed under the action alternatives within the mixed conifer and ponderosa pine habitats are designed to reduce the risk of high intensity wildfires in the short-term. In addition, treatments would retain residual late and old structure stand characteristics that exist throughout the project area and promote the development of late and old structured (LOS) habitat over the long-term. Treatments would thin plantations, opening these areas up for use by the flicker in the short-term, and promote the development of large tree structure in the long-term which would recruit large snags to be used as nesting habitat. Treatment would maintain the largest and healthiest trees in the overstory, continuing to provide large structure to be recruited as nesting habitat and enhance habitat by reducing stand densities to provide better foraging opportunities and access to the forest floor.

With the exception of the felling of snags that may pose an OSHA safety hazards, thinning operations would have no direct effects to snags or coarse woody material habitats. Commercial harvest would directly affect green tree replacements by reducing the number of trees in treatment units. However, the units would retain more than sufficient green tree replacements to exceed levels for snag recruitment in the long-term. Thinning would open up areas, and the indirect effects of treatments include healthier stands, but could reduce some foraging opportunities in the short-term. In addition through prescribed burning, there is the potential to recruit overstory snags and down wood in the short-term that could enhance nesting and foraging habitat in mature ponderosa pine stands.

The objective of prescribed fire is to reduce fuel loading to create a continuous mosaic of burned and unburned habitat. Mortality of snags in ponderosa pine habitat during prescribed fire treatments in Arizona and California ranged from 20% (Randall-Parker and Miller 2002), 45% (Horton and Mannan 1988), and 56% (Bagne et al. 2008). All three studies found that larger diameter ponderosa pine trees were least likely to die, at least in the short-term. Horton and Mannan (1988) found a 20-fold increase in abundance of snags < 15 cm dbh. Several studies showed that the highest snag losses were in areas where a long period of fire exclusion had occurred (Bagne et al. 1988, Holden et al. 2006). Bagne et al. (2008) and Horton and Mannan (1988) found that re-entry burns had a much lower mortality rate for snags, presumably because the trees that did not burn during the first entry were more resilient. Loss of snags from prescribed fire was partially mitigated by the creation of new snags (Horton and Mannan 1988, Bagne et al. 2008). Similarly outcomes are expected with the Melvin Butte project. The majority of these stands have not been burned for decades and this would be the first entry with prescribed fire. This treatment would be beneficial to the flicker from both a foraging and nesting stand point. Prescribed burning would remove herbaceous vegetation, providing ample opportunities for ground forage for the flicker and snag recruitment in the overstory which would provide nesting and foraging opportunities.

Table 126 summarizes the amount of habitat associated with treatments under each action alternative for the Melvin Butte project.

Table 126: Total Acres of Flicker Habitat Associated with each Treatment Type by Alternative.

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
B	84	84
HTH	31	35
MC – No Group Opening	-	12
MCGO	12	-
P	162	162

Scenic Views Enhancement	41	41
Total Acres.	**330**	**334**

Overall approximately 330 acres of habitat are associated with treatments identified under Alternative 2, and approximately 334 acres under Alternative 3. Both alternatives are similar; however Alternative 2 is more proactive in creating more fire resilient stands within mixed conifer by removing fading white-fir and creating small group opening and planting them to ponderosa pine. Overall treatments are fairly small in scale on the landscape (<1% at the Forest scale and 1% at the watershed level) and very little habitat is associated with treatments.

Proposed treatments would reduce the risk of high intensity wildfire by thinning the understory, reducing ladder fuels that make the area susceptible to a stand replacement fire. Treatments would accelerate stand development providing long-term habitat for the flicker which prefers a variety of habitat types but focus on mature stands. Although the recruitment of dead wood habitats would be slow, silvicultural treatments would provide beneficial indirect effects by promoting faster growth of green tree replacements, ultimately providing larger diameter snags and down wood over the next 30+ years. As stands age additional snags and logs would develop, providing a higher diversity of habitat and structure. As a result, stands would contain more abundant nesting habitat. In the short-term, commercial thinning from below and thinning of plantations with advance regeneration would reduce the dense understory in the ponderosa pine and mixed conifer stands which could promote ground foraging opportunities for the flicker.

See DecAID Snag and Log Analysis for the projects effect to dead wood habitat and distribution.

Alternative 2 and Alternative 3 – Cumulative Effects

Activities identified in Table 14 and the wildlife report were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to northern flicker reproductive habitat. The Deep Canyon and Whychus watersheds is being used as the scale for analysis for this species. The potential cumulative impacts are discussed below.

Approximately 54 acres of ongoing fire salvage is occurring in the 2012 Pole Creek Fire and approximately 250 acres of fire salvage is ongoing within the Two Bulls Fire. Danger tree removal has occurred or will occur to varying degrees resulting in a reduction of potential nest sites in stand replacement areas along main roads. The Pole Creek and the Two Bulls Fire Timber Salvage Projects remove snag habitat that would reduce potential reproductive habitat for the northern flicker.

The Ursus Hazardous Fuels Reduction Project is approximately 5,900 acres in size and is associated with approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to break up the fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project contains approximately 13 acres of suitable northern flicker habitat. Through project design areas are avoided containing high densities of snags and limits the removal of snags ≥20inches dbh. In addition, the project would retain 6 snags/acre across all treatment units. The project would impact far less than 1% of the existing habitat on the Deschutes National Forest.

Activities proposed under the Bend Municipal Watershed Fuels Reduction and the Bear Wallow Firewood Projects have occurred or may occur in suitable habitat. The Bend Municipal Watershed Hazardous Fuels Reduction and the Bear Wallow Firewood Projects focus primarily on removing dead lodgepole pine among green stands to reduce fuel loading; some of the activity could occur in mixed conifer habitat but would primarily occur in the lodgepole pine habitat. Overall, treatments would reduce the risk of loss of existing habitat from future large-scale disturbances. There are approximately 910 acres associated with these projects; none of these projects propose to remove large snags. However they would

remove medium size snags averaging approximately 14 inches dbh. The treatments would also remove concentrations of dead lodgepole pine and white-fir to disrupt fuel continuity in the project areas. Treatments would remove snag habitat but large snags would be retained on an individual basis to maintain snags habitat throughout the project areas. These projects have the potential to degrade flicker habitat.

The Three Creeks Personal Use Firewood Cutting Area also occurs in the watersheds. This area occurs in the mixed conifer and lodgepole pine habitat types. Firewood cutting is not wide spread and primarily occurs where dead trees can be accessed from open roads. Although snags are cut and removed removal occurs on an individual tree basis versus across the entire designated area. The area is approximately 3,029 acres. The majority of firewood removed is associated with beetle killed lodgepole pine and impacts to the flicker would be incidental and therefore would not measurably impact flicker habitat. Table 127 provides a summary of impacts to the northern flicker.

Table 127: Summary of impacts to northern flicker reproductive habitat within the Melvin Butte project area, Seep Canyon and Whychus watersheds, and across the Deschutes National Forest ("Forest").

	Acres of Flicker Habitat in the project Area	Acres of Flicker habitat in the Watersheds	Acres of Flicker Habitat Across the Deschutes National Forest
Existing	365 acres 0.1% of all nesting habitat on Forest	24,379 acres 11% of all nesting habitat on Forest	219,576 acres 13% of the entire Deschutes National Forest
Alternatives 2 and 3	-330 to -334 acres -0.1% of all nesting habitat on Forest	-330 to -334 acres -1% of all nesting habitat in watersheds	-0.1% of all nesting habitat on Forest (Melvin) -0.2% (Pole Creek Fire Salvage) -0.1% (Two Bulls Fire Salvage) -0.005% (Ursus) -0.4% (Bend Municipal Watershed)
Cumulative Total			0.6% reduction in nesting habitat on Forest

Conclusion

Cumulatively the project impacts less than 1% of suitable habitat across the Forest; the overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The loss of habitat would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan, and thus continued viability of the northern flicker is expected on the Deschutes National Forest.

Old-growth Lodgepole Pine and Post-fire Habitat: Black-backed Woodpecker

Existing Condition

The black-backed woodpecker is a unique species. Altman (2000) identified it as a focal species for old-growth lodgepole pine. However, it is also highly associated with post-fire environments. Wisdom et al. (2000) describes source habitats for black-backed woodpeckers as a year round resident that occurs in various forest types. Across its range it is most abundant in recently burned forests, but in Oregon, bark-beetle killed forests are frequently occupied. Marshall et al. (2003 pp. 368-370) reports for the black-backed woodpecker the "center of abundance" in Oregon is the "lodgepole pine forest east of the Cascade crest between Bend and Klamath Falls". Endemic levels of mountain pine beetles, common in lodgepole pine (10"+ dbh and 170 trees per acre), provide a constant food source. In a study conducted on the

Deschutes National Forest, Goggans et al. (1989) suggested management for the black-backed is tied to the maintenance of decay and disease.

Black-backed woodpeckers are highly associated with stand replacement events (beetle infestations and fire). Black-backed woodpeckers select for small diameter snags (12.7" + 1.1"dbh) for nesting and nest in hard snags with little decay (Saab and Dudley 1998 and Saab et al. 2002). Saab, Dudley and Thompson (2004) found black-backed woodpeckers rapidly colonize stand replacement burns within 1-2 years post-fire but are rare within 5 years which may be due to a decrease in prey of larval bark and wood boring beetles. In a study in Idaho Saab, Russell, and Dudley (2007) found that black-backed woodpecker nest densities peaked at 5 years post-fire. Similarly, Bonnot et al. (2009) found black-backed woodpeckers in the Black Hills of South Dakota, nesting within 3-5 yr. old pine snags near existing food sources (active beetle infestation) and in dense cover. They noted the ephemeral use of infested areas to the 3-5 years while wood-boring insects were abundant.

Wood boring insects that come in with fire differ from mountain bark-beetle outbreaks. Marshall et al. (2003) warns that burned forests and bark-beetle outbreaks should not be considered equivalent habitats. Wisdom contrasted nesting success for black-backed woodpeckers of 68.5 percent in bark beetle infested forests in Oregon with 100 percent success in burned forests of western Idaho and northwestern Wyoming. Black-backed population increases in fire areas lasts for 5 years (Saab and Dudley 1998), whereas large infestations of mountain bark-beetle in the lodgepole pine forests on the Deschutes National Forest last 15 years. Kroll et al. (2012) suggested that unlike salvage after fire, selective harvesting after beetle outbreaks can maintain avian populations comparable to those found in unharvested stands but cautioned that this is not as clear with woodpecker populations that have large home ranges (e.g. black-backed woodpeckers). Small-scale infestations of mountain bark-beetles in lodgepole pine or mixed conifer forests occur on a continuous cycle over the Deschutes National Forest. Snag densities in this habitat type vary widely.

Literature and studies cited within a petition to list the black-backed woodpecker as threatened or endangered under the federal Endangered Species Act (Hanson et al. 2012) support that tree mortality must be relatively recent (generally within 7 years or so after mortality; longer occupancy does occur but at very low and decreasing levels) in order to provide adequate habitat for this species.

However, the petition also pointedly suggests that thinning to reduce the stress and vulnerability of trees to mountain pine beetles indirectly impacts black-backed woodpeckers by reducing the suitability of the stand for its prey (i.e. thinning improves the health of trees that makes them resistant to beetles and reduces their availability for woodpeckers to eat). Thinning and other fuels reduction treatments can have similar impacts to woodpecker prey habitat by decreasing the extent and severity of a wildfire moving through the project area.

In last 15 years an on-going mountain pine beetle outbreak has occurred within the project area and within the Whychus and Deep Canyon Watersheds. The outbreak in the lodgepole pine community associated with the lodgepole pine and the mixed conifer plant association groups. The outbreak occurred to a lesser extent within the ponderosa pine community but does exist where trees are currently stressed from other diseases and/or overstocking. Although the outbreak peaked around 2008, and has greatly subsided, small areas of activity continue to exist in the project area.

The NatureServe status for the black-backed woodpecker is secure at the global level (G5), apparently secure at the national level (N4), and vulnerable at the state level (S3).

Black-backed woodpeckers will nest in snags >10" dbh at the 50-80% tolerance levels. See snag densities associated with these tolerance levels in the DecAid Analysis within Appendix C of the EA.

Through the Forest wide assessment completed for black-backed woodpecker (USFS 2012) reproductive habitat was mapped across the entire Deschutes National Forest using GNN data (See DecAid analysis Appendix C of the EA). Although the GNN data is not specific to black-backed woodpecker habitat, it can be used as representative because we know from the literature within DecAID and reports on file at the district for the MIS habitat mapping that this species use EMC, PPDF, and LP habitat types with snags >10" dbh.

Approximately 1,542 acre of black-backed woodpecker habitat occurs within the Melvin Butte project area and approximately 26,613 acres of habitat occurs within the Whychus and Deep Canyon Watersheds. There is approximately 446,152 acres of black-backed woodpecker habitat that occurs across the Deschutes National Forest. (See Table 128).

Table 128: Black-backed woodpecker reproductive habitat within the Melvin Butte Project Area, Whychus and Deep Canyon Watersheds, and across the Deschutes National Forest.

Acres of Habitat in the Melvin Butte Project Area	Acres of Habitat in the Whychus and Deep Canyon Watersheds	Acres of Habitat Across the Deschutes National Forest
1,542 acres 0.3% of all the nesting habitat on the Forest	26,613 acres 5% of all the nesting habitat on the Forest	446,152 acres 27% of the entire Deschutes National Forest

For the detailed assessments on the black-backed woodpecker for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

The quality of habitat for black-backed woodpecker was rated using wildlife data from DecAID and the GNN snag modeling. Quality of habitat at the Forest uses densities of snags associated with species that use of green conifer stands. Effects to black-backed woodpeckers would be addressed for both green stands and post-fire stands.

General observations of the black-backed woodpecker occur within the watersheds and no nest sites are known to occur in the project area.

Measure: Acres of reproductive habitat affected for black-backed woodpecker

Alternative 1 – No Action - Ecological Trend

Research and exisiting conditions suggest that black-backed activity has peaked in the project area due to the subsidence of the mountain pine bettle outbreak and is now declining due to the age of the snags and the time since the outbreak. There are still areas and individual trees that can contain beetle activity, and with it, possible black-backed woodpecker use. The project is associated with approximately 642 acres of post fire habitat from the 2012 Pole Creek fire. Forest structure and avian communities would change fairly rapidly after a fire depending on differences in prey availability, size, distribution and age of snag habitat. Kotliar et al. (2002) reports in a review of literature associated with effects of fire that black-backed woodpecker rapidly colonize stand replacement burns within 1-2 years and are rare within 5 years due to declines in bark and wood boring beetles. Effectiveness of habitat associated with the fire is rapidly declining.

The density of snags currently in the project area are temporary. Mitchell and Priesler (1998) have shown that up to 90% of lodgepole pine snags have fallen over within 14 years (up to 50% within 8-9 years). It is estimated that a majority of the lodgpole pine snags within the project area have been standing for 6-10 years. Within post fire conditions, it is estimated that about 75% of all snags may fall within 20 years

(Keen 1929, Dahms 1949, Parks et al. 1999, and Everett et al. 1999). As the snags fall and mature understories develope the potential for future habitat for black-backed woodpecker would increase.

The snag fall increases the amount of fuel loading in the project area. A wildfire would likely be of high intensity due to the level of downed logs serving as fuel.

Alternative 2 and 3- Direct and Indirect Effects

Thinning From Below (HTH), Mixed Conifer Thinning From Below with and without Group Openings (MCGO and MC-without openings), Scenic Views Enhancement

Commercial thinning (HTH) and Mixed Conifer Thinning with and without Group Openings (MCGO and MC - without openings) would consist of primarily thinning from below removing green trees >8”dbh. Treatments would focus on maintaining the overstory legacy trees in pure ponderosa pine and mixed conifer stands. Treatments would retain and promote the development of overstory ponderosa pine by reducing on-site competition. Within mixed conifer treatments stands are dominated by small trees and would focus on reducing stand densities primarily removing second growth lodgepole pine and white-fir and favor healthy white-fir and ponderosa pine. This treatment would result in the accelerated growth of residual trees while reducing the fire hazard. Long-term beneficial impacts of small tree thinning would be the reduction of habitat fragmentation by promoting the development of LOS habitat and large snags at an accelerated rate which would promote nesting habitat for the black-backed woodpecker.

Although treatments do not propose to remove snag habitat impacts could occur in the short-term by reducing high stocking densities of small green trees which attract beetles. This could reduce beetle outbreaks and beetle activity would most likely occur in individual trees or isolated occurrences. Similarly, thinning with group opening, where small group openings of approximately 1-3 acres in size would be created by removing white-fir or white-fir lodgepole pine mix, in areas where ponderosa pine is lacking. The openings would be planted to ponderosa pine to create a more fire resilient mixed conifer stand in the long-term. Although no snags are targeted for removal, treatment would also reduce densely stock stands, potentially reducing future beetle out breaks, likely keeping beetle occurrences at a localized level. Over the long-term, treatments focus on retaining existing snags and would promote the development of large trees to be recruited as future snags and nesting habitat. However, treatments would reduce dense forest condition reducing forest structure that attract beetle outbreaks, making condition less favorable for black-backed woodpeckers.

Non-commercial thinning (P) would occur within ponderosa pine plantations that are approximately 20 to 40 years old. Treatments would consist of removing material primarily <8”dbh and occasionally up to 12” dbh. Habitat was mapped where plantations are on average >10 inches dbh and due to overstocking isolated pockets of beetle out breaks occur in these stands, providing some foraging habitat. In addition, small pockets of small snags (approximately 1/2 acre to 1 acre in size) occur providing some nesting opportunities. In the long-term, thinning would reduce stand densities promoting the development of LOS ponderosa pine, recruit large snags, and create trees overtime that better meet nesting needs. However in the short-term, by removing high densities of green trees, it is likely that future beetle outbreaks would be reduced and beetle activity would occur on an individual tree basis or at more localized levels. Variable density thinning would occur creating a mosaic of tree densities. Although thinning would greatly reduce stand densities patches clumps of trees would be retained. This type of thinning is beneficial for the black-backed woodpecker as it maintains dense patches of green trees potentially creating small areas that could attract beetles providing foraging, as well as patches of snags for nesting.

The objective of prescribed fire is to reduce fuel loading to create a continuous mosaic of burned and unburned habitat. Treatments may unintentionally burn existing snags; however new snags could also be

recruited through this process. Mortality of snags in ponderosa pine habitat during prescribed fire treatments in Arizona and California ranged from 20% (Randall-Parker and Miller 2002), 45% (Horton and Mannan 1988), and 56% (Bagne et al. 2008). All three studies found that larger diameter ponderosa pine trees were least likely to die, at least in the short-term. Horton and Mannan (1988) found a 20-fold increase in abundance of snags < 15 cm dbh. Several studies showed that the highest snag losses were in areas where a long period of fire exclusion had occurred (Bagne et al. 1988, Holden et al. 2006). Bagne et al. (2008) and Horton and Mannan (1988) found that re-entry burns had a much lower mortality rate for snags, presumably because the trees that did not burn during the first entry were more resilient. Loss of snags from prescribed fire was partially mitigated by the creation of new snags (Horton and Mannan 1988, Bagne et al. 2008). This treatment would likely create short-term foraging habitat as a result of beetle attraction to the recently burned trees. Additionally, existing snags could likely be lost where concentrations exists. This treatment would likely result in the removal of dense pockets of small diameter green trees which have the potential to be targets of beetle outbreaks in the long-term. Therefore, beetle activity would likely occur on an individual tree basis or much more localized level. This treatment would recruit large ponderosa pine snags on an individual basis overtime, which could potentially provide nesting habitat. Due to the open nature of these stands post treatment, habitat suitability would greatly diminish.

Scenic Views Enhancement was developed to meet the scenic views objectives for the Forest Road 16 corridor. Treatments would remove small dense patches of fire killed trees to enhance visual quality. Small diameter fire killed trees are the focus, retaining all live trees and large snags to benefit scenic quality and maintain existing habitat. Treatment would not reduce reproductive habitat; however it would minimally reduce some foraging habitat by removing dense pockets of small fire killed trees. Large diameter snags and all green trees would be retained.

Table 129 summarizes the amount of habitat associated with treatments under each action alternative for the Melvin Butte project.

Table 129: Total Acres of Reproductive Habitat Associated with each Treatment Type by Alternative for the Melvin Butte Project.

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
B	116	116
HTH	99	146
MC – No Group Opening	-	160
MCGO	166	-
P	305	305
Scenic Views Enhancement	240	240
Total Acres	**972**	**967**

Overall, under Alternative 2 approximately 972 acres are associated with black-backed woodpecker reproductive habitat and approximately 967 under Alternative 3. Alternative 2 would retain approximately 570 acre of untreated suitable reproductive habitat and Alternative 3 would retain approximately 575 acres of untreated suitable reproductive habitat. In total, of the suitable habitat associated with the project areas, 35% of the habitat would remain in untreated stands.

The project primarily avoids removing snags where they exist, retaining existing habitat for the black-backed woodpecker. Treatments would thin stands to reduce existing and potential future beetle outbreaks, which the black-backed woodpecker uses for foraging opportunities. Although these treatments do not propose to remove potential nesting habitat, by reducing high density stands of green trees, it limits areas that could provide future foraging opportunities.

See snag and down wood analyses to review the projects effect to dead wood habitat as it relates to the quality of habitat for black-backed woodpecker

Alternative 2 and Alternative 3 – Cumulative Effects

Activities identified in Table 14 and the wildlife report were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to the Black-backed woodpecker reproductive habitat. The Deep Canyon and Whychus Watershed is being used as the scale for analysis for this species. The potential cumulative impacts are discussed below.

Approximately 54 acres of the Pole Creek Timber Salvage Project and approximately 250 acres of the Two Bulls Fire Timber Salvage Project are ongoing. Danger tree removal occurred on all the fires resulting in a reduction of potential nest sites in stand replacement areas along main roads. Fire salvage directly impacts black-backed woodpecker nesting and foraging habitat by removing fire killed trees that provide high quality foraging habitat in the first 5 years post fire when bark beetles are highly active as well as removing suitable nest snags.

The Ursus Hazardous Fuels Reduction Project is approximately 5,900 acres in size and is associated with approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to break up the fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project would impact up to approximately 2,311 acres of suitable black-backed woodpecker habitat. Project design avoids areas containing high densities of snags and limits the removal of snags $\geq$20inches dbh and under Alternative 3 limits removal on white-fir snag $\geq$22 inches dbh. In addition, the project would retain 6 snags per acre across all treatment units. The project would impact less than 3%-4% of the existing habitat in the Deep Canyon, Tumalo Creek, Deschutes River-Charleston Creek, and McKenzie Canyon-Deschutes River watersheds.

The Bend Municipal Watershed Fuels Reduction and the Bear Wallow Firewood Projects have occurred or may occur in suitable habitat. These projects focus primarily on removing dead lodgepole pine among green stands to reduce fuel loading, some of the activity are also associated with mixed conifer habitat. Overall, treatments proposed would reduce the risk of loss of existing habitat from future large-scale disturbances. There are approximately 910 acres associated with these projects within the Deep Canyon watershed. Treatment within these area focus primarily on reducing stand densities by thinning from below and removing concentration of dead lodgepole pine from bark beetle outbreaks. Treatments in these project areas could reduce black-backed woodpecker habitat by removing dead and dying lodgepole pine that provide both foraging and nesting opportunities.

The Three Creeks Personal Use Firewood Cutting Area also occurs in the watersheds. This area occurs in both mixed conifer and lodgepole pine habitat types. Firewood cutting is not wide spread and primarily occurs where dead trees can be accessed from open roads. Although snags are cut and removed, removal occurs on an individual tree basis versus across the entire designated area. The area is approximately 3,029 acres. The majority of firewood removed is associated with beetle killed lodgepole pine and the beetle outbreak subsided approximately 10 to 15 years ago. Due to lack of forage opportunities within the area it is assumed that black-backed woodpecker numbers have also subsided. Impacts to the black-backed woodpecker would be incidental from firewood gathering and would not measurably impact habitat.

Overall, implementation of the action alternatives under the Melvin Butte project does not propose to remove snag habitat; the project would primarily thin green trees. Snags could potentially be removed if they pose hazards to logging operations under OSHA guidelines. 240 acres of Scenic Views Enhancement Treatment occurs in the 2012 Pole Creek fire area; concentrations of small snags would be removed

primarily those less than 8 inches in diameter. The Scenic Views Treatment would incidentally impact habitat. Cumulatively, the incremental impacts associated with the Melvin Butte project has the potential to indirectly reduce habitat quality on approximately 969 acres. The project could reduce habitat quality on 3% of the available habitat associated with the Deep Canyon and Whychus watersheds. Table 130 provides a summary of impacts to the black-backed woodpecker reproductive habitat within the Melvin Butte project area, Deep Canyon and Whychus watersheds, and across the Deschutes National Forest.

Table 130: Summary of impacts to the black-backed woodpecker reproductive habitat within the Melvin Butte project area, Deep Canyon and Whychus watersheds, and across the Deschutes National Forest ("Forest')

	Acres of Black-backed Woodpecker Habitat in the Project Area	Acres of Black-backed Woodpecker Habitat in the Watersheds	Acres of Black-backed Woodpecker Habitat across the Deschutes National Forest
Existing	1,542 acres 0.3% of all nesting habitat on Forest	26,613 acres 5% of all nesting habitat on Forest	446,152 acres 47% of the entire Deschutes National Forest
Alternatives 2 and 3	-972 acres -0.2% of all nesting habitat on Forest	-972 to -967 acres -3% of all nesting habitat in watersheds	-0.2% of all nesting habitat on Forest (Melvin) -0.01% (Pole Creek Fire Salvage) -0.05% (Two Bulls Fire Salvage_ -0.5% (Ursus) -0.4% (Bend Municipal Watershed)
Cumulative Total			Total 1.1% reduction in nesting habitat on Forest

Conclusion

Cumulatively, with the ongoing forest management projects within the Deep Canyon and Whychus watershed, the project impacts less than 0.2% of suitable habitat across the Forest; the overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The loss of habitat would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan, and thus continued viability of black-backed woodpecker is expected on the Deschutes National Forest.

Landbird Conservation Strategy Consistency

Biological objectives are all based on "where ecologically appropriate" meaningful actions must occur within the proper habitat addressed in order to be consistent or not.

Species	Biological Objectives	Consistent Yes, No, or NA	Rationale
Black-backed Woodpecker	Provide large tracts (>1,000 acres) of lodgepole pine forest dominated by and	Yes	Thinning within lodgepole pine stands will promote the

Old Growth Lodgepole Pine	managed for late successional condition		development of late successional conditions and retain the largest and healthiest trees.

American Marten

Existing Condition

Martens are closely associated with forested habitats that have complex physical structure near the ground (Buskirk and Powell 1994, Bull et al. 2005, Slauson et al. 2004 and 2007). Open areas, such as regeneration logging units, recent severely burned areas, and natural openings are avoided, especially during the winter. Martens cross and re-cross their own tracks to investigate micro habitat features, such as stumps, logs, and brush piles that might contain food. They often use fallen logs as runways (Clark et al. 1987). Forested riparian habitats are used disproportionately higher than they are available, which indicates their importance as travel corridors (Bull and Heater 2005, Buskirk et al. 1989). (USFS 2012)

Much of their time during winter is spent resting or hunting beneath the snow in subnivean spaces created by physical structure close to the ground. This complex structure is more characteristic of older forest structural stages than younger forests. These conditions are also more characteristic of moist and cold forest types where fire return intervals are greater, allowing time for dead wood to be recruited and accumulate. Large logs may be particularly important as winter resting structures (Bennett 1984). (USFS 2012)

Martens are extremely susceptible to predation and are reluctant to venture into openings (Buskirk and Powell 1994). Martens seem to be sensitive to patch size, and usually avoid open habitats dominated by grasses, forbs, and saplings, especially in winter. These areas do not provide the structure necessary for a network of travel ways under the snow, nor do they offer access to this subnivean zone. A lack of overstory cover offers little protection from predators. These open habitats also have more severe microclimatic conditions than areas with forest canopy cover (Buskirk and Powell 1994). (USFS 2012)

Older aged forests often provide overstory cover from avian predators and the means to escape avian and mammalian predators (Bull and Heater 2001). Because marten avoid openings and prefer larger forest patches (Chapin et al.1998 and Hargis et al.1999), habitat fragmentation may lead to isolation of local populations too small for long term viability (Gibilisco 1994). (USFS 2012)

Marten use a variety of structures for resting and denning sites. Resting and denning sites offer protection from predation and thermal stress; thus, availability of quality denning sites likely increases the rates of survival and fecundity in marten (Raphael and Jones 1997). A variety of structures are used for dens, with trees, logs, and rocks accounting for 70 percent of the reported den structures. In virtually all cases of dens in trees, snags, or logs, dens were found in large structures characteristic of late-successional forests. In the Blue Mountains, marten selected for specific habitat as determined by comparing used sites with available and unoccupied sites ($p<0.01$) (Bull et al. 2005). Stands used by martens had higher densities of large snags greater than 20 inches dbh and trees greater than 10 inches dbh. They selected unharvested, closed canopy (50-75%), old-structure stands in subalpine fir and spruce forests. Northern aspects in upper slopes and drainages were selected for. In the Cascades, marten selected sites with higher canopy closure during snow periods than during snow-free periods (Raphael and Jones 1997). In Oregon, canopy closure at rest sites in lodgepole pine dominated stands averaged 36% in snow periods and 27% in snow-free periods. (USFS 2012)

Raphael and Jones (1997) found that down wood and slash piles were important resting and denning structures in the eastern Cascades of central Oregon. Forests in their study area were dominated by lodgepole pine. (USFS 2012)

The current conservation status of the American marten as listed by NatureServe, as secure nationally and globally, but the Oregon Department of Fish and Wildlife Sensitive Species List status is Vulnerable which signifies that the species is facing one or more threats to their populations and/or habitats. Vulnerable species are not currently imperiled in a specific geographic area or the state, but could become so with continued or increased threats to populations and/or habitats.

Historically the primary threat to marten range-wide was loss of source habitat through conversion to early seral stages by logging or wildfire. The LRMP recognized the current mountain pine beetle epidemic was killing thousands of acres of lodgepole pine forest and removing habitat for marten. In the early 2000s uncharacteristic wildfires contributed to additional loss of habitat on the forest. Thousands of acres of dead and dying trees created conditions suitable for stand replacement wildfires that increased in acreage to 46,660 acres during the 1990s decade and mushroomed to 190,000 acres during the 2000-2010 decade. While not all of this acreage was suitable marten denning habitat, much of the fire acreage in both decades was in mixed conifer and mountain hemlock plant associations that provided marten resting, foraging, and denning habitat. The majority of the acreage occurred on the north end of the Deschutes National Forest, Sisters Ranger District. Most of the acreage was defined as stand replacement fires that removed the overstory as well consuming much of the coarse woody debris and standing snags. This combination of events removed marten foraging, resting, and denning suitability on tens of thousands of acres and has likely had the greatest impact on marten on the Deschutes National Forest over the last 20 years (USFS 2012)

The Melvin Butte project area contains very little marten habitat due to the fact that there is only minor amounts of mixed conifer wet and lodgepole pine PAGs. Marten habitat occurs in the project area at higher elevation mixed conifer, mountain hemlock, and residual green lodgepole pine stands. This habitat is contained in the western end of the project area above 5,400 feet. Marten probably avoid the ponderosa pine and mixed conifer dry PAGs due to the more open nature of the stands and their tendency to avoid openings (Ruggerio et al. 1994). These stands lack complex horizontal structure typically found in more mesic forest conditions and in riparian areas. However, they may use the area for dispersal in a north to south continuum along the slopes of the Cascades. Some individual blocks of habitat occur in mixed conifer dry stands and although it is marginal the habitat was identified based on the overstory canopy cover the stands provide.

Through the Forest wide assessment completed for MIS, American marten reproductive habitat was mapped across the entire Deschutes National Forest. Approximately 968 acres of habitat exists within the project area. Approximately 35,375 acres of habitat occurs within the Deep Canyon and Whychus Watersheds and approximately 435,607 acres of habitat occurs across the Deschutes National Forest. Table 131 summarizes these acreages.

Table 131: American Marten Reproductive Habitat within the Melvin Butte Project Area, Deep Canyon and Whychus Watersheds, and across the Deschutes National Forest.

Acres of Habitat in the Melvin Butte Project Area	Acres of Habitat in the Deep Canyon Watershed	Acres of Habitat Across the Deschutes National Forest
968 acres 0.2% of all the habitat on the Forest	35,375 acres 8% of all the habitat on the Forest	435,607 acres 27% of all the habitat on the Forest

Denning habitat was modeled in Wildhab using all plant association groups (PAGs) except juniper and ponderosa pine without the presence of lodgepole pine. Only dense stands were considered denning habitat except in the lodgepole pine and dry cold white fir PAGs where open and dense were deemed suitable for denning. Those PAGs where lodgepole pine is an early seral species were also considered suitable denning habitat. Minimum dbh was defined as equal to or greater than 5 inches (Class 3) for lodgepole pine and equal to or greater than 15 inches (class 5) for the other PAGs.

For the detailed assessment on the marten for the Deschutes National Forest, see the Forest-wide Species Assessment (USFS 2012).

Measure: Acres of reproductive habitat affected for marten

Alternative 1 – No Action – (Ecological Trend)

In the Deep Canyon watershed and within the lodgepole pine community, 90% of the lodgepole pine stands were killed between 2001 and 2008 by an outbreak of the mountain pine beetle, with beetle mortality continuing to date. Very little canopy cover occurs in stands making marten susceptible to predation, rendering stands as unsuitable habitat. Overtime, as dead trees are recruited as down logs, concentrations of down logs accumulate and subnivean foraging and resting opportunities would be provided for the marten. Within mixed conifer stands, areas that currently provide suitable marten habitat would most likely have increased mortality due to tree stress from competition. Without the treatments to thin from below within multi-storied mixed conifer stands, stand densities would reduce the longevity of residual old growth and large tree structure that occurs in these stands. In the short-term, available denning habitat would be limited and in the long-term the future development late and old structure characteristics would be prolonged, as well as stands containing sufficient canopy cover to provide protection from predation.

Stand resilience to insects, disease, and wildfire is measured by the Upper Management Zone (UMZ). The UMZ relates to the density of trees (basal area, trees per acre, etc.) a forest stand can support without significant mortality from bark beetles. The upper management zone is the density level at which trees begin to come under significant stress and can become susceptible to bark beetles and other insects and diseases. Forest stands managed below the upper management zone are more resilient. There are approximately 4,456 acres that have the potential to receive vegetation treatment. Under the existing condition 92% of these stands are above the Upper Management Zone and are at risk or currently impacted by insects and disease due to high stand densities and as a result low resiliency. Approximately 29% (1,571 acres) of the project area is within the wet mixed conifer PAG, approximately 10% (531 acres) in lodgepole pine PAG, and <1% (8 acres) in the mountain hemlock PAG.

Across the Deschutes National Forest, landscape scale fires over the last ten years, have lead to a decline in marten habitat. These fires have consumed large areas of mixed conifer stands due to fuel concentration and stand densities associated with the mixed conifer PAG's. A stand replacement fire event could potentially remove marten habitat and it would take several decades to reestablish suitable marten habitat in the project area.

Overall, high stand densities would result in a decrease in tree vigor among all size classes. The most significant effect of high stand densities would be the gradual loss of the existing historic large-tree component/denning habitat which is likely to be at a much higher rate than if stand densities were reduced to more sustainable levels.

Alternative 2 and 3- Direct and Indirect Effects

Thinning From Below (HTH), Mixed Conifer Thinning From Below With and Without Group Openings (MCGO and MCw/oGO)

Thinning in suitable marten habitat would occur in mixed conifer stands containing residual old growth trees. Thinning from below (from 8" dbh and up) would favor ponderosa pine and healthy white-fir. The target basal area is between 40 to 60 square feet post treatment but would vary from 40 to 140 square feet for dominant overstory tree species in each stand. Where stands are dominated by white-fir, basal areas would be higher, as residual overstory white-fir would be left in aggregate patches and as individual trees. Different thinning scenarios depend on the alternative, the existing basal area, site productivity, and stand

structure objectives. This treatment maintains large trees by reducing their susceptibility to fire and insects by removing competition for space and nutrients. Thinning decreases stand densities and allows for faster growth of young trees while reducing risk (removal of ladder fuels). However, canopy cover is reduced overall resulting in more open stands. Negative impacts may result from more open stands, reducing the canopy cover and potentially making the marten more susceptible to predation. Beneficial impacts should result from reducing risk to existing suitable habitat and facilitating the development of future habitat. This treatment would not remove any snags or down wood unless the snags pose an OSHA safety hazard during logging operations. Snag cavities utilized by marten are often white-fir snags excavated by pileated woodpeckers. Treatments would maintain the largest and healthiest white-fir to provide future snags and down wood.

Due to past harvest of ponderosa pine within the areas identified for MCGO treatment, stands are comprised primarily of white-fir and lodgepole pine. These tree species are not fire resistant and due to mountain pine beetle outbreaks in the project area, much of the lodgepole pine is dead. As a result of tree mortality, canopy closure is low reducing the amount of suitable reproductive marten habitat and increasing fueling loading in these areas. White-fir is also a short-lived species, highly susceptible to insects and disease, and many of the white-fir in these stands are declining from mistletoe. The project proposes to remove the overstory and promote ponderosa pine within these stands where it previously existed, creating a more fire resilient mixed conifer stand in the long-term.

To maintain habitat for the marten as well as other species dependent on interior forest habitat healthy white-fir would be retained through mosaic thinning as individuals and in clumps. High densities of small dead trees (<7” dbh) that contribute to fuel loadings may be removed, but large snags meeting habitat requirement >10inches dbh would be retained to provide short-term habitat for rest site opportunities. Negative impacts may result from more open stands by removing dense patches, creating areas where marten are more susceptible to predation. Long-term beneficial impacts should result by reducing risk to existing suitable habitat and facilitating the development of more fire resistant future habitat by promoting the development of ponderosa pine in these stands. Where interlocking crowns remain in the overstory, marten use would continue due to the security and overstory structure that the stands would continue to provide.

Lodgepole Pine Improvement (LPI)

LPI Treatments would treat some mixed conifer habitat. Treatments are focused on removing unhealthy lodgepole pine to reduce beetle mortality to green stands and promote green tree vigor. Although treatments would remove commercial size trees they would primarily be smaller diameter trees; this have would a minor impact to reproductive habitat associated with these species. Minimal effects are anticipated due to the limited amount of habitat associated with this treatment type.

Prescribed Burning (B)

Prescribed Burning would also take place. Burning would reduce activity fuels and overall fuel loadings to acceptable levels. Fuel treatments would reduce fire risk and competition to established trees, increasing stand resiliency to wildfire. The objective is to create a mosaic of burned and unburned areas creating a discontinuous distribution of fuel throughout the project areas. Although burning could reduce down log concentrations, snags would likely be created and be recruited as down wood in the short-term. Treatments would reduce the risk of stand replacement fire which has greatly impacted marten habitat across the district due to the loss of interior forest habitats.

Scenic Views Enhancement

The Scenic Views Enhancement treatment was developed to meet Scenic Views objectives associated with the Forest Road 16 corridor. As a result of the 2012 Pole Creek Fire this area experienced stand replacement fire; areas containing high densities of small (<8 in. dbh) dead trees would be removed to enhance scenic quality. All green trees and large snags that contribute to visual quality would be retained. This treatment would not likely reduce reproductive habitat or future habitat since all green trees and large snags would exist post treatment.

Table 132 summarizes the amount of marten reproductive habitat associated with each action alternative for the Melvin Butte project.

Table 132: Total Acres of Marten Reproductive Habitat Associated with each Treatment Type by Alternative.

Treatment Type	Alternative 2 (acres)	Alternative 3 (acres)
B	207	207
HTH	325	383
MC – No Group Opening	-	50
LPI	17	17
MCGO	50	-
Scenic Views Enhancement	50	50
Total Acres.	**649**	**707**

The effects to marten habitat as a result of each treatment type are consistent across the action alternatives. The project area and habitat varies greatly from north to south due to the change in elevation and inherent soil quality within this north to south pattern. To capture the importance of habitat variation the project area was segmented into three productivity zones north to south. A habitat retention strategy was defined for the low elevation ponderosa pine where approximately 10% of area would be left in untreated stands and aggregate patches; in the mid-elevation ponderosa pine/ mixed conifer dry habitat with moderate site productivity where approximately 15% of this landscape would be left in untreated stands and aggregate patches; and within the high elevation mixed conifer wet stands with high site productivity where approximately 20% of this landscape would left in untreated stands and aggregate patches. These untreated areas would retain habitat connectivity between thinned stands and un-thinned stands and maintain marten habitat over time.

Overstory structural diversity would be reduced in MCGO and MC-no openings units but would remain in HTH units. Understory complexities would be reduced through fuels treatments to treat slash generated from thinning activities. Fuels treatments associated with harvest treatments may have impacts to marten and their prey species. Although prey habitat would be reduced in the short-term, some residual habitat would remain and provide foraging opportunities for the marten. Long-term benefits of treatments would be a reduction of stress to the overstory by thinning from below, promote the longevity of residual large tree structure, and the development of future old growth, providing long-term habitat. Similarly, in a meta-analysis by Fontaine and Kennedy 2012, analysis showed that surrogate fuels treatments (thinning and prescribed fire) in fire prone forests increased vertebrate biodiversity.

Affected habitat varies little between each alternative and the differences are insignificant.

Overall, approximately 649 acres of marten reproductive habitat are associated with treatments identified under Alternative 2 and approximately 707 acres under Alternative 3 totaling 70% of the existing reproductive habitat in the project area. The majority of these treatments would occur in the wet mixed conifer PAG. Thinning and burning would reduce snag and down wood structural complexities that contribute to marten reproductive habitat. Thinning would reduce overall canopy closure associated with these areas and reduce the probability of crown fire. Although burning would recruit snags and down

wood, slash treatment associated with these stand would decrease overall down wood level in the stands, minimally meeting Forest Plan objectives. Marten reproductive habitat would be reduced within the project area; however a full stocked overstory would remain post treatment. Although these stands may not meet the need for marten denning habitat, these areas would still provide avenues for dispersal.

See snag and down wood analyses to review the projects effect to dead wood habitat as it relates to the quality of habitat for marten.

Alternative 2 and Alternative 3 – Cumulative Effects

Activities identified in Table 14 were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to the marten. The Deep Canyon and Whychus watersheds will be used to discuss the cumulative impacts to this species.

Approximately 54 acres of salvage logging are ongoing within the Pole Creek Fire area and approximately 250 acres of salvage logging are ongoing within the Two Bulls Fire area. Danger tree removal along main roads has occurred or will occur to varying degrees; these project areas do not provide marten habitat.

The Ursus Hazardous Fuels Reduction Project is approximately 5,900 acres in size and includes approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to disrupt fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project removes habitat by reducing canopy cover in the eastside and montane mixed conifer habitat types through the thinning green trees. Through project design areas are avoided that contain high densities of snags and limits the removal of snags $\geq$20inches dbh and under Alternative 3 limits removal on white-fir snag $\geq$22 inches dbh. In addition, the project would retain 6 snags per acre across all treatment units. Implementation of the Ursus project would contribute to a small downward trend in local marten populations due to the reduction in canopy closures and smaller snags and logs in mixed conifer and lodgepole pine (EMC, MMC, and LP) habitat types. Additive impact to the Deep Canyon watershed would occur from both Melvin Butte and Ursus since both project propose thinning treatments that would reduce canopy closure in suitable habitat within the Eastside Mixed Conifer habitat type. The project would impact between approximately between 1,118 and 1,543 acres of overstory habitat suitable marten. This contribution is small because the projects are adjacent to high quality habitats in the roadless areas (marten observations have been made in roadless areas) and downed log densities would increase as snags fall.

Activities proposed under the Bend Municipal Watershed Fuels Reduction and the Bear Wallow Firewood Projects have occurred or may occur in suitable habitat. The Bend Municipal Watershed Hazardous Fuels Reduction and the Bear Wallow Firewood Projects primarily focus on removing dead lodgepole pine among green stands to reduce fuel loading; some of the activity could occur in mixed conifer habitat but would primarily occur in lodgepole pine habitat. Treatments would reduce the risk of loss of existing habitat from future large-scale disturbances. There are approximately 910 acres associated with these projects and do not propose to remove large snags within mixed conifer; however treatments associated with these projects would contribute to an overall reduction in canopy closure. The objectives of treatments are to reduce the risk of crown fires on the landscape; post treatment habitat suitability would diminish for marten. In areas containing concentration of snags and down logs concentrations would be removed and therefore would lack dead wood complexities that provide marten habitat. Minimally treatments would meet Forest Plan standards and guides for snags and down logs. Where green stands exist fully stocked stands would be retained post thinning, minimally providing dispersal opportunities for marten. However, treated stands would likely not provide denning opportunities.

The Three Creeks Personal Use Firewood Cutting Area also occurs in the watersheds. This area occurs in both mixed conifer and lodgepole pine habitat types. Firewood cutting is not wide spread and primarily occurs where dead trees can be accessed from open roads. Although snags are cut and removed, removal occurs on an individual tree basis versus across the entire designated area. The area is approximately 3,029 acres. The majority of firewood removed is associated with beetle killed lodgepole pine and impacts to the marten would be incidental from firewood gathering. Canopy cover would not likely decline as a result of firewood gathering since no green trees can legally be removed. Impacts to the marten habitat would be incidental from firewood gathering and would not measurably impact habitat.

Treatments associated with the mixed conifer PAG within the Melvin Butte project would thin from below, promoting the development of contiguous stands of late and old structure habitat this species needs for denning. In mixed conifer habitat dominated by ponderosa pine, the project would manage stands by thinning from below but would favor the ponderosa pine to develop a more fire resistant stand containing large ponderosa pine as the dominant species. Treatment would maintain large white-fir in the overstory, except where it is the dominant species, then ponderosa pine would be promoted. Through project design treatments would maintain untreated stands throughout the project area, providing small tree diversity that could provide habitat for marten.

Overall, implementation of the action alternatives as well as other ongoing projects in the Deep Canyon and Whychus Watersheds, should result in improved habitat conditions for marten in the long-term. Cumulatively, in the short-term there would be a decrease in dense understory habitat, reducing denning and foraging opportunities. Treatments would maintain healthy white-fir in the overstory promoting a more fire resilient mixed conifer stand and minimize the loss of more landscape to wildfire which would create unsuitable habitat for marten. Large untreated blocks of habitat are retained throughout the project area to provide habitat connectivity, as well as retention of habitat within each treatment unit. The project would promote habitat for this species by reducing the risk of stand replacement fire and promote the development of large tree structure in mixed conifer stands over time.

Melvin Butte project would reduce marten reproductive habitat on approximately 1% of the Deep Canyon and Whychus watersheds. Table 133 provides a summary of impacts to American marten reproductive habitat within the Melvin Butte project area, Deep Canyon and Whychus watersheds, and across the Deschutes National Forests.

Table 133: Summary of impacts to American marten reproductive habitat within the Melvin Butte project area, Deep Canyon and Whychus watersheds, and across the Deschutes National Forest ("Forest").

	Acres of Marten Habitat in the Project Area	Acres Marten Habitat in the Watersheds	Acres of Habitat Across the Deschutes National Forest
Existing	968 acres 0.2% of all denning habitat on Forest	35,375 acres 8% of all denning habitat on Forest	435,607 acres 27% of the entire Deschutes National Forest
Alternatives 2 and 3	-649 to 707 acres -0.1% of all denning habitat on Forest	-649 to 707 acres -1% of all denning habitat in watersheds	-0.1% of all denning habitat on Forest (Melvin) -0.01% (Pole Creek Fire Salvage) -0.3% (Ursus) -0.2% (Bend Municipal Watershed)
Cumulative Total			Total 0.6% reduction in denning habitat on Forest

Conclusion

Cumulatively, because this project impacts 0.6% of suitable American marten habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The loss of habitat would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan, and thus continued viability of American marten is expected on the Deschutes National Forest.

Consistency with the Deschutes LRMP

Wildlife standard and guideline WL-63 will be assessed. The project is consistent with the Deschutes LRMP.

Standard and Guideline	Do Not Meet, Meets, Not Applicable	Rationale
WL-63 – In preferred forest types, concentrations of down woody material will be left at an average of approx. one per acre after any timber harvest. Concentrations incorporating high tree stumps, logs, or snags are especially desirable.	Meets	This project does not target large snags for removal.

Snags and Down Wood

Introduction

Dead wood (standing or down) plays an important role in overall ecosystem health, soil productivity and numerous species' habitat. This dead wood habitat is crucial in the continuation of species that depend on snags and logs for all or parts of their life cycle (Laudenslayer 2002). Bird and mammal species rely on dead wood 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 decay stage is utilized by the same species, but rather a whole array at various stages or conditions. In forested environments, 93 wildlife species are associated with snags.

This includes 4 amphibians, 63 birds, and 26 mammal species (Rose et al. 2001). Uses of snags include nesting, roosting, preening, foraging, perching, courtship, drumming, and hibernating.

Snag and down wood levels are best analyzed at scales of subwatersheds or greater (Mellen et al. 2006). Due to the recent fires that span both the Whychus and Deep Canyon watersheds snags and down wood will be addressed as they relate to size, density, and distribution by habitat type for the Melvin Butte project area and within both the Whychus and Deep Canyon watersheds (262,308). The Whychus and Deep Canyon watersheds will be the zone of influence for measuring cumulative effects for snags and down wood.

Fires are a unique phenomenon, creating a boom and bust cycle of dead wood habitat, when viewed across a large landscape. Habitats created by fire represent only a small percentage of broad landscapes. Therefore, analyses of fire created dead wood habitats need to be conducted on a larger area to help determine how individual fire areas are contributing to habitat at the larger scale. Approximately 642 acres of the Pole Creek Fire of 2012 overlap the Melvin Butte project area.

There are four general habitat types found within the Melvin Butte project area; ponderosa pine/Douglas-fir (PPDF), eastside mixed conifer (EMC), lodgepole pine (LPP), and montane mixed conifer (MMC). The ponderosa pine/Douglas-fir habitat type is dominated by ponderosa pine trees; no Douglas-fir exists within the Melvin Butte project area. The eastside mixed conifer habitat type consists of several different tree species (e.g. ponderosa pine, white fir, lodgepole pine). The lodgepole habitat type is dominated by lodgepole pine, but white-fir and ponderosa pine can be found in these stands. The montane mixed conifer habitat type includes a mix of high elevation tree species. Tree species found in this habitat type include those mentioned previously as well as subalpine fir, white bark pine, and western white pine. The same compliment of habitat types is also found within the Deep Canyon and Whychus Watersheds. See Appendix E for more information.

DecAID was not be used to analyze snags; however DecAID will be used to evaluate habitat to individual species that utilize snags. **"Forest inventory data are not available for recent post-disturbance habitats"** (emphasis added). High snag densities resulting from these disturbances are temporary because snag densities decline rapidly as snags fall in the first decade or so after the disturbance. As a result, stands which have recently sustained a stand-replacing disturbance are not well represented in the inventory data in DecAID, even those from unharvested plots; they are an extremely small proportion of the landscape at any one point in time. Plots occurring in areas experiencing recent fire or other stand replacing disturbance likely are included in the inventory data from one of the other three structural condition classes and are likely plots with high levels of down wood (i.e., the right side of the distribution histograms). It was not possible to separate out plots occurring in these disturbed areas. As a result, inventory data are not available for recent post-fire habitats. (Mellen-McLean 2006). Due to the large amount of recent post fire habitat associated with the Whychus and Deep Canyon watersheds, forest inventory data will not be utilized for the cumulative effects analysis that is conducted at the watershed scale.

The Melvin Butte Project is located in Northwest Forest Plan (NWFP) land allocations; therefore the NWFP provides the management direction for the Melvin Butte project. The following summary of land management direction is displayed to compare standards and guides associated with the Deschutes National Forest. This comparison determines the most restrictive planning direction and how dead wood habitat will be managed based on the best available science and guidance.

Snag and Down Wood Management Direction

The following is a review of current management direction for snags and down wood and how standards would be used in the Melvin Butte project area.

Northwest Forest Plan (NWFP)

The NWFP provides standards and guidelines for snags and logs by land allocation (USDI and USDA 1994). Management activities would not occur within Congressionally Reserved; Riparian Reserves (reserves are located in the project area but no treatment would occur), or Late Successional Reserve land allocations; therefore these standards and guidelines do not apply to the project area. Standards and guidelines for the Matrix land allocation apply, including the Administratively Withdrawn land allocation.

Matrix land allocation standards and guidelines include the retention of green tree replacements and snags both in patches and singly. For treatments such as clear-cuts with reserves and shelterwood harvests 15% of the area associated with each cutting unit is to be retained. However, this standard and guideline does not apply to intermediate harvests (i.e. thinning). Since applicable standards have not yet been developed for snags and down wood for intermediate harvest, the standards that apply to regeneration harvest would be used for the Melvin Butte project area. At a minimum, snags are to be retained in the harvest units at levels sufficient to support species of cavity nesting birds at 40% potential population levels.

The project would provide specified amounts of coarse woody debris in the Matrix land allocation; a minimum of 120 lineal feet of logs per acre greater than or equal to 16 inches in diameter and 16 feet long should be retained.

Deschutes NF LRMP Standards and Guidelines

Standards and guidelines in the Deschutes NF LRMP which apply to species associated with snags and down wood include WL-37 and WL-38:

WL-37: In coniferous forest, sufficient snags will be maintained to provide 40 percent of potential population levels of cavity nesting species within even-aged harvest units of the General Forest, visual areas (retention, partial retention, and middle ground), and Deer Management Area allocations. In uneven-aged harvest units, within the management areas noted above, live replacement trees will be left during any harvest to assure 60 percent of cavity nesting potential through the rotation, except where natural deficits occur in diameter classes. In both even and uneven-aged management, groupings of green replacements will be the preferred implementation technique. Compliance will be based on the harvest unit area rather than an individual acre evaluation. In all other management areas, at least 60 percent of cavity nesting species potential population needs will be provided.

WL-38: Specific guidance will be provided by the Deschutes National Forest Wildlife Tree Implementation Plan.

WL-72: Logs and downed woody debris will be retained after timber management activities with an average of at least 3 cull logs per acre, plus 3 additional logs per acre in more advanced stages of decomposition.

Wildlife Tree and Log Implementation Strategy

The Deschutes National Forest Wildlife Tree and Log Implementation Strategy (WLTL) provides guidance and options for meeting the snag, green tree replacement (GTR), and down log objectives across the forest, regardless of management direction (USFS 1994b). This strategy focuses on the treatment unit as the area of accountability for meeting WLTL objectives. It states that “Snags, GTRs, and down logs will not be provided on every acre in the forested ecosystem. A mosaic distribution of WLTL resources across the landscape maintaining viable populations and ecological functions is the desired condition.” Current literature and research at the time, as well as incorporating the NWFP and Eastside Screen requirements were used to develop the number of hard snags (recently dead standing snag) needed by

each species to support various percentages of their population. These were developed for each vegetative series and for areas west and east of the Northwest Forest Plan line.

Table 134 summarizes the estimated number of snags per acre to meet 100% maximum population potential (MPP) for cavity nesters and estimated number of trees per acre (tpa) required to meet best available science for Green Tree Replacements (GTRs).

Table 134: Snag and GTRs for Wildlife Tree and log Implementation Strategy

	Habitat Type		
	Ponderosa Pine	**Mixed Conifer**	**Lodgepole Pine**
100% MPP based on best available science	4 snags/acre	4 snags/acre	6 snags/acre
GTRs @ 13-19" residual stand*	8 tpa	8 tpa	6 tpa

*This concurs with the 10-19" average dbh for the small/medium structure stage defined in DecAID.

Biological Potential

Habitat requirements, including snag and down woody material levels, were described in the LRMP and amended Eastside Screens for a variety of wildlife species using information known at the time in Thomas (1979) and Brown (1985). However, more recent empirical studies indicate that snag numbers and sizes selected by some wildlife species are far higher than those calculated by the maximum potential population technique (Bull et al. 1997, Rose et al. 2001). The East-side Screens do not apply to the Melvin Butte project area.

This suggests that the LRMP direction of managing for 100 percent population levels (WL-37 S&G) of primary excavators may not represent the most current knowledge of managing for cavity nesters and that these snag levels, under certain conditions, may not be adequate for some species, particularly for secondary cavity nesters. In addition, the current direction provides recommendations for green stands only when studies show that cavity-nesting birds require higher snag densities in post-fire conditions versus green stands for nesting and productivity (Bull et al. 1997, Rose et al. 2001). This is likely because cavity-nesting birds require more snags for foraging, cover, and protection from predators in post-fire environments.

DecAID Advisory Tool

The DecAID Advisor (Mellen-McLean et al. 2009) is used as the best available science for the Melvin Butte snag analysis. DecAID is a web-based advisory tool that helps managers evaluate effects of forest conditions and existing or proposed management activities on organisms that use snags and down wood. It is a summary, synthesis, and integration of published scientific literature, research data, wildlife databases, forest inventory databases, and expert judgment and experience. DecAID is used to estimate sizes and densities of dead wood that provide habitat for many species and ecological processes. It presents information on the range of "natural conditions" (as represented by unharvested plots within the plots sampled), "current conditions" (all plots sampled, including both unharvested and harvested plots), and wildlife use.

Historical Range of Variability

The terms Historical Range of Variability (HRV), Natural Conditions, and Historical Conditions in DecAID are sometimes used interchangeably to indicate conditions which occurred on the landscape prior

to the influence of humans (particularly Europeans). Because it is difficult to determine the actual snag and down wood levels prior to the influence of humans, the term Reference Condition is used in DecAID when referring to the use of vegetation inventory data from DecAID based on data from unharvested plots. When using the "natural condition" of snag and down wood distribution represented by the summary of forest inventory data from unharvested inventory data in DecAID, caution should be used due to years of fire exclusion. The vegetation data can help determine the "natural range of variability" for dead wood, which can be used as a proxy for HRV. In managing habitat within HRV, it is assumed that adequate habitat will be provided because species which survived those levels of habitat in the past are present today. The more that current conditions deviate from HRV, the less likely it is that adequate habitat occurs on the landscape to sustain those species. Although existing snag and down wood levels and composition in DecAID may not accurately reflect pre-European "natural" or historical conditions, they are still within reason when comparing them to other recent research.

Comparison of DecAID with other research

Harrod et al. (1998) estimated snag densities in ponderosa pine dominated dry forests for snag densities (> 6" dbh) at 6 to 14 snags per acre (4.5-7.0 tons per acre) in pre-European settlement landscapes. These estimates were derived by calculating the basal area of snags from pre-1930 growth rates, holding forest stand structure relatively constant (i.e., as a new live tree is recruited another one becomes a mortality) and applying published snag fall rates (Bull et al. 1980, Keen 1929, Raphael and Morrison 1987, and Schmid et al. 1985). It was assumed that historical frequent, low intensity fires did not accelerate snag fall rates.

Agee (2002) estimated lower snag densities (2 snags per acre) than Harrod et al. (1998) for the ponderosa pine/Douglas-fir forest series by estimating the number of trees in 0.25 acre clumps of 16 age classes and assuming that the oldest patch was killed by insects every 25 years. He assumed fire helped to decompose snag patches and after 5 fires at 10 year intervals, snags would be completely consumed. Agee (2002) compared his estimates to Harrod et al. (1998) but assumed an average snag diameter of 30" dbh when calculating biomass, whereas Harrod et al. (1998) estimated densities for size classes as small as 6" dbh. Results from regional studies in Eastern Washington and Oregon (across all land ownerships) by Ohmann and Waddell (2002) suggest there are currently 2.025 total snags per acre greater than 10"dbh, of which 0.405 snags are greater than 20"dbh.

Snag densities reported by Harrod et al. (1998), Agee (2002), and Ohmann and Waddell (2002) are within the range (50% tolerance level) of those reported in DecAID (Mellen-McLean et al. 2009) for Ponderosa pine/Douglas-fir and Eastside Mixed Conifer habitat types for small and medium trees.

How DecAID was reviewed for the Melvin Butte Project

Analysis areas should be sufficiently large to encompass the range of variation in wildlife habitat types and structural conditions that occur in the area (Mellen-McLean et al. 2009). In general, at least 20 square miles (12,800 acres) in each habitat type is suggested as a minimum size for an analysis. The Whychus and Deep Canyon watersheds (HUC 10) were used for an appropriate comparison to the vegetation inventory data in DecAID for the Melvin Butte project area.

The PAGs in the Melvin Butte project area were compared to habitat types in DecAID. The DecAID habitat types are: (1) ponderosa pine/Douglas-fir (PP/DF) which best represents the ponderosa pine dry (PPD) and ponderosa pine wet (PPW) PAGs; (2) eastside mixed conifer (EMC) which best represents the mixed conifer wet (MCW) and mixed conifer dry (MCD) PAGs; and (3) lodgepole pine (LP) (Table 135).

Table 135: Plant Association Groups, Corresponding Habitat Types in DecAID and acres in the Melvin Butte Project Area

Plant Association Group in Melvin Butte project area	DecAID Habitat Type	Number of Acres in the Melvin Butte project area
Ponderosa pine (wet and dry)	Ponderosa Pine/Douglas Fir	1,123
Mixed conifer (wet and dry)	Eastside Mixed Conifer	3,694
Lodgepole Pine (wet and dry)	Lodgepole Pine	530
Mountain Hemlock (dry)	Montane Mixed Conifer	8

In order to use the best available science for analyzing effects to dead wood (snags and logs) at least 12,800 acres of a habitat type are necessary (see Appendix E). The overlapping Deep Canyon watershed does not contain this amount of lodgepole pine or eastside mixed conifer habitat; therefore a second watershed was added: the adjacent Whychus watershed. The Whychus watershed is very large, making up a significant portion of the southern end of the Sisters Ranger District. Effects using this watershed will focus on the lodgepole pine and eastside mixed conifer habitats. These watersheds comprise the habitat types the proposed actions are treating at scales that would meaningfully represent cumulative effects (e.g. species territory size, connectivity to habitat across the Forest). Only National Forest System lands will be analyzed within the "zone of influence"; private lands are not managed for snag and log habitat nor management indicator species. Habitat for each identified species associated with the project area will be discussed on a Forest wide basis to address species viability as it relates to MIS.

An HRV analysis of existing snag density and down wood across the Deschutes National Forest and at the 5th field watershed (HUC 10) level used information from DecAID and the Ochoco and Deschutes Viable Ecosystems Management Guide (*Viable*, USDA FS 1994c). The Viable model was developed to classify vegetation on a landscape basis and compares existing vegetation with site potential. Viable stratifies the environment along a gradient of size, structure, species composition, and relative tree density. The various classifications are then linked to wildlife habitat requirements. The 2004 Deschutes National Forest satellite imagery layer was used to develop the Viable map. Data is mapped on a 25 meter pixel grid and assigned a value relating to size, structure, tree species, and tree density for the animal species. The resulting layer was then updated by removing stand replacement and mixed mortality fires and forest management activities within the last five years.

The percentage of the landscape in each snag category was then weighted to match the HRV ranges from the Viable analysis. The snags per acre categories were summarized to get a historical range of snag densities that would be expected to occur in the Melvin Butte analysis area.

Wildlife Data Tolerance Level

In DecAID, a tolerance level as it relates to wildlife data is defined as follows: "Tolerance Levels are estimates of the percent of all individuals in the population that are within some specified range of values" (Mellen-McLean et al. 2009). DecAID is not a viability model and tolerance levels should not be interpreted as population viability "thresholds." DecAID tolerance levels may be interpreted as three levels of "assurance": low (30% tolerance level), moderate (50% tolerance level), and high (80% tolerance level)" (Mellen-McLean et al. 2009). The higher the tolerance level, the higher the "assurance" that snag habitat is being provided. For example, using data from the wildlife species curves for white-headed woodpeckers (Table 136) in small and medium sized trees in the ponderosa pine/ Douglas-fir habitat type, the snag density (≥10"dbh) for white-headed woodpeckers is as follows:

Table 136: Wildlife Data Tolerance Level

Tolerance Level	Snags per acre	Explanation
30% tolerance level	0.3 snags/acre	Areas with < 0.3 snags/acre would be expected to be used for nesting by only 30% of the individuals within the population

		of white headed woodpeckers, and conversely 70% of the population would be expected to nest in areas with > 0.3 snags/acre.
50% tolerance level	1.7 snags/acre	Half the individuals within the population would be expected to nest in areas with <1.7 snags/acre and the other half would be expected to nest in areas with >1.7 snags/acre.
80% tolerance level	3.7 snags/acre	80% of the individuals within the population of white headed woodpeckers would be expected to nest in areas with <3.7 snags/acre and conversely 20% of the population would be expected to nest in areas with >3.7 snags/acre.

Snags Existing Condition

Stand exam plot data was collected within each habitat and each stand structure type to define the existing condition of snags in the Melvin Butte project area. Stand exam data was utilized to define the existing condition for snags across the project area due to the fact that the project area is very small (5,375 acres); this data more accurately displays snag densities compared to the GNN data which is better suited for larger landscapes as identified in the DecAid Advisor. Snag data was extrapolated from stand exam plots and displayed in the size classes (Table 137) identified within the DecAid Advisor: Snags <10 - 19 inches dbh and <20+ inches dbh.

Table 137: Average dead trees per acre by dbh class within the Melvin Butte Project Area.

Size Class	Existing Condition
10-19 inches dbh	9.28 snags/acre
20+ inches dbh	.71 snags/acre

To determine snags densities for wildfires within the Whychus and Deep Canyon watersheds, pre-fire GNN stand structure and composition data was used and associated with the vegetation mortality mapping for those fires. Once vegetation mortality was applied, GNN stand structure and composition data could estimate post fire snag numbers and sizes on all 26,120 of the acres of stand replacement, mixed severity, and underburned stands throughout the fire area. Please see Appendix C for a detailed report of how the analysis was conducted.

Snag habitat would only be provided in the short term. It is estimated that about 75% of all snags are likely to fall within 20 years (Keen 1929, Dahms 1949, Parks et al. 1999, and Everett et al. 1999). Once the snags are on the ground there would be a period of time that stand replacement areas have minimal amounts of snags. In the mixed severity areas trees that survived the Pole Creek Fire would be able to provide a future supply of snags.

Down Wood Existing Condition

Logs are an important component on the landscape. They provide organic and inorganic nutrients in soil development, provide microhabitats for invertebrates, plants, amphibians, and other small vertebrates, and provide structure for riparian associated species in streams and ponds. It has been shown that size, distribution, and orientation may be more important than tonnage or volume. Small logs provide escape cover or shelter for small species. It is still unknown what levels of down woody material are needed to provide quality habitat for associated species (Bull et al. 1997). Tallmon and Mills (1994) have shown that red-backed voles, a primary prey species for the spotted owl, are highly associated with large down material in more advanced decay stages. Truffles, a dietary staple of the northern flying squirrel, have also been loosely associated with down material.

Heavy concentrations of down wood may impede travel by big game and present a fire hazard. However, increased levels also provide cover for small invertebrates and may protect seedlings from browse and scorching. Orientation has also been shown to be important. Logs that lie along a contour are used more than those lying across contours. Larger sized logs are also used by more species than smaller logs. (Bull et al. 1997).

A variety of species are associated with down wood. Use by species differs in relation to size, decay class, and purpose of use, as well as many other factors. Therefore, by providing for varying densities, sizes, species, and decay classes on the landscape, down wood would provide for an array of wildlife species. Most available information of wildlife use of downed wood is representative of green stands.

Down wood abundance on the Deschutes National Forest is highly variable due to many factors. The Deschutes National Forest lies on the eastside of the Cascades where there is a limited availability of water and nutrients as compared to the west side of the Cascades. This, combined with overcrowded stand conditions due to fire suppression, has led to tree mortality above historic levels especially within smaller size classes. Plant associations groups that tend to be drier (i.e. ponderosa pine and mixed conifer dry) may recruit higher levels of down wood today than historically.

Measures:

- ***Consistency with the Deschutes LRMP (USDA 1990), Deschutes Wildlife Tree and Log Implementation Strategy (USDA 1994b), and the Northwest Forest Plan (USDA 1994b) down wood guidelines.***
- ***Snag densities that occur within the Whychus and Deep Canyon Watersheds.***

Alternative 1 – No Action (Ecological Trend)

There are no known direct impacts to snags, down wood, or green tree replacements (GTRs) under Alternative 1 (No Action). Current fuel loadings and fuel continuity from of fire suppression has put the project area at risk of large fires within the Whychus and Deep Canyon watersheds; there have been seven large fires since 2002. The Melvin Butte project area is one of the few remaining mid-elevation areas on the Sisters Ranger District that has not burned. Due to the fire history of the district and small lighting caused fires in or near the project area from the 2014 fire season, the likelihood is high for stand replacement fire. These large stand replacement events create snags; however, this pulse of snags is short lived (less than 25 years) and there is a long lag time until snags are available on the landscape. In addition, there are limited large trees to provide future large snag habitat. Over time competition would continue to increase in overstocked stands and smaller snags are expected to increase across the landscape.

Snags are expected to increase over time as insects and disease in overly dense stands cause additional tree mortality at natural levels consistent with increasing levels of inter-tree competition. Down wood levels would increase as snags continue to fall in the future absence of fire. Although a steady recruitment of new snags and logs are expected, they would generally be less than 20” (Table 138) dbh size classes, the preferred size class by many species of wildlife. Green tree replacements would remain at existing levels across the landscape and all trees would continue to be available as green tree replacements.

Wildfires may create additional snags and logs beneficial to some woodpecker species. However, there is also risk of a high-intensity stand replacement fire which may reduce current habitat conditions for a larger number of species. In addition, these pulses of post-fire habitat are usually short-lived. Stand resilience to insects, disease, and wildfire is measured by the Upper Management Zone (UMZ). The UMZ relates to the density of trees (basal area, trees per acre, etc.) a forest stand can support without significant mortality from bark beetles. The upper management zone is the density level at which trees begin to

come under significant stress and can become susceptible to bark beetles and other insects and diseases. Forest stands managed below the upper management zone are more resilient. There are approximately 4,456 acres that have the potential to receive vegetation treatment. Under the existing condition 92% of these stands are above the Upper Management Zone and are at risk or could be impacted by insects, disease and stand replacement fire due to high stand densities.

Extreme fire hazard equates to high flame lengths and varying degrees of crown fire. Given assumptions made from the best available science, extreme and even moderate and high fire hazard would be damaging to valued stand characteristics such as large old trees.

Small diameter down wood would continue to be created as competition for nutrients and water makes trees more susceptible to insects and disease. There are limited large trees ≥ 21" dbh available for future large down wood recruitment. Increased stand densities perpetuates the problem of losing large tree structure over time which many species require for suitable nesting and foraging habitat. In dense stands increased competition for nutrients would require a longer period of time for the smaller trees to become large trees and utilized by these species. It also allows for fewer available nest sites which could result in more competition for existing sites between species and lead to greater predation risks. Increased stand densities may increase the risk of loss from fire. Species which require snags for nesting primarily utilize softer snags (moderate decay); these softer snags would likely be consumed more rapidly with increased fire intensities, leading to large areas of the landscape being unsuitable if such an event were to occur.

The Forest Vegetation Simulator was utilized to model the trend in snag densities by size class over time. Snag densities derived from plot data collected through stand exams were displayed in the existing condition and utilized to model snag densities over time. Snag data was displayed in 10 year increments over a 100 year time period without the presence of fire. It is important to acknowledge that the likelihood of fire occurring in Melvin Butte project area is high. Approximately 42% of the Sisters Ranger District within the elevation zone of the Melvin Butte project has burned since 2002. Table 138 displays the change of snag densities overtime without treatment.

Table 138: FVS modeled snag densities for the existing condition within the Melvin Butte project area

Year	Snags per acre 10-19 inches dbh	Snags per acre 20+ inches dbh
2014	9.28	0.71
2024	10.44	0.84
2034	10.40	0.86
2044	10.18	1.05
2054	9.65	1.23
2064	9.42	1.44
2074	9.34	1.61
2084	8.70	1.75
2094	7.97	1.83
2104	7.38	1.93

Small diameter snags continue to increase for the first 30 years then precipitously decline for the next 70 years. However, due to the amount of small diameter trees succumbing to insects and disease, it slightly decreases from competition and the number of large snags increase, but by a very slight amount.

The following is a summary of snags **greater than 10 inches** dbh per acre by structure stage and habitat type for snag dependent species. Table 139 and Table 147 summarize snag densities for the Existing

Condition within the EMC, PP, and LP habitat by the large, open and small structures classes for the Whychus and Deep Canyon watersheds.

Table 139: Existing Condition EMC habitat type large structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	82	523	368	436	423	273	2,105
Whychus Creek	960	2,263	1,542	2,309	715	1,145	8,933
Grand Total	1,042	2,786	1,910	2,745	1,138	1,418	11,038

Table 140: Existing Condition EMC habitat type open structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	143	379	192	162	119	350	1,344
Whychus Creek	352	701	994	1,611	1,172	3,671	8,501
Grand Total	494	1,080	1,186	1,773	1,291	4,021	9,845

Table 141: Existing Condition EMC habitat type small structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	365	1,220	1,132	554	563	223	4,057
Whychus Creek	2,328	5,157	1,903	2,216	831	609	13,046
Grand Total	2,694	6,377	3,036	2,770	1,394	833	17,103

Table 142: Existing Condition PP habitat type large structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	175	977	43	17	37	6	1,255
Whychus Creek	2,503	2,928	49	48	59	93	5,679
Grand Total	2,677	3,904	92	66	97	99	6,934

Table 143: Existing Condition PP habitat type open structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	155	119	48	35	222	359	938
Whychus Creek	813	293	95	106	164	195	1,665
Grand Total	969	412	143	140	385	554	2,603

Table 144: Existing Condition PP habitat type small structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	4,404	520	75	17	148	24	5,188
Whychus Creek	16,156	8,643	572	93	67	49	25,581
Grand Total	20,560	9,164	647	109	215	73	30,768

Table 145: Existing Condition LP habitat type large structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total

Deep Canyon	4	69	417	332	215	159	1,196
Whychus Creek	246	532	482	602	183	66	2,111
Grand Total	250	601	900	934	398	225	3,307

Table 146: Existing Condition LP habitat type open structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	49	54	73	52	7	547	781
Whychus Creek	177	222	364	294	269	1,453	2,779
Grand Total	225	275	437	346	276	2,000	3,560

Table 147: Existing Condition LP habitat type small structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	169	629	1,851	1,122	1,238	183	5,192
Whychus Creek	2,134	2,622	914	1,421	369	248	7,708
Grand Total	2,303	3,251	2,765	2,542	1,608	431	12,900

Table 148 - Table 156 summarize snag densities **greater than 10 inches dbh** for the Existing Condition by percent (%) of the Whychus and Deep Canyon watersheds within the EMC, PP, and LP habitat by the large, open and small structures classes for the Whychus and Deep Canyon watersheds.

Table 148: Existing Condition percent of watershed in EMC habitat type large structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	4	25	17	21	20	13
Whychus Creek	11	25	17	26	8	13
Total	9	25	17	25	10	13

Table 149: Existing Condition percent of watershed in EMC habitat type large structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	11	28	14	12	9	26
Whychus Creek	4	8	12	19	14	43
Total	5	11	12	18	13	41

Table 150: Existing Condition percent of watershed in EMC habitat type open structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	9	30	28	14	14	6
Whychus Creek	18	40	15	17	6	5
Total	16	37	18	16	8	5

Table 151: Existing Condition percent of watershed in PP habitat type small structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	14	78	3	1	3	0
Whychus Creek	44	52	1	1	1	2

Total	39	56	1	1	1	1

Table 152: Existing Condition percent of watershed in PP habitat type open structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	17	13	5	4	24	38
Whychus Creek	49	18	6	6	10	12
Total	37	16	5	5	15	21

Table 153: Existing Condition percent of watershed in PP habitat type small structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	85	10	1	0	3	0
Whychus Creek	63	34	2	0	0	0
Total	67	30	2	0	1	0

Table 154: Existing Condition percent of watershed in LP habitat type large structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	0	6	35	28	18	13
Whychus Creek	12	25	23	29	9	3
Total	8	18	27	28	12	7

Table 155: Existing Condition percent of watershed in LP habitat type open structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	6	7	9	7	1	70
Whychus Creek	6	8	13	11	10	52
Total	6	8	12	10	8	56

Table 156: Existing Condition percent of watershed in LP habitat type small structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	3	12	36	22	24	4
Whychus Creek	28	34	12	18	5	3
Total	18	25	21	20	12	3

Alternative 2 and 3- Direct and Indirect Effects

Snags

Under Alternatives 2 and 3 the project proposes thinning from below (HTH), mixed conifer thinning from below with group openings (MCGO), mixed conifer thinning form below without group opening (MC-No Group Openings), ponderosa pine with dwarf mistletoe, non-commercial thinning (P), prescribed burning only (B), lodgepole pine improvement harvest (LPI), and Scenic Views Enhancement. Table 157 displays the treatment types and acres for the Action Alternatives.

Table 157: Total acres of treatment associated with each alternative by treatment type.

Treatment Type	Alternative 2	Alternative 3

B	809	809
HTH	998	1,164
MC – No Group Opening		769
MCGO	839	
LPI	249	249
Dwarf Mistletoe	160	
P	1,174	1,174
Scenic Views Enhancement	240	240
Total Acres.	**4,469**	**4,405**

Large snags are not proposed for removal as part of the treatments under any of the action alternatives. Minor incidental loss of snags may occur during treatments due to OSHA requirements for removal of danger trees during logging operations; however these are incidental and would occur randomly throughout the project area and not affect snag patches.

Within the LPI units stands were heavily impacted by mountain pine beetle outbreaks and stress from site competition and multiple diseases, leading to white-fir with mistletoe, root rot, and fir engraver. Treatments would remove unhealthy trees to reduce fuel concentrations around green trees. Stand densities would be reduced minimizing the likelihood of continued bark beetle outbreaks and enhance the longevity of the residual green trees by removing diseased trees. The Scenic Views Enhancement Treatment occurs along Forest Road 16 and is associated with primarily lodgepole pine and some mixed conifer; during the Pole Creek Fire this portion of road received stand replacement and mixed mortality fire. The objective of this treatment is to enhance the scenic quality by removing concentration of small diameter fire killed trees, retaining all live trees as well as all large snags. Treatment would enhance the visual quality while retaining snag habitat, providing opportunities for cavity nesting habitat and watchable wildlife (LRMP M9-79, 80, and 81).

Alternatives 2 and 3 proposed understory treatments including non-commercial thinning, ladder fuel reduction, and prescribed burning across all habitat types (ponderosa pine, mixed conifer, and lodgepole pine) and is associated with all treatment types. Although thinning would not target snag removal, prescribed burning could inadvertently recruit existing snags as down logs and recruit snags from residual green trees. These activities could have minor short-term impacts to snags, logs, and GTRs but may have some beneficial impacts to these habitat components in the long-term by creating stand conditions that accelerate and develop larger tree structure and future snags and logs, than if these small trees were not thinned.

In areas identified for thinning canopy cover and stand densities would be reduced to lessen the risk of a large-scale disturbance event (insects, disease, or fire). Thinning would directly reduce canopy cover but it would also reduce the fire risk to individual stands by disrupting the fuel continuity across the project area, reducing the continuation of these disturbance events. Under Alternative 2, within MCGO treatment, small group opening would be created from 1 to 3 acres in size where unhealthy white-fir dominates the stand. Group openings would be planted to ponderosa pine to increase the stand resilience to insects, disease, and fire. In the short-term, due to the removal of unhealthy white-fir, there would be a lower recruitment of white-fir snags but treatments would retain all healthy white-fir and ponderosa pine, promoting vigor and accelerating the development of large tree structure throughout these stand. As a result, larger snags would be recruited in the long-term, which have the potential to be utilized by a much larger variety of species dependent on dead wood habitat.

Thinning is expected to reduce down wood recruitment in the short-term; however in the long-term it is anticipated that there would be more large trees that can be recruited into down wood.

In addition, removal of the understory in overstocked stands would decrease the competition for nutrients and water which is anticipated to lower the susceptibility of the trees to insects and disease (Cochran and Barret 1999). Currently there are a limited number of large snags and trees available to provide replacement large trees. Many of the future large trees and snags are within overstocked stands which would increase the amount of time the trees would take achieve the desired size and height. Thinning overstocked stands would reduce competition which should increase growth rates in the remaining trees. Sufficient recruitment of future large down wood from currently smaller green trees is of concern. Many potential snags are in overstocked stands which would increase the time it takes the trees to reach larger size and height. Cochran and Barret (1999) showed that 30 years after thinning on the Deschutes National Forest there were large differences in average tree sizes among different group stocking levels. They also showed that the growth rates of the 20 largest diameter trees per acre were reduced by competition from smaller trees.

Fuels treatments in the project area would disrupt fuel continuity and the risk of a large fire event, which should reduce the risk to individual large snags and trees. Effects to snags from prescribed underburning are similar for both alternatives with similar acres proposed under Alternative 2 and 3 (933 acres). Mortality of snags in ponderosa pine habitat during prescribed fire treatments in Arizona and California ranged from 20% (Randall-Parker and Miller 2002), 45% (Horton and Mannan 1988), and 56% (Bagne et al. 2008). All three studies found that larger diameter ponderosa pine trees were least likely to die, at least in the short-term. Horton and Mannan (1988) found a 20-fold increase in abundance of snags < 15 cm dbh and showed evidence of woodpecker foraging use in southeastern Arizona. Several studies showed that the highest snag losses were in areas where a long period of fire exclusion had occurred (Bagne et al. 1988, Holden et al. 2006). Bagne et al. (2008) and Horton and Mannan (1988) found that re-entry burns had a much lower mortality rate for snags, presumably because the trees that did not burn during the first entry were more resilient. Loss of snags from prescribed fire was partially mitigated by the creation of new snags (Horton and Mannan 1988, Bagne et al. 2008). It is anticipated in the Prescribed Burn Only (B) Treatment that some snags would be lost to burning. This should also be partially mitigated by the recruitment of large snags since there is a large component of old growth associated with this treatment type.

Within areas proposed for prescribed fire there is the potential of changing large snags into down wood. Burning prescriptions should reduce the chance of losing large snags. However, it is assumed that some large snags would be consumed during prescribed fire operations.

Down wood is at risk of being consumed by prescribed fire treatments. In Arizona Randall-Parker and Miller (2002) found that 50% of the down logs were consumed by prescribed fires. Horton and Manann (1988) found that the number and volume of ponderosa pine logs decreased by 42% and 56% respectively after prescribed fire (both fall and spring burns). Preferred avian foraging sites before burning (logs with sapwood) were proportionately less numerous after the prescribed fire (Hortona and Manann 1988).

All current down wood would remain in areas that do not have prescribed fire as part of the treatments.

The action alternatives would reduce activity fuels and overall fuel loadings through prescribed burning and mastication treatments. Treatments would increase stand resiliency to wildfire and reduce competition between residual trees in the long-term and reduce down woody material in the short term.

Within the mixed conifer habitat type, high down log densities were identified in EA unit 57 due to high levels of bark beetle mortality associated with the lodgepole pine. Some of the logs occur as natural recruitment but many are human caused by personal use firewood cutting. The down wood densities are such that it creates a barrier for equipment to access the unit and implement thinning prescriptions and creates areas of high fuel concentration. To effectively treat these stands, down wood would be removed

to allow equipment access. However, down wood would be retained to meet NWFP standards for the Matrix land allocation of 120 lineal feet down wood per acre.

Approximately 775 acres of the project area would remain as untreated stands, retaining high stocking densities and provide habitat for interior forest species. These denser (untreated) forest patches would act as part of the greater landscape mosaic. These areas would have a higher stocking rate and would provide some diversity of canopy cover across the landscape. Due to high tree densities these areas would recruit high level of snags and down woody material.

In untreated habitat there would continue to be an increased risk from disturbance, although disrupting the fuel continuity across the landscape would reduce the risk of a larger scale disturbance events. In addition, some of the areas identified for no treatment occur in higher site potential areas which would promote large trees with greater canopy closure over the long term. These areas have the potential to provide large snags and down woody material in the short-term.

FVS was used to model and compare snag recruitment overtime between the No Acton Alternative/Existing Condition and the Action Alternatives. Stand exam plot data was utilized to determine snag numbers within each treatment type. Snag data was modeled on 10 year increments over a 100 year period. Table 158 and Table 159 display the average snag density over time by treatment type and size class.

Table 158: Snags per acre for Alternative 2 modeled on 10 year increments by treatment type.

	DM Alt 2 (snags/acre)		**MCGO Alt 2 (snags/acre)**		**HTH Alt 2 (snags/acre)**		**P Alt 2 (snags/acre)**		**Burn Alt 2 (2008-2088) (snags/acre)**		**LPI Alt 2 (snags/acre)**	
Year	10-19” dbh	20”+ dbh	10-19” dbh	20”+ dbh	10-19” dbh	20”+ dbh	10-19” dbh	20”+ dbh	10-19” dbh	20+	10-19” dbh	20”+ dbh
2014	8.048	0.814	10.434	1.712	72.660	12.504	4.636	0.822	6.662	0.790	9.456	0.258
2024	1.177	0.245	8.047	1.705	34.272	9.672	0.439	0.134	27.255	1.416	1.172	0.058
2034	0.931	0.244	7.277	1.748	31.055	11.347	0.470	0.224	4.968	0.776	1.584	0.083
2044	0.804	0.255	7.157	1.828	26.891	13.013	0.506	0.337	4.864	0.938	1.553	0.099
2054	1.121	0.304	6.988	1.940	22.457	14.718	0.867	0.455	4.402	1.155	1.680	0.133
2064	2.120	0.352	6.734	2.129	18.205	16.066	2.213	0.542	3.873	1.398	1.920	0.178
2074	2.987	0.374	6.651	2.415	14.218	16.923	3.147	0.590	3.243	1.633	2.247	0.246
2084	2.796	0.384	6.201	2.778	11.322	17.237	3.595	0.634	2.639	1.883	2.803	0.319
2094	2.565	0.376	5.740	3.131	9.310	17.087	3.534	0.667	2.146	2.151	3.375	0.375
2104	2.222	0.382	5.503	3.482	7.395	16.502	3.263	0.696	6.754	0.807	3.268	0.427

Table 159: Snags per acre for Alternative 3 modeled on 10 year increments by treatment type.

	MC - No Openings Alt 3	**PCT Alt 3**	**Burn Alt 3 (2008-2088)**	**LPI Alt 3**	**HTH Alt 3**

	(snags/acre)		(snags/acre)		(snags/acre)		(snags/acre)		(snags/acre)	
Year	10-19" dbh	20"+ dbh	10-19" dbh	20"+ dbh	10-19" dbh	20"+ dbh	10-19" dbh	20"+ dbh	10-19" dbh	20"+ dbh
2014	10.43	1.71	4.636	0.822	6.662	0.790	9.456	0.258	57.970	10.018
2024	8.05	1.71	0.439	0.134	27.255	1.416	1.172	0.058	28.153	8.091
2034	7.28	1.75	0.470	0.224	4.968	0.776	1.584	0.083	25.675	9.148
2044	7.16	1.83	0.506	0.337	4.864	0.938	1.553	0.099	22.477	10.506
2054	6.99	1.94	0.867	0.455	4.402	1.155	1.680	0.133	18.919	11.915
2064	6.73	2.13	2.213	0.542	3.873	1.398	1.920	0.178	15.474	13.043
2074	6.65	2.41	3.147	0.590	3.243	1.633	2.247	0.246	12.241	13.791
2084	6.20	2.78	3.595	0.634	2.639	1.883	2.803	0.319	9.937	14.074
2094	5.74	3.13	3.534	0.667	2.146	2.151	3.375	0.375	8.291	13.989
2104	5.50	3.48	3.263	0.696	6.754	0.807	3.268	0.427	6.636	13.533

The Dwarf Mistletoe Treatment would remove heavily infected mistletoe trees on about 160 acres; infected trees would be removed from both the overstory and understory. Some trees greater than 21 inches would be harvested and some trees girdled to provide additional snag habitat. Trees over 21 inches that have low levels of mistletoe would be retained and mistletoe infected branches pruned in the lower portion of the crown. Although snags are not targeted for removal they could be recruited as down wood within the first 10 years. The DM units are young stands of ponderosa pine and due to stand age and lack of large trees the majority of snags recruited within the next 90 years would be small to medium size. Snags in the large size class (greater than 20 inches dbh) are slow to recruit but could also increase in number over the next 90 years post treatment.

The majority of existing snags in the project area are located within the 839 acres associated with the MCGO treatment and the 998 acres associated with the HTH treatments. Both treatments thin from below in a mosaic fashion within mixed conifer and ponderosa pine stands. Treatments do not target snags for removal and would promote fire resistant Late and Old structure stands while retaining late and old structure components. Treatment would reduce stand densities to promote tree vigor by 1) reduce site competition for resources; 2) reduce the risk of stand replacement fire; and 3) and promote the development of Late and Old Structure (LOS) which includes large snags. Trees selected for removal within the MCGO treatment would primarily be white-fir and lodgepole pine. Small group openings (<3 acres in size) would be created in areas void of ponderosa pine and dominated by diseased and fading white-fir. Stands within HTH treatment are dominated by ponderosa pine and white-fir would be removed unless they are not directly competing with ponderosa pine; treatments would promote the largest and healthiest ponderosa pine in these stands. Snag modeling snag indicates that within the first 10 years snag densities decline. Over the next 90 years, there are fewer smaller snags and more large snags over 20 + inches dbh per acre would be recruited as a result of the development of late and old structure habitat.

Very few snags exist within the 20-40 year old 1,174 acres of PCT ponderosa pine plantations. Treatment would thin stands in a mosaic fashion to create stand heterogeneity. No snags are targeted for removal due to the size and age of these plantations; the modeling data show that the majority of snags are small to medium sized. Within the first decade many of these small to medium snags are recruited as down wood, but as predicted, due to thinning and the reduction of site competition, snag recruitment increases at about year 40.

The approximately 809 acres of Prescribed Burn Only Treatment occur within stands dominated by LOS ponderosa pine or are classified as LOS due to stand characteristics. Within the first 10 years following treatment there is a large increase in small and medium snags and a slight increase in large snags. Within the following 20 years post treatment, the majority of the small and medium snags have been recruited as

down wood, and over the remaining 100 year period snag recruitment levels are consistent to those associated with the existing condition.

The LPI Treatment would occur on approximately 249 acres. Over the last 15 years this area has been impacted by a mountain pine beetle outbreak. Treatments would remove dying lodgepole pine and white-fir within residual green stands to reduce fuel loadings and disease. A review of the modeling data indicates that small and medium snags would be greatly reduced in this area within the first 10 year period both from treatment as well as recruitment into down wood. Within the next 100 year period snag densities recover due to the 100 year cycle required in the development of mature lodgepole pine. Due to the size of lodgepole pine, very few mature trees reach 20 inches dbh and snag densities in this size class stay consistently low over the 100 year period.

Alternative 3 was developed based on key issues identified during public scoping. In this alternative the dwarf mistletoe treatments were combined with HTH (thinning from below) and mixed conifer thinning treatments would be thinned (i.e. no group openings would be created). The outcome of each treatment and snag recruitment modeled over 100 years for Alternative 3 is the same as Alternative 2. The major differences between the two alternatives is that under Alterative 3 snag densities for year 2014 for the HTH treatment are much lower and snag recruitment for MC-no group openings is much higher over time. Under Alternative 3 the dwarf mistletoe treatment would not occur but would be thinned from below and were lumped with the HTH units. Snag densities are low in the DM units and when lumped with HTH treatments in Alternative 3, the overall snags per acre is lower. However, the HTH treatment and projected snag recruitment is consistent with Alternative 2. Within the MC-no group openings treatment, insect and disease ridden white-fir pockets would be recruited as snags over time. This creates a higher recruitment of white-fir snags throughout the 100 year period.

Conclusion

The action alternatives do not target snags for removal. The only down wood that is proposed for removal occurs in EA unit 57 and would occur under both action alternatives. Retention of down wood would meet NWFP standards and guidelines. Alternative 3 is the more conservative of the two action alternatives; it would recruit more snags consistently through time on a unit by unit basis. Alternative 2 is the more proactive approach to address insects and disease as well as developing more fire resistant stands over the long term. However, on a stand level basis there is a small margin of difference between alternatives and the number of snags per acre that are recruited overtime. Due to the small size of the project area, size of treatment units, and the fact that dead wood is not specifically targeted for removal, the action alternatives would have a very minor effect to snags and coarse woody debris.

Cumulative Effects - Alternative 2 and Alternative 3

The cumulative effect analysis for snags and down wood was conducted for the Whychus and Deep Canyon watersheds. Due to the fact that the Pole Creek Fire over laps the Melvin Butte project area and the Whychus and Deep canyon watersheds, both watersheds would be used to measure the incremental impacts from the Melvin Butte project with ongoing and future foreseeable projects to determine cumulative effects to snags and down wood.

The last 100 years of fire suppression has changed stand compositions across the Sisters Ranger District. Stand densities have increased as well as outbreaks of insects and disease, although both are endemic to the district. As a result of disturbance large areas of mortality exist in stands across the district. Since 2002 a series of uncharacteristically large wildfires created large areas of stand replacement across the district. From 2002 to the present, approximately 42% of the district land base has been affected by wildfire.

Activities identified in Table 14 were reviewed to assess whether, in combination with the likely impacts of the Melvin Butte project, there would be any cumulative impacts to snags and down wood. Eastside mixed conifer stands within the Whychus and Deep Canyon watersheds are used as the zone of influence to measure cumulative effects for this analysis. Based on that review the potential cumulative impacts are those discussed below.

Table 160 displays large wildfires which have occurred within the Whychus Watershed - Black Crater, Lake George, Black Butte 2, and Rooster Rock. Deep Canyon Watershed – Two Bulls Fire.

Table 160: Recent Fire History in the Whychus and Deep Canyon Watersheds

Fire	Date	Acres of National Forest Land
Cache	2002	40
Black Crater	2006	5,147
Lake George	2006	1,857
GW	2007	186
Black Butte 2	2009	559
Rooster Rock	2010	1,362
Pole Creek	2012	26,120
Two Bulls	2014	487
Total		35,758

Approximately 1,642 acres have been salvaged logged within these fires, equaling approximately 4% of the fire areas containing high severity areas. These salvage projects retained 6 snags per acre across all salvage units.

The Pole Creek Fire Danger Tree Removal, the Pole Creek Fire Timber Salvage, and the Two Bulls Timber Salvage Projects total approximately 1,584 acres. These are ongoing projects that would and have removed fire killed trees reducing snag densities and snag habitat in the watersheds.

Activities proposed under Ursus Hazardous Fuels Reduction, the Bend Municipal Watershed Fuels Reduction, and the Bear Wallow Fire Wood Projects have occurred or will occur in the two watersheds. Fuels reduction treatments focus on removing dead lodgepole pine and white-fir among green stands to reduce fuel loading. The Ursus Hazardous Fuels Reduction, the Bend Municipal Watershed Fuels Reduction, and the Bear Wallow Fire Wood Projects predominantly occur within montane mixed conifer and/or lodgepole pine habitat types. These areas are associated with high levels of bark beetle mortality in lodgepole pine stands. These project areas would directly remove snags to disrupt fuel continuity and therefore would reduce snag and log habitat. These projects are being implemented to reduce the risk of loss of existing habitat from future large-scale disturbances. There is not a lot of overlap in time and space between the Ursus and Melvin Butte projects vis-a-vis effects to dead wood in the different wildlife habitat types. These two projects share the Deep Canyon watershed. There is little to no overlap between the two projects in the MMC and PPDF habitat types; therefore cumulative effects in these habitat types are minimal to none. Melvin Butte does not propose any activities in the MMC habitat type. Table 161 provides a summary of the overlap between the Melvin Butte and Ursus projects in the Deep Canyon watershed.

Table 161 Summary of Overlap of habitat type between Melvin Butte and Ursus in the Deep Canyon Watershed.

Habitat Type	Acres in Deep Canyon Watershed	Acres in Ursus Project Area also in Deep Canyon	Acres in Melvin Butte Project Area**

		Watershed*	
EMC_ECB	7489	1614 (21%)	3694 (49%)
MMC	4779	857 (18%)	8 (0.2%)
LP	7016	903 (13%)	530 (7%)
PPDF	7242	0 (0%)	1123 (15%)

*The Ursus project area overlaps the Tumalo Creek, Deep Canyon, and McKenzie Canyon-Deschutes

The Melvin Butte project does not propose to remove snags other than those posing an OSHA safety hazard. Thinning within the EMC_ECB habitat types and removal of some mistletoe lodgepole pine may cumulatively reduce snag development in the future; however the Deep Canyon watershed currently has high snag densities in a range of habitat types due to the Pole Creek and Rooster Rock Fires (2012 and 2010 respectively) and insect mortality in the Three Sisters and Bearwallows Inventoried Roadless Areas.

Personal use firewood cutting is occurring within the 3,029 acre Three Creek's Firewood Cutting Area. Individual dead trees are being removed by for personal use firewood primarily within the road prism of open roads. Cutting is not wide spread and occurs on a site specific basis where individual trees are removed or small groups of dead trees. Only dead lodgepole pine and white-fir can be utilized for firewood.

The following display the change in snag densities by habitat type for snags greater than 10 inches dbh across the Whychus and Deep Canyon watersheds as a result the Melvin Butte project.

The following is a summary of snags per acre **greater than 10 inches dbh** by structure stage and habitat type for snag dependent species. Table 162 - Table 170 summarize the **changes to snag densities** as a result of Alternative 2 and 3 within the EMC, PP, and LP habitat by the large, open and small structures classes for the Whychus and Deep Canyon watersheds.

Table 162 Alternative 2 and 3 EMC habitat type large structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	82	534	368	433	423	266	2,106
Whychus Creek	960	2,275	1,542	2,307	714	1,134	8,932
Grand Total	1,042	2,809	1,910	2,740	1,137	1,400	11,038

Table 163 Alternative 2 and 3 EMC habitat type open structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	143	420	192	160	115	315	1,345
Whychus Creek	350	1,574	958	1,551	1,047	3,020	8,500
Grand Total	493	1,994	1,150	1,711	1,162	3,335	9,845

Table 164 Alternative 2 and 3 EMC habitat type small structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	365	1,221	1,132	554	563	222	4,057
Whychus Creek	2,328	5,180	1,902	2,211	828	596	13,045

Grand Total	2,693	6,401	3,034	2,765	1,391	818	17,102

Table 165 Alternative 2 and 3 PP habitat type large structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	175	977	43	17	37	6	1,255
Whychus Creek	2,503	2,928	49	48	59	93	5,680
Grand Total	2,678	3,905	92	65	96	99	6,935

Table 166 Alternative 2 and 3 PP habitat type open structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	155	119	48	35	222	359	938
Whychus Creek	813	300	95	105	164	188	1,665
Grand Total	968	419	143	140	386	547	2,603

Table 167 Alternative 2 and 3 PP habitat type small structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	4,404	520	75	17	148	24	5,188
Whychus Creek	16,157	8,644	572	93	67	48	25,581
Grand Total	20,561	9,164	647	110	215	72	30,769

Table 168 Alternative 2 and 3 LP habitat type large structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	4	69	417	332	215	159	1,196
Whychus Creek	246	532	482	602	183	66	2,111
Grand Total	250	601	899	934	398	225	3,307

Table 169 Alternative 2 and 3 LP habitat type open structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	49	54	73	52	7	547	782
Whychus Creek	177	251	364	293	262	1,432	2,779
Grand Total	226	305	437	345	269	1,979	3,561

Table 170 Alternative 2 and 3 LP habitat type small structure

Snags Per Acre	0	0-15	15-30	30-60	60-90	>=90	Total
Deep Canyon	169	629	1,851	1,122	1,238	183	5,192
Whychus Creek	2,134	2,627	913	1,420	368	246	7,708
Grand Total	2,303	3,256	2,764	2,542	1,606	429	12,900

Table 171 - Table 179 summarize the **changes to snag densities** for snags **greater than 10 inches dbh** from alternative 2 and 3 by percent (%) of the Whychus and Deep Canyon watersheds within the EMC, PP, and LP habitat by the large, open and small structures classes for the Whychus and Deep Canyon watersheds.

Table 171 Alternative 2 and 3 percent of watershed in EMC habitat type large structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	4%	25%	17%	21%	20%	13%
Whychus Creek	11%	25%	17%	26%	8%	13%
Total	9%	25%	17%	25%	10%	13%

Table 172 Alternative 2 and 3 percent of watershed in EMC habitat type open structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	11%	28%	14%	12%	9%	26%
Whychus Creek	4%	8%	12%	19%	14%	43%
Total	5%	11%	12%	18%	13%	41%

Table 173 Alternative 2 and 3 percent of watershed in EMC habitat type small structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	9%	30%	28%	14%	14%	6%
Whychus Creek	18%	40%	15%	17%	6%	5%
Total	16%	37%	18%	16%	8%	5%

Table 174 Alternative 2 and 3 percent of watershed in PP habitat type large structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	14 %	78 %	3 %	1 %	3 %	0 %
Whychus Creek	44 %	52 %	1 %	1 %	1 %	2 %
Total	39 %	56 %	1 %	1 %	1 %	1 %

Table 175 Alternative 2 and 3 percent of watershed in PP habitat type open structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	17 %	13 %	5 %	4 %	24 %	38 %
Whychus Creek	49 %	18 %	6 %	6 %	10 %	11 %
Total	37 %	16 %	5 %	5 %	15 %	21 %

Table 176 Alternative 2 and 3 percent of watershed PP habitat type small structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	85 %	10 %	1 %	0 %	3 %	0 %
Whychus Creek	63 %	34 %	2 %	0 %	0 %	0 %
Total	67 %	30 %	2 %	0 %	1 %	0 %

Table 177 Alternative 2 and 3 percent of watershed LP habitat type large structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	0 %	6 %	35 %	28 %	18 %	13 %
Whychus Creek	12 %	25 %	23 %	29 %	9 %	3 %

Total	8 %	18 %	27 %	28 %	12 %	7 %

Table 178 Alternative 2 and 3 percent of watershed LP habitat type open structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	6 %	7 %	9 %	7 %	1 %	70 %
Whychus Creek	6 %	9 %	13 %	11 %	9 %	52 %
Total	6 %	9 %	12 %	10 %	8 %	56 %

Table 179 Alternative 2 and 3 percent of watershed LP habitat type small structure

Snags Per Acre	0	0-10	10-20	20-30	30-60	>=60
Deep Canyon	3 %	12 %	36 %	22 %	24 %	4 %
Whychus Creek	28 %	34 %	12 %	18 %	5 %	3 %
Total	18 %	25 %	21 %	20 %	12 %	3 %

Alternatives 2 and 3 do not target snags for removal. Under Alternatives 2 and 3 within LPI Treatments on approximately 249 acres there is the potential for individual dying lodgepole pine and white-fir to be removed. This treatment would reduce fuel loadings in areas adjacent to healthy stands and would focus on the removal of unhealthy trees that are fading from residual mountain pine beetle attack and disease. The Scenic Views Treatment would remove concentrations of small snags less than 8 inches dbh and therefore do not contribute to snag densities. The total project area treated is very small on the landscape and the total number of snags removed are minor at a watershed scale. Cumulatively, as a result of Alternative 2 and Alternative 3, there is no change to snag densities as it relates to the overall snags per acre for the watersheds as well as the percent of the watershed for each habitat type as displayed in the existing condition and the cumulative effect section (See Table 171-Table 179). Since snags are not targeted for removal and snag removal is incidental, the percent of snags reduction on the watershed scale is not measureable and is a minor impact.

Table 180 displays estimated acres by quality of habitat for snag dependent species after the proposed treatments for Melvin Butte within the Whychus Creek and Deep Canyon Watersheds. Quality of habitat is based on DecAid tolerance level and associated snag densities. Please see Appendix C for a detailed report of how the analysis was conducted and the existing condition for habitat quality.

Table 180 Comparison of habitat for species post Melvin Butte Treatments

Species	0-30% Poor Quality	>30-50% Low Quality	>50-80% Moderate Quality	>80% High Quality	Grand Total
American Marten	266,230	28,008	25,988	123,088	443,314
Black Backed Wood Pecker	429,942	149,257	50,378	28,526	658,103
Cavity Nesting Birds	316,492	46,795	7,988	5,662	376,938
Hairy Woodpecker	232,395	142,230	1,410	903	376,938
Pileated Woodpecker	583,976	45,890	14,162	14,075	658,103
Pygmy Nuthatch	375,737	99,878	75,101	107,388	658,103
White-headed Woodpecker	269,801	147,231	60,970	180,100	658,103

Williamson's Sapsucker	582,173	46,110	15,745	14,075	658,103

Conclusion

Cumulatively under Alternatives 2 and 3 snags are not targeted for removal. Incidental removal of snags may occur under OSGA guidelines. Targeted tree removal focus on trees fading from residual bark beetles out breaks and disease. This treatment would occur on approximately 249 acres under Alternative 2 and 3 within Lodgepole Pine Improvement Treatment. Within the Scenic Views Treatments small (< 8 in. dbh) fire killed trees would be removed on approximately 240 acres to enhance visual quality along Forest Road 16.

The Whychus and Deep Canyon Watershed has been highly impacted by wildfire; high snag densities currently exist within these watersheds. Fire created snag habitat would decrease over time, creating a gap when little snag habitat exists (primarily in stand replacement areas) because there are few green trees of sufficient size to provide future snag recruitment. Dahms (1949) found 10 years post-fire, 50% of fire killed ponderosa pine snags remained standing but this declined to 22% standing after 22 years. It is estimated that about 75% of all snags may fall within 20 years (Keen 1929, Dahms 1949, Parks et al. 1999, and Everett et al. 1999). Treatments proposed for Melvin Butte would promote the development Late and Old structure habitat and reduce the risk of wildfire to these watersheds. The Melvin Butte project would retain fully stock stands after treatment and recruit individual snags over time. With the ongoing forest management projects within the Whychus and Deep Canyon Watersheds and by comparing the snags per acre by habitat type across both watersheds; there would be less than a 1% reduction in overall snag habitat. Implementation of the Melvin Butte project would not incrementally contribute to a change in viability of dead wood habitat on the Deschutes National Forest.

Consistency with the Deschutes LRMP, Deschutes Wildlife Tree and Log Strategy, and the Northwest Forest Plan

Wildlife standards and guidelines WL-37 and WL-38 will be assessed. The project is consistent with the Deschutes LRMP, the Deschutes Wildlife Tree and Log Strategy, and the Northwest Forest Plan.

Source Document	Standard & Guideline or Management Recommendation	Doesn't Meet, Meets, Exceeds, or Does Not Apply	Rationale
Northwest Forest Plan	Retain snags at levels to meet 100% of potential population levels for white-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl.	Meets	Snags are not targeted for removal with this project. However incidental removal could occur within the Lodgepole Improvement units as well as Scenic View Enhancement units. All large snags will be retain >20 inches dbh, target snag levels are expected to exceed 100% potential population levels.
	Provide Green Tree Replacements to meet the 100% of potential population levels for white-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl.	Meets	The project will implement primarily thinning from below retaining fully stocked stand. Residual stand densities will exceed target stand densities to meet 100% potential population levels.
	Within Matrix lands a	Meets or	Down wood is not targeted for

	minimum of 120 linear feet of logs per acre greater or equal to 16 inches diameter and 16 feet long should be retained.	Exceeds	removal except where it will interfere with mechanical thinning. In these situations down logs will be maintained to meet NWFP S&G's.
Deschutes NF LRMP – Wildlife Tree and Log Strategy	Retain snags of various sizes to meet at least 40% of potential population levels in Matrix and 100% of potential population levels in LSR by PAG	Meets	Snags are not targeted for removal. No LSR is located in the project area.
	Provide Green Tree Replacement to meet at least 40% of potential population levels in matrix and 100% of potential population levels in LSR by PAG	Meets	The project will implement primarily thinning from below retaining fully stocked stand. Residual stand densities will exceed target stand densities to meet 100% potential population levels.

Northwest Forest Plan Species of Concern: Bats

Measure: Roosting and foraging habitat impacted

The Northwest Forest Plan calls for retaining snags, decadent trees, and green tree recruitment for roosting bats in Matrix and Adaptive Management Areas (Page B-7, Stand Management):

"Adequate numbers of large snags and green trees are especially critical for bats because these trees are used for maternity roosts, temporary night roosts, day roosts, and hibernacula. These should be well distributed throughout the matrix because bats compete with primary excavators and other species that use cavities. Day and night roosts are often located at different sites, and migrating bats may roost under bark in small groups. Thermal stability within a roost site is important for bats, and large snags and green trees provide that stability. Individual bat colonies may use several roosts during a season as temperature and weather conditions change. Large, down logs with loose bark may also be used by some bats for roosting."(NWFP 1994)

Snag densities are poorly known for most species of bats but some research indicates that snag density requirements may be higher than those needed for woodpeckers (Lacki et al. 2008). Bats frequently switch roosts to escape predation and avoid parasites (Lewis 1995, Barclay and Kurta 2007).

Table 181: Bat Species Potentially Occurring in the Melvin Butte project area.Table 181 lists 11 species of bats with habitat on the Deschutes National Forest and potentially occurring in the project area.

Table 181: Bat Species Potentially Occurring in the Melvin Butte project area.

Bat Species Potentially Occurring in the Project Area			
Species	PAG	Roost Substrate	Potential Presence (Yes/No)
Long-eared myotis	Mixed conifer and ponderosa pine	Large hollow trees, snags, loose bark, crevices, rock outcrops, bridges, buildings, caves	Yes
Fringed myotis	Ponderosa pine	Trees, snags, buildings, caves, rocks, cliffs and bridges	Yes
Long-legged myotis	Mixed conifer, ponderosa pine	Trees, snags, buildings, caves, rocks, cliffs and bridges	Yes
Little brown	Mixed conifer,	Trees, snags, buildings, caves, rocks,	Yes

myotis	ponderosa pine, desert	cliffs and bridges	
California myotis	Mixed conifer, ponderosa pine, desert	Arid habitat, rocky outcrops, caves, bridges	Yes
Yuma myotis	Mixed conifer, ponderosa pine, desert	Trees, snags, buildings, caves, rocks, cliffs and bridges; highly associated with water	Yes
Small-footed myotis	Mixed conifer, Ponderosa pine, desert	Loose bark on trees and snags, crevices, cliffs, caves, mines, building	Yes
Big brown bat	Mixed conifer, ponderosa pine, desert	Trees, snags, buildings, caves, rocks, cliffs and bridges	Yes
Canyon bat	Ponderosa pine, desert	Arid habitat, rocky outcrops, caves, bridges	Low potential
Silver-haired bat	Ponderosa pine	Under bark in large snags, bridges, buildings	Yes
Hoary Bat	Mixed conifer	Green foliage and branches	Yes
Townsend's big-eared bat	Ponderosa pine, desert.	Highly associated with caves but sometimes uses hollow trees in ponderosa pine forests, lava, bridges, and buildings	Yes
Pallid bat	Ponderosa pine, desert	Arid habitat, coniferous forests, rocky outcrops, caves, bridges	Yes
Spotted bat	Ponderosa pine fringe, desert	Highly associated with vertical cliff habitat	No

Snag Habitat and Impacts From Fire

Little is known about the roosting ecology of bats and their prey in burned forests. Limited research has focused on short-term bat foraging activity in burned areas with varying types of severity (Hayes 2009, Buchalski et al. 2013). In general, low intensity wildfires and prescribed fire create relatively few snags (Horton and Mannan 1988) and many are small diameter, which are of marginal use for most roosting bat species which usually prefer large-diameter (>21 inches dbh) roost trees (Barclay and Kurta 2006). For species that avoid foraging in dense forests, bat activity may increase post-fire due to an increased insect productivity and more open foraging conditions at least for the first year after the fire (Buchalski et al. 2013). During this one year post-fire study, Buchalski et al. (2013) showed that bat activity was either neutral or positive regardless of the intensity of the fire.

Bats usage of trees and snags includes cavities in hollow trees, cracks or crevices in trees or snags, or behind exfoliating (sloughing) bark. They may be less likely to use heavily charred/sooty fire-killed trees if a sufficient number of roost trees are available in the surrounding area. The 2012 Pole Creek Fire and 2014 Two Bulls fire likely removed some roost habitat while creating additional roost habitat within the Deep Canyon watershed. Removal of dense forest patches may have improved foraging conditions for bats at least short-term, particularly where viable roosting habitats occur within close proximity to water.

Lacki et al. (2012) monitored 301 roost snags of long-legged myotis in Oregon, Washington, and Idaho. This is one of the most common bat species occurring on the Deschutes National Forest. Overall, persistence rates declined with increasing roost-years across the study areas. Roost snags in Washington showed a lower persistence rate 1 year post-discovery than did roost snags in Oregon and Idaho. Estimates of percentage of snags still standing 10 years post-discovery were highest for ponderosa pine (6.8%), slightly less for Douglas-fir (5.3%), and lowest for grand fir (0.9%). They found half-lives of roost snags to be <3 roost-years, much shorter than other published values for half-lives of snags of

multiple species of conifers (Russell et al. 2006, Angers et al. 2010), and the overall average of roost snag persistence 10 years post-discovery across snag species was 4.3%. Replenishment of snags suitable for long-legged myotis on an annual basis is likely needed to ensure adequate habitat of this bat species, especially given the frequency of roost switching within years shown by many bats (Lewis 1995, Barclay and Kurta 2007) and the short-term reuse of tree roosts among years by bats.

Alternative 1 -No Action (Ecological Trends)

There are no known direct impacts to snags, down wood, or green tree replacements (GTRs) under Alternative 1 (No Action). Current fuel continuity due to increased fuel loadings from fire suppression has put the project area at risk of large fires. Within the Whychus and Deep Canyon watersheds, there have been seven large fires since 2002. The Melvin Butte project area is one of the few remaining mid-elevation areas on the Sisters Ranger District that has not burned. Due to the history of the district and small lighting caused fires in or near the project area from 2014 fire season, the likelihood is high for stand replacement fire in the project area. These large stand replacement events create snags; however, this pulse of snags is short lived (less than 25 years) and there is a long lag time until snags are available again on the landscape. In addition, there are limited large trees to provide future large snag habitat. Competition would continue to increase in these overstocked stands and smaller snags are expected to increase across the landscape over time.

Snags are expected to increase over time as insects and disease as overly dense stands continue to cause additional tree mortality at natural levels consistent with increasing levels of inter-tree competition. Down wood levels are also expected to increase over time as snags continue to fall in the absence of fire. Although a steady recruitment of new snags and logs are expected, they would generally be less than 20” dbh size classes, the preferred size class by many species of wildlife. Green tree replacements would also remain at existing levels across the landscape and all trees would continue to be available for use as green tree replacements.

However, there is also risk of a high-intensity stand replacement fire which may reduce current habitat conditions for a larger number of species. In addition, these pulses of post-fire habitat are usually short-lived. Stand resilience to insects, disease, and wildfire is measured by the Upper Management Zone (UMZ). The UMZ relates to the density of trees (basal area, trees per acre, etc.) a forest stand can support without significant mortality from bark beetles. The upper management zone is the density level at which trees begin to come under significant stress and can become susceptible to bark beetles and other insects and diseases. Forest stands managed below the upper management zone are more resilient. There are approximately 4,456 acres that have the potential to receive vegetation treatment. Under the existing condition 92% of these stands are above the Upper Management Zone and are at risk or currently be impact by insects, disease and stand replacing fire due to high stand densities and as a result low resiliency.

Extreme fire hazard equates to high flame lengths and varying degrees of crown fire. Given assumptions made from the best available science extreme and even moderate and high fire hazard would be damaging to valued stand characteristics.

As insects and disease increase in these stands large areas of dense snags would increase. As snags fall, bat roosts would be lost and there would likely be a longer period of time before large roosts are again available. Loss of stands containing green trees would limit use by some species (e.g., long-legged bat and silver-haired bat) until stands recover. Recovery of forested stands would depend on the presence of conifer seed sources. In many areas, the absence of a seed source would delay recovery by several decades. Where there was a seed source, the majority (80-90%) is comprised of white fir. This is not a tree species usually favored by bats as white fir does not get as large as Douglas-fir or ponderosa pine or develop deep fissured bark used for roosting. However, white-fir does result in hollow snags more often

than the other species which also provides roost habitat. In the event of future impacts to the project area by fire mixed mortality and underburned stands across the landscape would likely serve as habitat. However, in stands dominated by white fir, these stands would likely see additional impacts over the next 5-10 years as white fir damaged by fire are likely to die due to the thin bark and root systems near the ground surface. This would provide more snag habitat but would also reduce canopy cover. Many species use riparian areas which would likely recover more quickly than conifer stands unless high fire intensity kills the root systems. Bat species that roost in rock crevices, bridges, cliff faces, and buildings are not likely to see any decrease in these types of roost site structure; however, impacts to the vegetation surrounding these sites from the fire may impact habitat suitability.

Direct and Indirect Impacts—Alternative 2 and 3

Large snags are not targeted for removal under the action alternatives. Minor incidental loss of snags may occur during treatments due to OSHA requirements for removal of danger trees during logging operations; however these are incidental and would occur randomly throughout the project area, not affecting snag patches.

Lodgepole pine and white-fir snag numbers would be slightly reduced from current levels due to harvesting of standing fading lodgepole pine and white-fir within approximately 249 acres associated with Lodgepole Improvement Treatment (LPI) and approximately 240 acres of Scenic Views Enhancement Treatment. Within LPI units both lodgepole pine and white-fir are dying due to insects and disease outbreaks. These outbreaks occurred as a result of stress to individual trees from high stand densities and intraspecific competition for site resources. Treatments would remove dying trees to reduce fuel concentrations around green trees. Stand densities would be reduced minimizing the likelihood of continued bark beetle outbreaks enhancing the longevity of the residual green trees by removing diseased trees.

The Scenic Views Enhancement Treatments along the Forest Road 16 corridor and are associated within lodgepole pine and some mixed conifer habitats. During the 2012 Pole Creek Fire this portion of Forest Road 16 experienced stand replacement and mixed mortality fire. The objective of this treatment is to enhance the scenic quality by removing concentrations of small diameter fire killed trees while retaining all live trees as well as all large snags. Treatments would result in enhanced visual quality along the road corridor while retaining snag habitat providing utility for bats as roosting habitat (LRMP M9-79, 80, and 81).

Alternatives 2 and 3 propose understory treatments including non-commercial thinning, and/or ladder fuel reduction, and prescribed burning across all habitat types (ponderosa pine, mixed conifer, and lodgepole pine) and associated treatment types. These activities would not directly remove snags in the short-term, but may have some beneficial impacts to these habitat components in the long-term by creating stand conditions that would accelerate and develop larger tree structure and future snags, than if these small trees were not thinned.

In areas identified for thinning, canopy cover and stand densities would be reduced to lessen the risk of a large-scale event (insects, disease, or fire). Thinning would directly reduce the fire risk to individual stands by disrupting fuel continuity across the project area, and reduce the risk of disturbance events. Under Alternative 2, within MCGO treatments, small group openings would be created from 1 to 3 acres in size where the unhealthy white-fir dominates these stands. These group openings would be planted to ponderosa pine to increase stand resiliency to insects, disease, and fire. In the short-term, due to the removal of unhealthy white-fir, there would be lower recruitment of white-fir snags in these areas but treatments would retain all healthy white-fir and ponderosa pine promoting vigor and accelerating the development of large tree structure. As a result, larger snags would be recruited in the long-term, which have the potential to be utilized by bats.

In addition, removal of understory in overstocked stands would decrease the competition for nutrients and water, which is anticipated to lower the susceptibility of the trees to insects and disease (Cochran and Barret 1999). Currently there are a limited number of large snags and trees available as well as replacement large trees. Many of the future large trees and snags are within overstocked stands, which would increase the amount of time the trees would take achieve the desired size and height. Thinning overstocked stands would reduce competition which should increase growth rates to the remaining trees. Cochran and Barret (1999) showed that 30 years after thinning on the Deschutes National Forest there were large differences in average tree sizes among different group stocking levels. They also showed that the growth rates of the 20 largest diameter trees per acre were reduced by competition from smaller trees.

Fuels treatments in the project area would disrupt fuel continuity and reduce the risk of a large fire event which should reduce the risk to individual large snags and trees. Effects to snags from prescribed underburning are similar for both alternatives with similar acres proposed under Alternative 2 and 3 (933 acres). Mortality of snags in ponderosa pine habitat during prescribed fire treatments in Arizona and California ranged from 20% (Randall-Parker and Miller 2002), 45% (Horton and Mannan 1988), and 56% (Bagne et al. 2008). All three studies found that larger diameter ponderosa pine trees were least likely to die, at least in the short-term. Horton and Mannan (1988) found a 20-fold increase in abundance of snags < 15 cm dbh and showed evidence of woodpecker foraging use in southeastern Arizona. Several studies showed that the highest snag losses were in areas where a long period of fire exclusion had occurred (Bagne et al. 1988, Holden et al. 2006). Bagne et al. (2008) and Horton and Mannan (1988) found that re-entry burns had a much lower mortality rate for snags, presumably because the trees that did not burn during the first entry were more resilient. Loss of snags from prescribed fire was partially mitigated by the creation of new snags (Horton and Mannan 1988, Bagne et al. 2008). Therefore it is anticipated that although some existing bat habitat may be lost for prescribed fire activity, new snags would be produced from fuels treatments in the short-term. However, newly created snags would remain unsuitable until they decay to the point of providing viable bat roosting habitat.

Approximately 775 acres of the project area would remain as untreated stands retaining high stocking densities providing habitat for interior forest species. These denser (untreated) forest patches would act as part of the greater landscape mosaic. These areas would have a higher stocking rate and would provide some diversity of canopy cover across the landscape and in the short-term would recruit existing large trees as snags providing bat roosting habitat in the short-term

In untreated habitat there would continue to be an increased risk from disturbance, although disrupting fuel continuity across the landscape would reduce the risk larger scale disturbance events. In addition, some of the areas identified for no treatment occur within higher site potential areas which allow them to produce large trees with greater canopy closure. These areas would continue to provide large green tree structure with areas of higher snag densities intermixed.

See snag and log analysis for a complete summary on affects to snag habitat.

Cumulative Impacts—Alternatives 2 and 3

The cumulative effects area for bats includes the Whychus and the Deep Canyon watersheds due to stand replacement fires that are associated with both watersheds and overlap the Melvin Butte project area. Previous effects to potential bat habitat include loss of large-diameter trees and snags due to timber harvest reduction in large-tree structure due to overstocked stands and fires. The Black Crater, Pole Creek, and Two Bulls Fires created roost habitat particularly in the mixed mortality areas and in some of the stand replacement fire areas. Foraging habitat in previously dense contiguous large patches may have been enhanced in these fires due to openings in the mid-canopies.

Approximately 54 acres of salvage logging are ongoing within the Pole Creek Fire and approximately 250 acres of salvage logging is being proposed within the Two Bulls Fire. Danger tree removal has occurred or would occur on these fires to varying degrees resulting in a reduction of potential roost sites in stand replacement areas along main roads.

Activities proposed under the Sisters Area Fuels Reduction (SAFR), the Glaze Forest Restoration, the Ursus Hazardous Fuels Reduction, the Bend Municipal Watershed Fuels Reduction, and the Bear Wallow Fire Wood Projects have occurred or would occur in the two watersheds. Fuels reduction treatments focus on removing dead lodgepole pine among green stands to reduce fuel loading. The SAFR and Glaze projects all focus on thinning from below to restore and enhance ponderosa pine conifer stands while reducing the risk of stand replacing fires. Overall, treatments could reduce snag and log habitat, but primarily focus on thinning from below to reduce fuel densities on approximately 21,507 acres. These projects are being implemented to reduce the risk of loss of existing habitat from future large-scale disturbances.

Potential roost sites are not limited in the watershed outside the project area due to the mosaic of varying degrees of fire severities. In portions of the watersheds, treatments and natural fires enhanced foraging habitat by opening up mid-canopies while in other areas, a reduction in shrub habitat may reduce habitat for insect prey. Fires across the watersheds have resulted in a reduction of large snags.

The proposed thin, mow, and burn treatments in the Ursus project would accelerate the development of large tree structure which would provide positive benefits for bat roost habitat over the long-term (i.e., greater than 30 years post-implementation).

Personal use firewood cutting is occurring within the 3,029 acre Three Creek's Firewood Cutting Area. Individual dead trees are being removed by personal use firewood cutters primarily within the road prism of open roads. Cutting is not wide spread and occurs on a site specific basis, where individual trees are removed or small groups of dead trees. Only dead lodgepole pine and white-fir can be taken for firewood.

Alternatives 2 and 3 would not incrementally add to ongoing and reasonably foreseeable impacts to bats; the Melvin Butte project does not propose to remove large snags that provide habitat.

Conclusion—Alternatives 2 and 3

Cumulatively Alternatives 2 and 3 do not target snags for removal. Incidental removal may occur where snags pose a safety hazard under OSHA guidelines. Targeted tree removal in these areas would be trees that are fading from residual bark beetle out breaks and disease issue. This treatment would occur on approximately 249 acres under Alternatives 2 and 3. The Whychus and Deep Canyon Watershed has been highly impacted by wildfire; high snag densities currently exist within these watersheds. Within these post fire areas, snag habitat would decrease over time creating a gap in time when little snag habitat exists (primarily in stand replacement areas) because there are few green trees of sufficient size to provide recruitment limiting roosting habitat for bat habitat. Dahms (1949) found 10 years post-fire, 50% of fire killed ponderosa pine snags remained standing but this declined to 22% standing after 22 years. It is estimated that about 75% of all snags may fall within 20 years (Keen 1929, Dahms 1949, Parks et al. 1999, and Everett et al. 1999). Treatments proposed for Melvin Butte would promote the development of Late and Old structure and reduce the risk of continued wildfire to these watersheds, promoting roosting habitat for bat overtime. The Melvin Butte project would retain fully stocked stands to recruit snags individually over time. With the ongoing forest management projects within the Whychus and Deep Canyon Watersheds there would be less than a 1% reduction in overall snag habitat. Implementation of this project would not incrementally contribute to a change in viability of bat habitat on the Deschutes National Forest.

FIRE, FUELS AND AIR QUALITY

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Fire, Fuels, and Air Quality specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

This section addresses the following component of the Melvin Butte vegetation project purpose and need:

Reduce fuel loadings and forest vegetation density to lessen the hazard associated with uncharacteristic wildfires to nearby communities and key ecosystem components, such as watersheds, large old trees and wildlife connectivity habitat.

To meet the purpose and need of this project, the Melvin Butte action alternatives are designed to reduce the likelihood of an uncontrolled stand replacement wildfire impacting values at risk. This section of the environmental assessment focuses on the effects that vegetation management activities described in the action alternatives have on fire hazard within the project area.

Management Direction

General direction as it relates to Fuels Management is found at Forest Service Manual (FSM) 5150. FSM 5150 directs Forests to initiate fuels treatments in accordance with local land and resource management plans. On the Deschutes National Forest, the Land and Resource Management Plan (Deschutes LRMP), was completed in 1990. In areas within the range of the Northern Spotted Owl, the Deschutes LRMP was amended with the Final Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl and its corresponding Record of Decision and Standards and Guidelines (Northwest Forest Plan). The Northwest Forest Plan requires that Watershed Analyses be completed in Key Watersheds. The Whychus Watershed Analysis (1998), Update (2009), and Updated (2013) respond to these requirements. Fire and fuels management are directed and/or guided by the goals, objectives, standards, and guidelines in all of these plans. Refer to Table 182 and the following discussion for an overview of these documents.

Table 182 Overview of the goals, standards, guidelines, and recommendations within the Deschutes National Forest LRMP and the Northwest Forest Plan.

Deschutes LRMP
Forest Management Goal*: Provide a fire protection and prescribed burning program which is responsive to land and resource management goals and objectives.

Forest-wide goal: To provide a well-managed fire protection and prescribed fire program that is cost efficient, responsive to land stewardship needs, and resource management goals and objectives	FF-1: Prevention of human caused wildfire will focus on areas of high use and high risk. Identified areas of high use and high risk are: • Recreation use along major travelways and bodies of water during the summer periods • Personal use firewood cutting during late spring and early summer • Large numbers of deer hunters during the fall • Large areas of Beetle Killed pine adjacent to subdivisions and private developments • Industrial operations on National Forest Land during summer FF-5: All wildfires will receive a timely and energetic suppression response that minimizes suppression costs plus resource losses, and best meets multiple use standard and guidelines for each management area. Those fires that threaten life, private property, public and firefighter safety, improvements or investments shall be given high priority and suppressed to minimize losses. FF-6: All wildfires will require an appropriate suppression response. FF-9: Burn plans will be prepared in advance of ignition and approved by the appropriate line officer for each prescribed fire. Prescribed burning will conform to air quality guidelines. Burn plans will define an escaped fire. A fire that escapes will be declared a wildfire and the Wildland Decision Support System (WFDSS) will be used to document further action. FF-10: Unplanned ignitions may be managed to meet multiple objectives if (1) consistent with the land management allocation and upon approval of a decision within the WFDSS and (2) the fire is burning within prescription. Normally, prescribed burning will be by planned ignition. FF-11: Levels and methods of fuels treatment will be guided by the resource objectives within the management area. * In May of 2015, the Deschutes National Forest made an administrative change to the glossary of the Land and Resource Management Plan to reflect updated wildland fire management policy and terminology. Management direction with the Land and Resource Management Plan has been reinterpreted to reflect this update.
Management Area Goal: Old Growth	M15-19: Prescribed fire is not appropriate in lodgepole pine stands. In Ponderosa pine and mixed conifer stands, prescribed fire may be used to achieve desired old growth characteristics. It may also be used there to reduce unacceptable fuel loadings that potentially could result in high intensity wildfire. M15-20: Prescribed fire is the preferred method of fuel treatment. However, if prescribed fire cannot reduce unacceptable fuel loadings, other methods will be considered. M15-21: Natural fuel loading will normally be the standard.

Management Area Goal: Scenic Views	M9-27: In Retention Foregrounds slash from a thinning or tree removal activity, or other visible results of management activities, will not be visible to the casual forest visitor for one year after the work has been completed. In partial retention foregrounds, logging residue or other results of management activities will not be obvious to the casual forest visitor two years following the activity. M9-90: Low intensity prescribed fires will be used to meet and promote the desired visual condition within each stand type. Prescribed fire and other fuel management techniques will be used to minimize the hazard of a large high intensity fire. In foreground areas, prescribed fires will be small, normally less than 5 acres, and shaped to appear as natural occurrences. If burning conditions cannot be met such that scorching cannot be limited to the lower 1/3 of the forest canopy, then other fuel management techniques should be considered. M9-91: If at any time during the course of the prescribed burn it appears that the objectives for the burn are not being met, all burning will cease.
Management Area Goal: Front Country	M18-34: Prescribed fire may be used to protect, maintain, and enhance timber and forage production. The broadest application of prescribed fire will occur in the Ponderosa pine type. Criteria for using fire are as follows: • To reduce risk of conflagration fire • To increase soil productivity by cycling bound nutrients • To prevent encroachment of less desirable, competing tree species • To increase palatability and cover of desirable forage species • To prepare sites for reforestation M18-35: The lowest cost option [for fuel treatment] which meets the silvicultural, soil, water, and fire objectives should be selected. M18-36. Slash will be treated to minimize chances of large wildfires, but will not be cleared to the point that the forest floor is devoid of all slash and logs. Some slash and larger dead material will be left for ground cover for soil protection, microclimates for establishment of trees, and small mammal habitat. Optimum fuel loadings should be guided by … "Photo Series for Quantifying Forest Residues"… These fuel loadings will be revised when new data, methods, or research indicate that a new profile would improve resource management programs.
Northwest Forest Plan	
Administratively Withdrawn	[Administratively Withdrawn Areas] are identified in current forest and district plans or draft plan preferred alternatives and include recreational and visual areas, back country, and other areas not scheduled for timber harvest
Matrix	Most of the timber harvest will occur on matrix lands. Standards and guidelines assure appropriate conservation of ecosystems as well as provide habitat for rare and lesser -known species

Whychus Watershed Assessment (1998), Update (2009) and Update (2013)

The Whychus Watershed Assessment (1998), Update (2009) and Updated (2013) prioritizes areas for treatment and guides future management within 12 sub-watersheds on the Sisters Ranger District, including: Upper Indian Ford, Lower Indian Ford, Fourmile Butte, Upper Trout Creek, Lower Trout Creek, Headwaters Whychus Creek, Upper Whychus Creek, Middle Whychus Creek, Lower Whychus Creek, Three Creek, Triangle Hill and Deep Canyon. The Melvin Butte project area falls within the Deep Canyon sub-watershed (see Hydrology section) and also the Cascade Forest Landscape Strategy Area. From the original assessment to the update, this strategy area has risen in priority from 4th to 2nd. This is because there have been sixteen large wildfires in the Sisters Ranger District since 2002 that have reduced mixed conifer habitat, reduced connectivity, and increased the importance of remaining habitat. As it

relates to fire and fuels, the Melvin Butte project responds to several of the goals identified for the Cascade Forest Landscape Strategy Area (CFLR):

- Restore forest habitats.
- Aim for a balance of vegetation within each Plant Association Group resulting in a healthy and resilient forest using the historic range of natural variability as a guideline.
- Reduce potential for habitat loss due to stand replacement wildfires in areas where this type of fire behavior is outside the historic natural range of variability and when risks to public safety and large scale loss of property are unacceptable.
- Protect this habitat from loss due to large-scale fires, insects and disease epidemics, and major human impacts so that late-successional ecosystems and biodiversity are maintained.

Additional input from national policies also guides the planning of activities on Deschutes National Forest lands.

National Fire Plan (2000)

In response to catastrophic fire events prior to 2000, the National Fire Plan of 2000 was co-authored by the Forest Service, Department of Interior, and Western Governors Associations to outline operating principles for firefighting readiness, prevention through education, rehabilitation, hazardous fuels reduction, restoration, collaborative stewardship, monitoring, jobs, and applied research and technology transfer. The National Fire Plan is a series of documents with an accompanying budget request that guides fire and fuels management as to how best to respond to recent fire events, reduce the impacts of wildland fires on rural communities, and ensure sufficient firefighting resources in the future. The National Fire Plan is also where direction on reducing immediate hazards to the Wildland Urban Interface (WUI) began. The Melvin Butte Project responds to the following hazardous fuels reduction and restoration elements of the National Fire Plan:

- Hazardous Fuels Reduction- Assign highest priority for fuels reduction to communities at risk, readily accessible municipal watersheds, threatened and endangered species habitat, and other important local features where conditions favor uncharacteristically intense fires.

- Restoration- Restore healthy, diverse, and resilient ecological systems to minimize uncharacteristically intense fire on a priority watershed basis. Methods will include removal of excess vegetation and dead fuels through thinning, prescribed fire, and other treatments.

Wildland Urban Interface and Community Wildfire Protection Plan

In 2004, the City of Sisters, local fire protection districts, Deschutes and Jefferson Counties, Oregon Department of Forestry, U.S. Forest Service, and the Bureau of Land Management formed a committee to develop a community wildfire protection plan (CWPP) under the direction established by the 2003 Healthy Forest Restoration Act (Project Wildfire 2009). The purpose of the updated 2014 Greater Sisters Country CWPP is to:

- Protect lives and property from wildland fires;
- Instill a sense of personal responsibility and provide steps for taking preventive actions regarding wildland fire;
- Increase public understanding of living in a fire-adapted ecosystem;
- Increase the community's ability to prepare for, respond to and recover from wildland fires;
- Restore fire-adapted ecosystems; and

- Improve the fire resilience of the landscape while protecting other social, economic and ecological values.

The plan outlines a strategy, identifies priorities for action, and suggests immediate steps that can be taken to protect the communities from wildland fire while simultaneously protecting other important social and ecological values. The plan was first revised in May 2006 to include considerations of community growth, seasonal recreation areas, and ingress and egress corridors that were not identified in the initial plan or in the Federal Register (Vol. 66 No 3.). In December 2009, a second revision was drafted to outline updated priorities and action plans for fuels reduction treatments, structural vulnerabilities, and defensible space in the Greater Sisters Country wildland urban interface (WUI). As a result of these revisions, the committee outlined the following goals:

- Reduce hazardous fuels on public lands;
- Reduce hazardous fuels on private lands (both vacant and occupied);
- Reduce structural vulnerability;
- Increase education and awareness of wildfire threat; and
- Identify, improve and protect critical transportation routes
- and prioritized the following treatments on public lands:
- All areas where Crown Fire Potential is rated Extreme by the federal agencies within the designated WUI boundary (*with priority given first to the areas within ¼ mile of communities at risk);*
- Within 300 feet of any evacuation route from each Community at Risk;
- For mixed conifer and lodgepole stands which have missed typical fire cycles and still pose threats of potential crown fires to communities, specific fuels treatments shall be accomplished on federal and state lands to reduce and maintain fuel loads to that which can produce flame lengths of less than four feet to provide for effective initial attack and minimize the resistance to control; and
- Although the treatments should focus on areas rated Extreme for Crown Fire Potential, maintenance of previously treated lands is also a top priority where treatment is critical to maintain this status within the CWPP area. Treatment and maintenance of previously treated lands before treatment begins again in other places is an important component of keeping communities safe.

Additionally, the committee determined that the overall WUI boundary would include communities as well as key transportation corridors and seasonal recreation areas with infrastructure, such as Forest Road 16 and the popular Three Creek Lake recreation area. This site specific definition of WUI will be used throughout this document and differs from that defined in the literature related to the structure protection and the home ignition zone (Cohen no date, Cohen 2000). Research related to the WUI as it relates to the home ignition zone was considered but is unrelated to issue of compromised ingress and egress from the Three Creek Lake recreation area.

Interagency Prescribed Fire Planning and Implementation Procedures Guide

Federal prescribed fire programs are guided by the principles of the 1995 *Federal Wildland Fire Management: Policy and Program Review* (USDA, USDI, 1995) and the 2001 update (USDA, USDI, et al, 2001). Federal wildland fire policy is guided by the 2009 *Guidance for Implementation of Federal Wildland Fire Management Policy* (USDA, USDI, et al, 2014). Collectively these principles establish that

wildland fire programs be implemented equally, consistently and concurrently, as a means to protect, maintain, and enhance resources. Firefighter and public safety are emphasized as priorities in the planning and implementation of all fire management activities.

The purpose of the PMS 484 is to provide consistent interagency guidance, promote common terms and definitions, and provide standardized procedures, for the planning and implementation of prescribed fire.

The PMS 484 describes what is *minimally* acceptable for prescribed fire planning and implementation. Agencies may choose to provide more restrictive standards and policy direction, but must adhere to these *minimums*.

Interagency prescribed fire program goals are to:

- Provide for firefighter and public safety as the first priority.
- Ensure that risk management is incorporated into all prescribed fire planning and implementation.
- Use prescribed fire in a safe, carefully planned, and cost-efficient manner.
- Reduce wildfire risk to communities, municipal watersheds and other values and to benefit, protect, maintain, sustain, and enhance natural and cultural resources.
- Use prescribed fire to restore natural ecological processes and functions, and to achieve land-management objectives.

National Cohesive Wildland Fire Management Strategy (2014)

As a cohesive strategy, effort was designed as a three-phased process to allow for inclusiveness and understanding of the complexities of managing wildfire risks across the country. Environments are created to foster and sustain stakeholder engagement and increase collaboration between federal, state and local governments and partner organizations. The best available science was used to develop a National Cohesive Strategy that will help guide the future of wildland fire management.

The strategy vision is to safely and effectively extinguish fire, when needed; use fire where allowable; manage our natural resources; and as a Nation, live with wildland fire.

The strategy goals are to:

1.) Restore and Maintain Landscapes
2.) Fire-Adapted Communities
3.) Response to Wildfire

Working in conjunction with scientific data analysis, The National Strategy establishes broad, strategic national-level direction as a foundation for implementing programs and activities across the nation. Based on a landscape-level collaborative approach, describing how the Nation can focus future efforts in making strategic investments to reduce the severe effects of wildfire on areas of high risk.

The mission of the Cohesive Fuels Treatment strategy is to lessen risks from wildfires by reducing fuels build-up in federally-managed forests in the most efficient and cost effective manner possible. Four principles guide the strategy: 1) prioritization, 2) coordination, 3) collaboration, and 4) accountability. While all of these principles are important to fuels management, the first principle *prioritization*, provides direction for treatments proposed in the Melvin Butte project area.

Prioritization - The President and the Congress have given clear direction that priority in the fuels treatment program should focus on two key areas. First, priority should be given inside the WUI, places where people have settled in forests, woodlands, shrublands, and grasslands. Here, people, their

structures, and their work face the greatest threats. Second, outside the WUI, priority treatments must concentrate on sites where vegetation is most likely to support catastrophic fires that threaten vital resources or locations of particular value to local communities. In addition, non-WUI treatments must be applied to areas where fuel loads could quickly increase to dangerous levels without active management.

In the Melvin Butte project area, the proposed action and action alternatives recommend treatments adjacent to private land that are outside of the designated WUI. Vegetation in these areas could support a wildfire that could threaten vital forest resources, such as the city of Bend's municipal water supply. The Rooster Rock fire, which started in early August of 2010, is an example of how a fire initiating on Forest Service land in this area could easily travel to private land and threaten this resource (Rooster Rock Fire WFDSS Decision; Noonan-Wright et al 2011). Fire behavior during active burning periods was documented as primarily fuels and spot fire driven with flame lengths too high for direct attack (Loomis 2010).

Clean Air Act

Air quality is an important aspect of the central Oregon area. For the most part, air quality conditions are good except during certain times in the winter when temperature inversions create woodstove pollution problems, and certain times in the spring and summer when prescribed burning activities are occurring (1990 LRMP, pg. EIS 2-131).

The 1990 federal Clean Air Act (CAA) is a legal mandate designed to protect human health and welfare from air pollution. Individual states develop programs for implementing the CAA through State Implementation Plans. For this area we utilize the Oregon Department of Forestry (ODF) Smoke Management Plan.

The Oregon Implementation Plan considers local geography and industry to further define how the provisions of the CAA would be implemented through the Oregon Smoke Management Plan. The pollutants thought to affect human health include particulate matter emitted in smoke that is less than 10 microns in diameter (PM 10). The plan includes regional monitoring and regulation of pollutants less than 10 and 2.5 micrometers (PM 10 and PM 2.5) in size. The Forest Service is required by law to follow the directions of the State Forester in conducting prescribed burning in order to achieve strict compliance with all aspects of the CAA by working in conjunction with the Oregon Department of Forestry (ODF) to adhere to the Oregon Smoke Management Plan. The prevention of Significant Deterioration provisions of the CAA requires measures, to preserve, protect, and enhance the air quality for areas designated as "Class 1" airsheds (42 U.S.C. 475(d)(2)(B). The closest Class 1 airshed is the Three Sisters Wilderness located 1 mile west of the project area.

A Smoke Sensitive Receptor Area (SSRA) is an area designated by the board, in consultation with the Department of Environmental Quality that is provided the highest level of protection under the smoke management plan because of its past history of smoke incidents, density of population or other special legal status related to visibility (OAR-629-048-0140).

The following are potential project area SSRA's: Redmond located 20 air miles and Bend approximately 12 air miles.

In 2005, the ODF Smoke Management Program developed a concept known as the "Best Burn Day Strategy". This strategy helps to reduce the amount of burning necessary on marginal days when a higher likelihood of smoke intrusions exists. Specifically, the "Best Burn Day Strategy" seeks to:

"provide maximum opportunities for land management objectives to be met while maintaining air quality, health standards and visibility objectives. Burning can be managed more effectively with improved

coordination, communication, technology, public education, increased utilization of forest fuels and maximizing burning during optimum burning conditions whenever possible" (ODF-SMP, pg. 1).

Fire Behavior Modeling Assumptions, Limitations, and Inputs

Fire Behavior modeling inputs (LANDFIRE 2010: LF 2010 – LF 1.2.0) were downloaded from www.landfire.gov. LANDFIRE delivers seamless landscape-level, geospatial canopy and fuels data products for incorporation into fire behavior modeling software. Methods are based on peer-reviewed science from multiple fields. LANDFIRE products are consistent, comprehensive, and standardized. Efforts were made to field verify and update the data to reflect some of the recent vegetation changes across the modeling area, including the effects from recent fires (i.e., Pole Creek). However, the amount and extent of error is uncertain. Although this approach has limitations, model outputs yield useful information for comparisons of landscape fuel treatments (e.g. pre- and post-treatment effectiveness; Stratton 2004).

FlamMap, a fire behavior mapping and analysis program that computes conditional fire behavior characteristics (flame length, crown fire potential, burn probability, etc.) over an entire landscape, was used with LANDFIRE to determine fire hazard across the Melvin Butte project area. Fire behavior outputs are considered "potential" because they are conditional on a fire actually occurring (Finney 2006). FlamMap is a state of the art tool used by many researchers and in many studies including, Finney (2006), Stratton (2004), Gerke and Stewart (2006), Stratton (2009), and Ager et al. (2010), to name a few. FlamMap uses eight distinct raster (i.e. "grid") data files (aspect, slope, elevation, fuel model, canopy height, canopy base height, crown bulk density, and crown class) and specific weather and fuel moisture conditions as inputs.

Modeled fire hazard potential provides a "snap shot" of the existing condition for fuels and describes the likelihood of effective fire suppression actions under simulated weather and topography conditions. This metric assumes that there is no connection between adjacent pixels of data and is based on the combination of flame length and crown fire potential. In FlamMap, flame length calculations are based primarily on the surface fire spread models while crown fire activity links surface fire activity with canopy characteristics (Rothermel 1972, VanWagner 1977, Rothermel 1991, Finney et al. 2006). Therefore, combining crown fire activity with flame lengths into one metric provides a comprehensive depiction of the current "hazard" within an area.

In order to determine the effect to air quality resulting from wildfire compared to prescribed fire, an analysis was done with the computer model First Order Fire Effects Modeling (FOFEM). Currently, FOFEM provides quantitative fire effects information for tree mortality, fuel consumption, mineral soil exposure, smoke emissions and soil heating. The assumptions made within FOFEM and in this analysis are as follows:

- Smoke potentially impacts human health through inhalation of Particulate Matter (PM).
- The National Fuel Loading Models (FLM) data set was used for both prescribed burning and wildfires. This data set was masked to areas within the Melvin Butte project area where prescribed fire may occur under each Alternative. The FLM surface fuel classification system (Lutes et al. 2009) was developed by the Missoula Fire Sciences Laboratory to characterize wildland surface fuels. The FLM provide a simple and consistent way for managers to describe onsite fuels for input into the FOFEM model.
- Prescribed burning is conducted under typical spring fuel moisture conditions (1 hour fuels 6%, 10 hour fuels 8%, and 100 hour fuels 10%); wildfires occur under 90th percentile fire season fuel moisture conditions (See Assumptions section for more detail)

- PM outputs under all alternatives are modeled using the existing fuel vegetation profile. Treatment effects (thinning, mastication, harvest, and biomass removal) will ultimately reduce fuel loading and/or arrangement and thus emissions prior to prescribed burning. Using the existing fuel profile, rather than the treated fuel profile, allows for the most conservative comparisons of emissions or a "worst case scenario" approach accounting for temporal variability associated with treatments across the project area.

Indicator and Measurement

The primary purpose of the Melvin Butte project is to decrease fire hazard. There is a need to reduce forest fuel loadings in order to lessen the hazard associated with uncharacteristic and large wildfires threatening nearby communities and key ecosystem components. To indicate how the alternatives affect fire hazard within the Melvin Butte planning area the following measurements are used:

1) Change in fire hazard across the project area. The measure is the amount of area in acres of low, moderate, and high fire hazard when compared to all alternatives.
2) The effect to air quality resulting from high intensity wildfire. The measure is the production of PM 2.5 and PM 10 under wildfire vs. prescribed fire conditions for proposed treatment areas.

What is Fire Hazard?

In regards to wildland fire, there exists a considerable range of definitions for hazard (Hardy C. C., 2005). For the purpose of this analysis, the following definition is used:

Fire Hazard is a fuel complex, defined by volume, type, condition, arrangement, and location that determines the degree of ease of ignition and the resistance to control (NWCG 2014).

This analysis assumes that a fuel complex rated low for fire hazard will not support widespread crown fire and surface fire behavior will be of relatively low intensity under summer like weather conditions. To rate wildfire hazard, the matrix in Table 183 was used (Valliant, Ager, Anderson, & Miller, 2012).

Table 183 Fire hazard matrix for the Melvin project area (Vaillant et.al. 2012)

Potential Flame Length (ft.)	Crown Fire Potential		
	Surface*	Torching	Active
Less than 4	Low	Low	Moderate
4 – 8	Moderate	Moderate	Moderate
8 – 11	Moderate	High	High
More than 11	High	High	High

*no crown fire potential

Using this matrix, fire hazard is represented as a combination of potential flame length and crown fire activity in which the fuel complex will support during 90th percentile weather conditions.

Weather and Fuel Moisture Inputs

The Round Mountain Remote Access Weather station (RAWS) was selected as the weather station that best represents fuel conditions for the planning area, since it is located at a similar elevation (5,900 feet) to the project area and temperature, relative humidity, and consequently fuel moistures are closely tied to elevation. The Colgate RAWS is closer to the Melvin Butte planning area than the Round Mountain RAWS, but the Colgate RAWS sits at a lower elevation (approximately 3,280 feet) and consequently may underestimate fuel moistures (which would overestimate fire behavior). The modeling inputs used in fire

behavior modeling are those representing the 90th percentile "fire season" (July 1 to September 30) conditions from the Round Mountain RAWS from 1996 to 2013. The Round Mountain RAWS has data available from 1988 to 2013, but the most complete data set is available from 1996 to 2013. Sensitivity analysis of the dead fuel moisture conditions at the Round Mountain RAWS showed very little difference between the 97th and 80th percentile conditions for fuel moisture, indicating a generally receptive fuel bed during a substantial proportion of fire season. Dead fuel moistures were conditioned using 90th percentile weather including, humidity and temperature prior to modeling to incorporate the local spatial variability in dead moisture that occurs with topographical influences. As live and herbaceous fuel moistures predicted from RAWS stations are modeled rather than field sampled, the values extracted from the RAWS were increased by 20% to be more in line with live fuel moisture sampled across the forest (National Fuel Moisture Database 2014). Historic gust data, also derived from the Round Mountain RAWS, was used to identify wind speeds in the modeling environment, since average wind speeds derived from RAWS stations represent a 10-minute average taken only once at 1300hrs daily. Research has shown wind speeds that persist for only one minute can produce large fluctuations in flame height, trigger crowning, and throw showers of sparks across a fireline (Stratton, 2004). A northwest wind (315°) was used in the Melvin Butte analysis since most historic large fires in this particular area on the Sisters Ranger District have burned generally in a south easterly direction (see Figure 20).

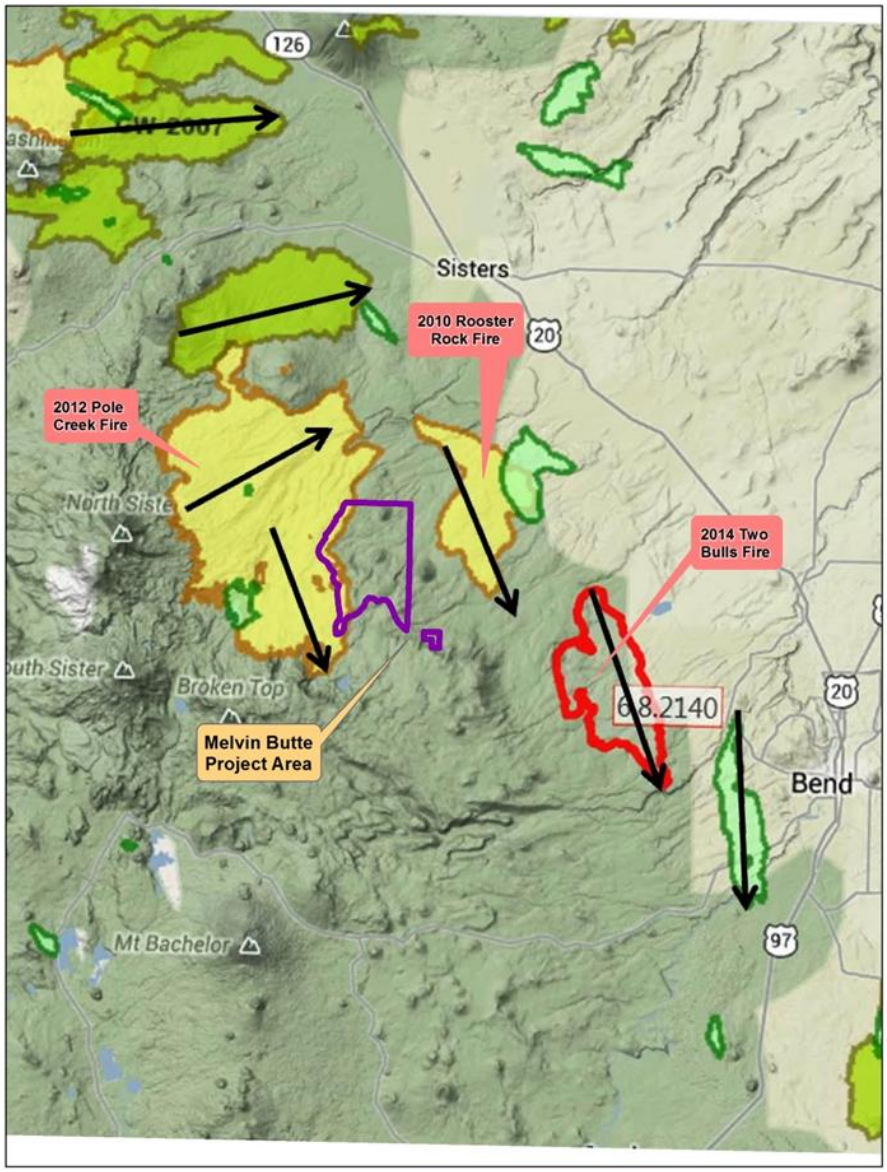


Figure 20 Historical fire spread direction N-S & W-E. One day spread distance of 4 to 6 miles (Stratton 2014).

Table 184 Percentile fuel moisture and winds used to model fire behavior within the Melvin Butte planning area and vicinity

Variable	80th Percentile	90th Percentile	97th Percentile
1 hour fuel moisture (%)	3	3	2
10 hour fuel moisture (%)	4	4	3
100 hour fuel moisture (%)	8	7	6
Live herbaceous moisture (%)	40	35	35
Live woody moisture (%)	84	83	83
Wind Gust (mph)	22	25	30
Wind direction	Northwest		

Project Area Description

Fire Regime

Fire regimes are used to describe the patterns of fire occurrences, frequency, size, severity, and sometimes vegetation and fire effects, in a given area or ecosystem (NWCG, 2014). A fire regime is a landscape level reference condition generalization based on fire histories at individual sites. There is no record of a significant fire within the Melvin Butte project boundary in the past 100 years. The national, coarse-scale classification of fire regimes includes five groups:

Fire Regime I: 0-35 years, Low severity

Typical climax plant communities include ponderosa pine, eastside/dry Douglas-fir; where surface fires are most common. Large stand-replacing fire can occur under certain weather conditions, but are rare events (i.e. every 200+ years).

Fire Regime II: 0-35 years, Stand-replacing, non-forest

Includes true grasslands and savannahs with typical return intervals of less than 10 years, with typical return intervals of 10-25 years.

Fire Regime III: 35-100 years, Mixed severity

This regime usually results in heterogeneous landscapes. Large, stand replacing fires may occur but are usually rare events. Such stand-replacing fire may "reset" large areas (10,000-100,000 acres) but subsequent mixed intensity fires are important for creating landscapes' heterogeneity. Within these landscapes a mix of stand ages and size classes are important characteristics; generally the landscape is not dominated by one or two age classes.

Fire Regime IV: 35-100+ years Stand-replacing

Seral communities that arise from or are maintained by stand-replacement fire, such as lodgepole pine, aspen, western larch, and western white pine, often are important components in this fire regime. Dry sagebrush communities also fall within this fire regime. Natural ignitions within this regime that results in large fires may be relatively rare, particularly in the Cascades north of 45 degrees latitude.

Fire Regime V: >200 years, Stand-replacing

This fire regime occurs at the environmental extremes where natural ignitions are very rare or virtually nonexistent or environmental conditions rarely result in large fires.

The Melvin Butte project area is composed of vegetation characterized by Fire Regime II, III, IV, & V as shown in Table 185 and Figure 21 Melvin Butte planning area historic fire regimes. Melvin Butte planning area historic fire regimes.

Table 185 Fire regimes by acres in project area.

Fire Regime	Description	PAG	ACRES	% Forested
I	0- 35 year, frequent low severity	P. Pine	1,109	21%
III	35-100+ years, mixed severity	M. Conifer	3,690	69%
IV	35-100+ years, stand replace severity	LP. Pine	523	10%
V	200+ years, stand replace severity	Hemlock	8	0%
OTHER	Not burnable or Unclassified	Rock /Cinder	44	0%

TOTAL			5,374	100%

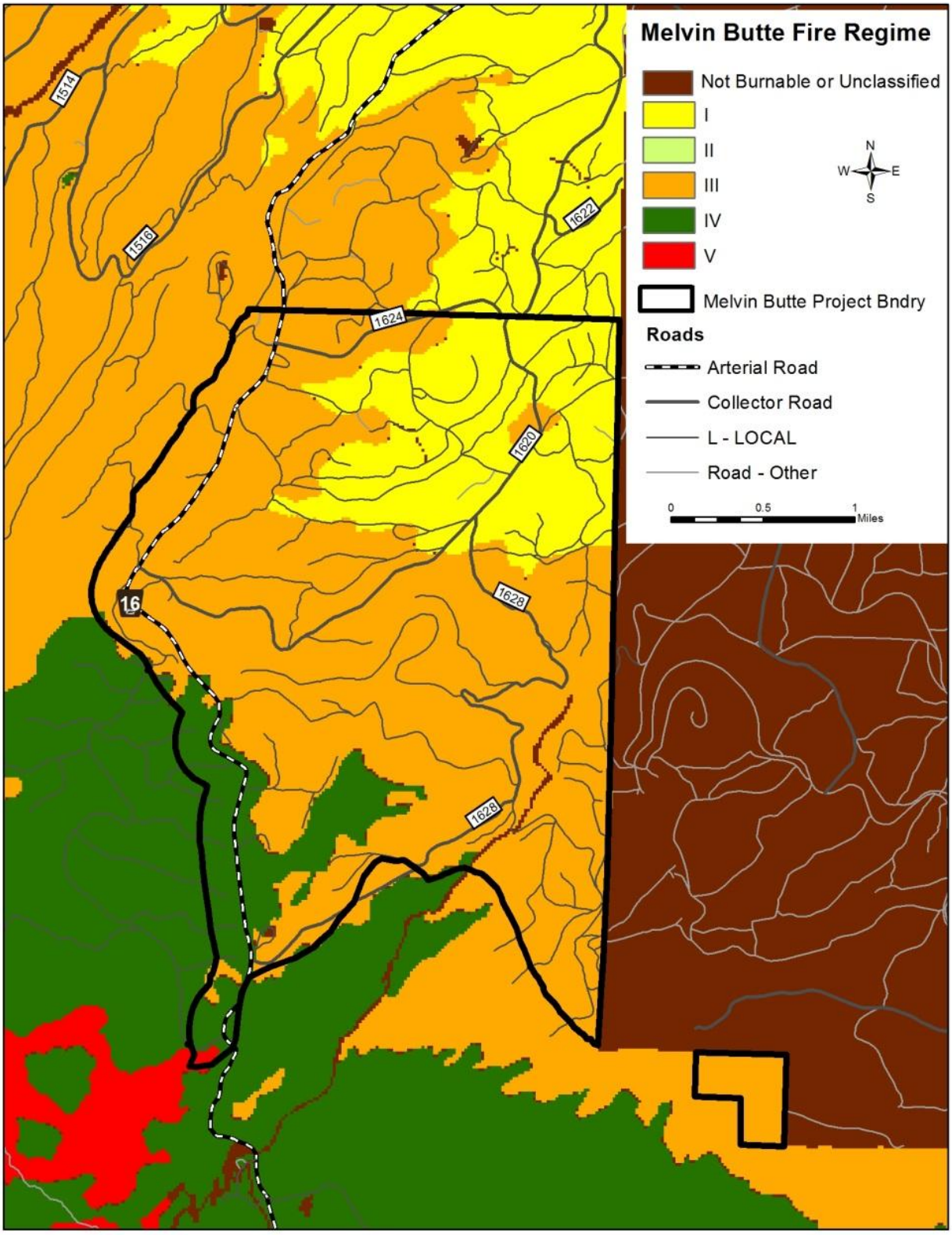


Figure 21 Melvin Butte planning area historic fire regimes.

There is no record of a significant fire within the Melvin Butte project boundary in the past 100 years. Prior to the enactment of federal resource management agencies around 1910, approximately 40 to 50 thousand acres of the 1.6 million acre Deschutes National Forest burned annually, primarily in frequent fire adapted ponderosa pine forest type but also in mixed conifer forest type in the upper elevations of the project area. Fires were a mix of low and mixed severity that maintained the structural and compositional stages within the historic range of variability (HRV). Past forest management practices such as regeneration harvest (clear-cutting and over-story removal) and fire exclusion through fire suppression policy have shifted the structural stages outside of the HRV in the Melvin Butte project area. Along with Fire Regime analysis the project uses HRV as a reference framework for historical estimates of forest size-classes (structure) and seral stages, tree species (or lack of) proportional dominance, that may have been present at any given point in time in the past 300 years (see the silviculture section of this environmental assessment for more details pertaining to HRV).

A significant amount of departure from reference conditions affecting resilience occurs in the ponderosa pine, where large diameter open ponderosa pine and mixed conifer plant association groups (Whychus Watershed Analysis). Historically, about 90% of the project area was dominated by large ponderosa pine. Currently, more than 75% of the project area is dominated by trees less than 20 inches in diameter at breast height. Much of this acreage occurs as small blocks of plantations (about 22% of the project area); second growth stands; lodgepole pine stands; or other areas dominated by small trees.

Fire History

Fredrick Colville's 1898 report, "Forest Growth and Sheep Grazing in the Cascade Mountains of Oregon", generally describes vegetation on the eastern slope of the cascades over century ago. Colville described ponderosa pine-dominated forests as "the yellow pine forest, …[in which] the principal species is …Pinus ponderosa. The individual trees stand well apart and there is plenty of sunshine between them." Colville describes the upper range of ponderosa pine forests as "denser, and often contain a considerable amount of Douglas spruce [fir]….California white fir… with an undergrowth of snowbrush…manzanita…" and the areas dominated by lodgepole pine as "small, thin barked trees easily killed by fire…..set so close together that it is often difficult to ride through them on horseback".

More than a century of human intervention has inadvertently created conditions that have put mixed-conifer forests in the Pacific Northwest at considerable risk. Fire exclusion and past logging and grazing practices have contributed to this problem, as have uncharacteristically large insect outbreaks and severe wildfires (Merschel, Spies, Heyerdahl 2014).

Evolving fire science and recent publications covering fire ecology topics such as fire history, and effects of thinning and burning on fire behavior and fuels is notable and applicable to the Melvin Butte planning area. Hyerdahl et. al. (2012) conducted a fire ring study within the Whychus Watershed concluding that between 1675 – 1850 fires occurred every 8 years on average (range 4 to 16 years). Everett et al.(2000) report on mean fire free intervals of 6.6 to 7 years in dry forest types during the pre-settlement period (1700/1750-1860**)** and lengthened intervals of 3 to 38 years during the fire suppression period (1910-1996). They found a clear shift to a less frequent, but greater severity fire regime, associated with longer recovery intervals (Everett et al. 2000)

Wright and Agee (2004) report mean fire free intervals of 7 to 43 years (1562 to 1995) in dry mesic forests of eastern Washington State. Sampling with Dry forests suggested that historical fires were of low intensity, leaving overstory structure intact. The composition and structure of the historical forest was characterized by a preponderance of very large (>100 centimeters or 39.4 inches dbh) ponderosa pine. Mesic forests exhibit a wider range of fire severities, with moderate and occasional high severity fires or crown fires. Fire frequency and size decline dramatically about 1900, coincidentally with increased timber harvesting and fire suppression (Wright and Agee 2004).

Recent large fire occurrence in and around the project area (
Figure 22 and Table 186 provides some insight into potential fire behavior and impacts to the Whychus watershed and the Melvin Butte project area.

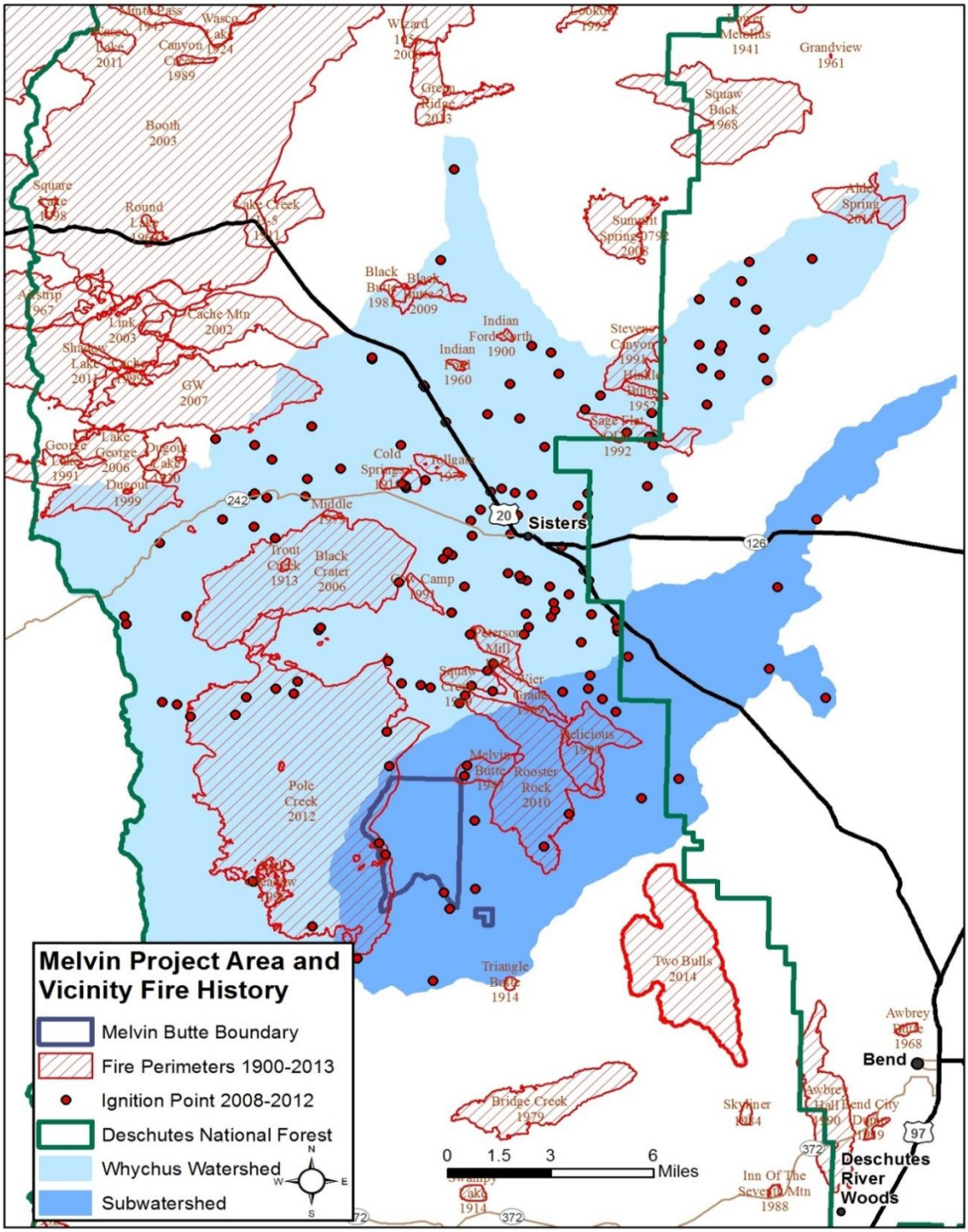


Figure 22 Fire occurrence within the Whychus Watershed.

Table 186 Nine significant fires surrounding the Melvin Butte Project area since 2000. The analysis area acres are within the Whychus Watershed.

Fire Name	Year	Cause	Fire Acres	Analysis Area Acres
Cache Mountain	2002	Lightning	4,358	43
Black Crater	2006	Lightning	9,411	9,396
Lake George	2006	Lightning	5,537	1,857
GW	2007	Lightning	7,349	954
Stevens Canyon	2008	Lightning	173	76
Black Butte II	2009	Lightning	578	559
Rooster Rock	2010	Human	6,119	6,119
Alder Springs	2011	Human	1,449	1,052
Pole Creek	2012	Lightning	26,119	26,119
TOTAL			**61,093**	**46,175**

The most recent fire of significance is the human caused Two Bulls Fire, June 7th 2014. Beginning as two fires (Figure 23) that merged into one, the Two Bulls fire travelled six miles in an afternoon and evening. The northerly wind driven fire prompted immediate evacuations in areas west of Bend. No homes or structures were damaged or lost as a result of this fire. However, equally strong winds out of the west would have likely led to several more subdivisions being impacted by the fire. The fire burned approximately 6,908 acres of mostly private land and cost nearly $5.6 million to suppress. Two Bulls, which was primarily influenced by a strong north wind, occurred three miles east of the Melvin Butte planning area. The fire regime and fuel type are similar to what is found in the Melvin Butte planning area. The Two Bulls fire provides an example of expected spread rates and fire growth.

Figure 23 2014 Two Bulls Fire. Photo by Steve Orange, Sisters Ranger District Timber Sale Administrator.

The second most recent fire of significance is the lightning caused Pole Creek Fire, September 9th 2012, which occurred directly west and adjacent to the Melvin Butte planning area. The Pole Creek fire travelled three to four miles during its first burn period and grew to about 26,119 acres. No homes or structures were lost, however, notification and evacuation strategies were implemented immediately and key ecosystem habitat was severely impacted. Additionally, the Three Creek Lake recreation area along with the city of Bend's municipal watershed was threatened. This fire (Figure 24) burned actively for three weeks in fire regimes I, III, IV & V, produced significant smoke impacts, and cost upwards of $18 million to suppress. Fuels treatments played a significant role in stopping the fires spread to the east, which provided anchor points for fire suppression personnel during containment efforts. The burned area contains similar fire regime and pre fire fuel type to the Melvin Butte project area, thus the Pole Creek fire provides an example of expected spread rates and fire growth.

Figure 24 2012 Pole Creek Fire. Photo taken from Broken Top by Katie Ryan.

The third most recent fire of significance is the human caused Rooster Rock, August 2, 2010, which occurred directly north and east of the Melvin Butte planning area. The Rooster Rock fire travelled three to four miles during the first burn period and grew to about 6,119 acres. This fire burned one structure, threatened numerous other structures and resources of concern, including the city of Bend's municipal watershed (Rooster Rock Fire WFDSS Decision; Noonan-Wright et al 2011). Fire behavior was documented as primarily fuels and spot fire driven with flame lengths too high for direct attack (Loomis 2010; Figure 25). Weather at the time of Two Bulls, Pole Creek, and Rooster Rock fires, as well as forest fuel conditions are representative of events and conditions, respectively, which occur within the Melvin Butte planning area.

Figure 25 Head of Rooster Rock fire with two spot fires along the flank. Displays typical fire behavior in Melvin Butte project area vegetation type. Photo courtesy of Mel Gard, archived on Inciweb.

Existing Condition

The Melvin Butte area is characterized by large areas of mistletoe infested ponderosa pine stands with an area of beetle killed lodgepole pine intermixed with dense stands of mixed conifer. Mountain pine beetle epidemics in lodgepole pine forests can leave vast acreages of forest with dead lodgepole pine (Raffa et al. 2008) and the past 30 years on the Deschutes and Fremont-Winema National Forests can serve as an example of the scale of these disturbances. There have been two distinct peaks in activity in the region, one occurring in the 1980s and the other more recently ramping up after 2000, persisting to this day at a distinctly lower level (Shaw. et al. 2012). Decades of fire exclusion, insect and disease activity, and previous forest management activities, have all contributed to relatively high vertical and horizontal forest fuel loadings. The current landscape condition combined with lightning or a human caused ignition source during typical summer time weather creates an atmosphere where a wildfire could present a high risk to human safety and loss of vital forest habitat.

Forest Fuel Condition and Fire Hazard

The combination of dwarf mistletoe activity (see silviculture section), previous forest management practices, and fire suppression activity over the last 100 years has shaped current vegetative conditions and consequently fuels within the Melvin Butte project area (Figure 26).

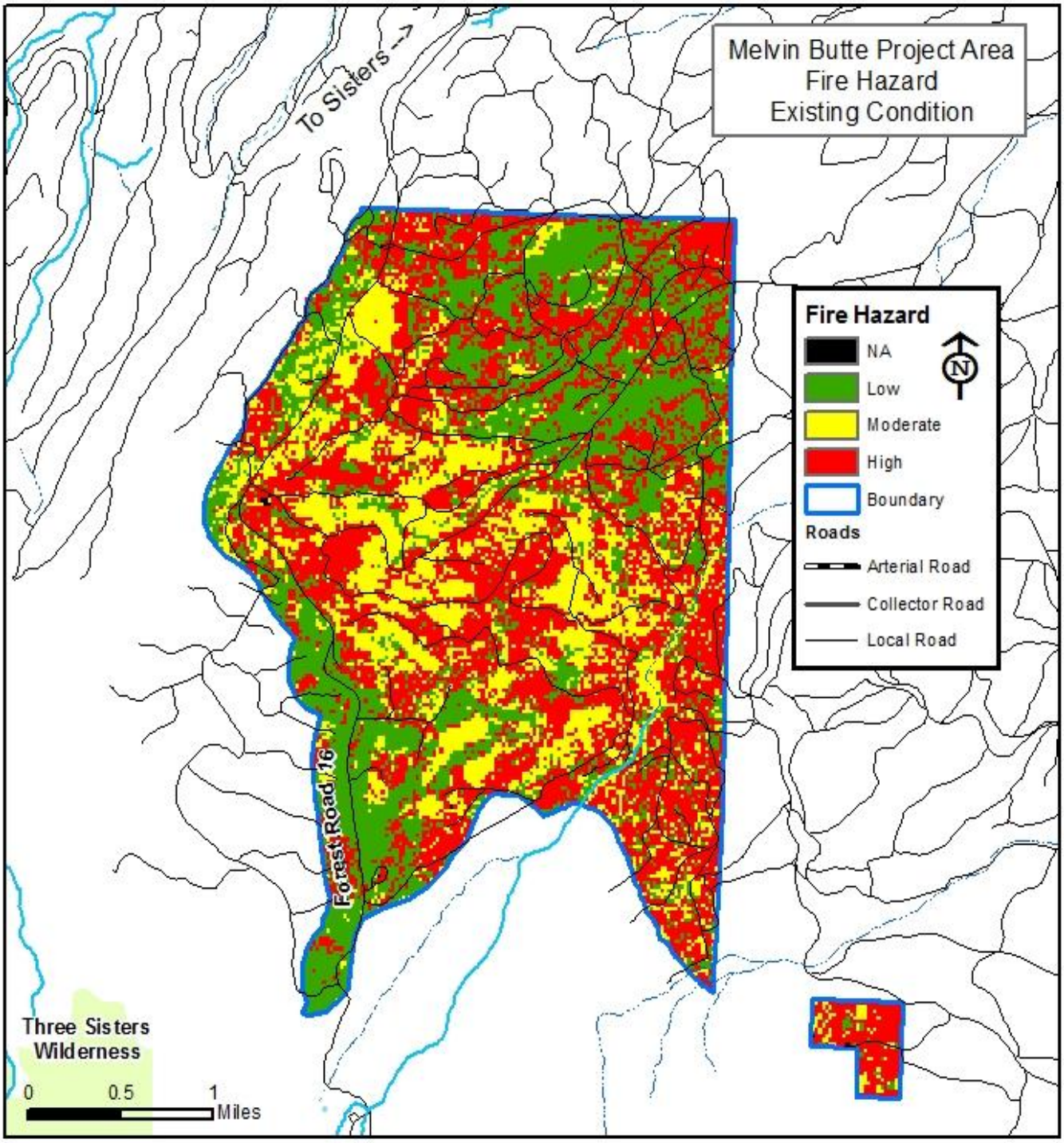


Figure 26 FlamMap and GIS modeling display of the existing fire behavior hazard within the Melvin Butte Project boundary.

Values at Risk

Wildfire in this area could quickly threaten nearby recreational developments, adjacent private timberland, and the Bend Municipal Watershed. Deschutes National Forest fire managers have identified

the roadless areas to the south and unburned wilderness areas to the southwest of Melvin Butte as High Risk Exposure Areas.

Firefighter and Public Safety - High fuel loadings, continuous fuels, poor access and high snag densities classify these areas as safety hazards that increase the risk of exposure for initial attack and/or extended attack firefighting resources. The project area coupled with adjacent vegetation management project areas is bordered by private land, wilderness and roadless areas. From a landscape view, this is one of the few areas where treatments can be implemented on a large enough scale to make a significant change in fire hazard. Public health and air quality degradation would be a concern if wildfire occurred in the Melvin Butte area. The communities of Sisters, Redmond, and Bend experienced six consecutive days of severely degraded air quality during the Pole Creek Fire when the 24-hour average for levels of PM 2.5 (fine particulate matter) remained in the "Very Unhealthy to Hazardous" range (Oregon Health Authority and Oregon Department of Forestry, 2014). Smoke impacts from the Pole Creek Fire were felt across Jefferson and Deschutes Counties, as well as the Willamette Valley.

Forest Road 16 Wildland Urban Interface Travel Corridor - Accessible from the town of Sisters, is the primary travel route within the project area to the Three Creek Lake recreation area and is considered WUI due to its critical role as a travel corridor and evacuation route (see Figure 27). The Greater Sisters CWPP steering committee expressed great concern over critical transportation routes, such as Forest Road 16, as part of the CWPP planning process and recommended that routes such as these be protected (Project Wildfire 2014). A problem fire, lightning or human-caused could jeopardize ingress to and egress from the Three Creek Lake Recreation area and consequently jeopardize public and fire fighter safety. Because of this, there is an immediate need to reduce and maintain arterial travel corridors. Fire hazard can be explicitly defined in many ways but is fundamentally the state of the fuels as determined by the volume, condition, arrangement, and location (Hardy 2005). For this reason, treating fire hazard must modify fuels in a way that lessens the likelihood of fire ignition, potential damage, or resistance to control (Evans et al 2011).

The 2012 Pole Creek post fire perimeter includes a section of Forest Road 16. The two lane paved road was used as a containment strategy called backfiring. Backfire is a tactic associated with indirect attack where fire managers intentionally set fire to fuels inside the control line to slow, knock down, or contain a rapidly spreading fire. Backfiring provides a wide defense perimeter and may be further employed to change the force of a convection column (NWCG, 2014). Although the western side of Forest Road 16 has received recent fire activity, vertical and horizontal fuel loads are at levels in support of high intensity fire and do not provide an adequate margin of safe egress and ingress to firefighters and the public.

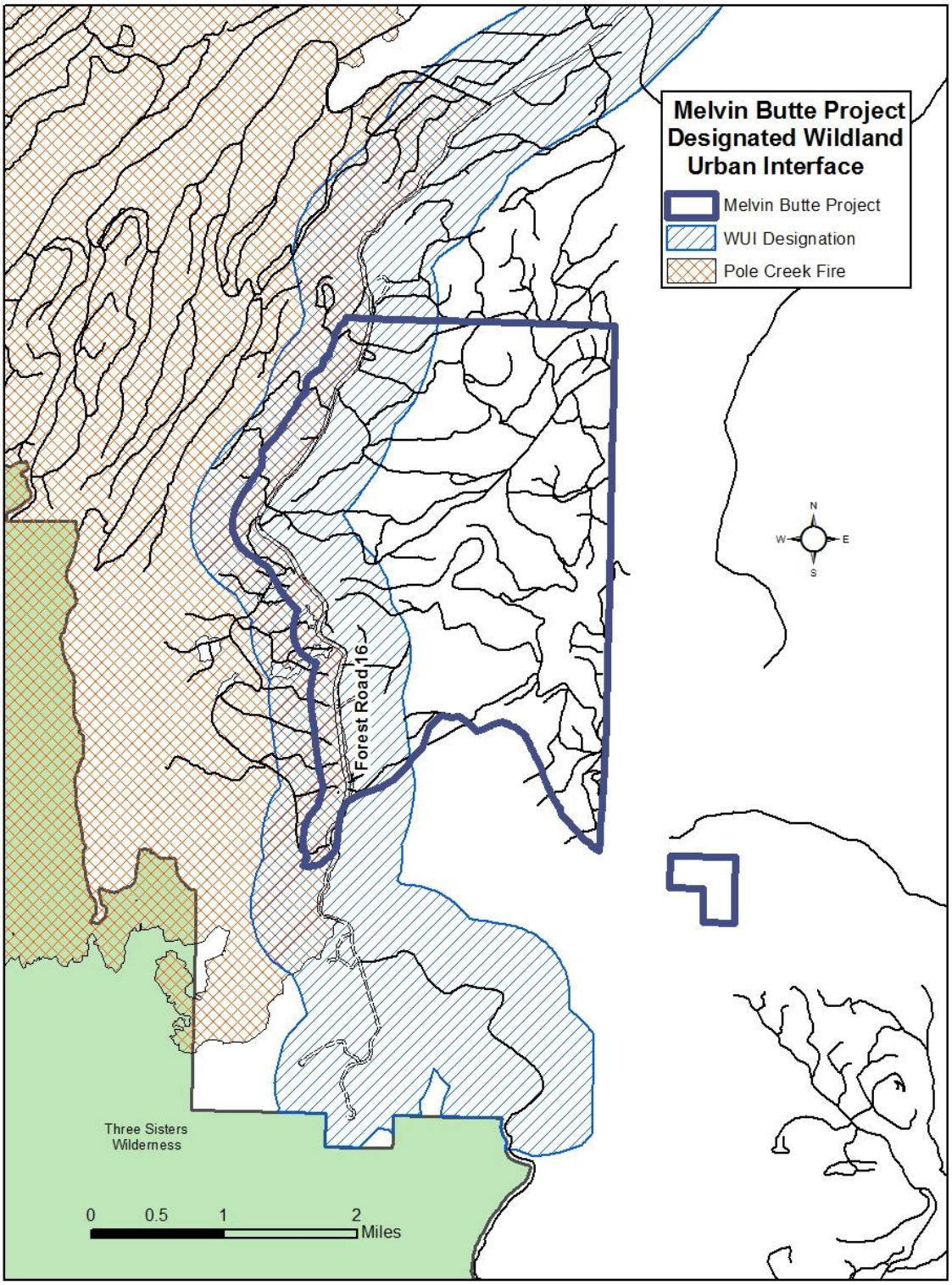


Figure 27 Forest Road 16 travel corridor designated as Wildland Urban Interface by the Greater Sisters Country CWPP.

Across much of the Melvin Butte project area, treating the WUI (Figure 27) in combination with the surrounding landscape functions will reduce fire hazard, reintroduce fire into fire adapted systems, and improve ecosystem health.

Private Timberlands – The east side of the Melvin Butte planning area is bordered by the "Skyline Forest". The Skyline Forest is a 33,000 acre (50 sq. mile) tree farm historically known as the Bull Springs Tree Farm. The 2014 Two Bulls Fire burned more than 6,000 acres of the Skyline Forest. Fidelity's Skyline Forest contains an informal system of trails, wildlife habitat and a migration corridor for mule deer and elk moving between summer and winter range (Deschutes Land Trust, 2014).

Recreation Values – Upper and Lower Three Creek Sno-Parks, Triangle Hill Loop and portions of the Windigo Cross District Trail are located within the Melvin Butte project area. All but the Windigo Trail are primary attractions to winter recreationists. Within a mile of the southern portion of the project area boundary there are five trailheads and three campgrounds as described in Chapter 3 of the Melvin Butte EA. This area can attract upwards of 400 recreationists at one time during summer months. Safe and timely evacuations on a one way ingress to and egress from route will be the primary concern if a wildfire were to impact the area.

Bend Municipal Watershed – The Bridge Creek Watershed approximately 3.5 miles south from the project area. Approximately half of Bend's water comes from this area. Given a one day spread distance of 4 to 6 miles (Stratton, 2014) a wildland fire occurring in the Melvin Butte project area has a high potential to move south and threaten this watershed.

See "Hazard Reduction Strategy and Principles to Protect Values at Risk" within the Project Design section to view values at risk vicinity map.

Project Design

Description of Hazardous Fuels Reduction Activities

Table 187 provides a summary of treatment acres by analysis for Alternatives 2 and 3.

Table 187 Total project area treatments acres by analysis Alternatives 2 and 3

Alt. 2 Treatments	Acres	Alt. 3 Treatments	Acres
Prescribed Fire	809	Prescribed Fire	809
Thinning	998	Thinning	1,933
Mixed con. group openings	839	Lodgepole pine imp.	249
Dwarf mistletoe areas	160	Plantation	1,174
Lodgepole pine imp.	249	Scenic View Enhance	240
Plantation	1,174	*Retention Strategy	775
Scenic View Enhancement	240	*No Treatment	229
*Retention Strategy Area	775		
*No Treatment	159		
Alt. 2 Total Acres	4,469	Alt. 3 Total Acres	4,405

*Retention Strategy Area and No Treatment acres were analyzed for treatment. Specialists determined no primary or secondary treatments will occur on these acres thus not included in the Alternative acres for each Alternative.

Small and medium size tree harvest is accomplished by using ground based harvest equipment. Some small tree thinning may be accomplished by hand while utilizing chainsaws. Small tree thinning units,

identified as pre-commercial thinning (PCT), are typically plantation treatments thinned at a level desired to meet wildlife and silvicultural objectives (Table 184).

Activity slash fuel generated from PCT units may be 1) lopped and scattered or 2) piled by machine or by hand and burned or removed as biomass. Ladder fuel reduction (LFR), typically occur in the Thinning, Scenic View Enhancement, and Lodgepole Pine Improvement Treatments (thinning of small trees up to 8" in diameter) is based on silvicultural prescription. Excess slash material remaining with LFR treatment units would be piled by machine or by hand and burned or removed for biomass.

Mowing is proposed as a secondary treatment in both action alternatives to decrease the height of live or dead brush through the mastication (mowing) of brush in stands as needed throughout treatment units within the project area.

Burn only (with small tree thinning permitted to prepare containment lines for holding purposes in unit 8) treatment is proposed on 30 acres to re-introduce fire on the landscape and to meet wildlife objectives in both Alternatives 2 & 3.

Prescribed Fire is proposed as a secondary treatment on all acres for each alternative following thinning and mowing activities. All prescribed fire activities would occur when fuels and weather conditions are conducive to achieving planned fuels and resource objectives. Typical underburn conditions occur during spring and fall seasons, however depending on the season, objectives may still be achieved any time of year.

Underburning results in some amount of first order, or short-term, fire effects that include bole scorch, needle scorch, shrub mortality and at times may also result in some tree mortality. These effects depend on many variables such as climatology, stand condition, fuel loadings, fuel moistures, ignition patterns and weather conditions during burn operations.

All proposed treatment units will receive some form of thinning, mowing (with the exception of the Pechman (d) acres), and underburning to reduce surface fuel loadings. Fire behavior analysis and professional experience conclude that all successional treatment types achieve desired conditions. Longevity of treatments and other ecological values such as brush response, recruitment of beneficial species, and nutrient cycling indicate that prescribed underburning is the desired treatment over mowing in stands that have been both proposed for mowing and/or underburning. Best available science shows that all intermediate treatments should be accompanied by surface fuel modification, and the most success related to effective fuel reduction is achieved when using prescribed fire for such treatments (McIver et al. 2012; Graham et al. 1999).

Hazard Reduction Strategy and Principles to Protect Values at Risk

As seen in the existing condition hazard rating Figure 28 high fire hazard exists within the project area. Fire knows no boundaries, once a fire gets established under the current conditions intensities will build quickly with minimal opportunity to contain and protect values at risk. When designing treatments, consideration was put into how fire would travel across the landscape (see Figure 20 historical fire spread direction in Weather and Fuel Moisture Inputs section). The intent is to maximize treatment effectiveness through strategic placement emphasis towards values at risk. The figure to the right shows the location of strategic roads, campgrounds and trailheads, the Bridge Creek Watershed, and other ownership lands within and adjacent to the Melvin Butte project area.

Road Systems and WUI Corridor

Road systems allow ground suppression forces to access wildfires. Use of major roads in a defensible space is recommended, especially in the WUI where public safety and evacuation is of high concern. Forest Road 16 within the WUI corridor would be cleared of contiguous surface fuel loading up to 250 feet from both sides of the road. Forest Roads 1620, 1624, and 1628 would be cleared of contiguous surface fuel loadings up to 150 feet from both sides of each road where permissible. Snags should not be retained near the roads (within a tree length) that remain open to the public. This strategy allows for safe ingress/egress to and from a fire for fire fighters and ties in with the Greater Sisters Country CWPP Action Plan and Implementation priorities. Consequently, when fuel conditions allow surface fires to gain high intensities and get into the canopies of trees contributing to extreme fire behavior (torching, crowning, and long range spotting), direct attack by ground forces becomes ineffective. Wildland fires under these conditions will cross any road system with such intensity that suppression forces have little chance of containing the fire from the road. Aerial delivery of fire retardant alone will only slow a wildfire for a short period of time. Suppression forces need to quickly utilize the effect of the retardant to contain a wildfire. Roads provide a good area for retardant to be utilized by suppression forces.

Private Timberlands

On the eastern edge of the project adjacent to the Skyline Forest, emphasis would be placed on hazardous fuels reduction within 600 feet of the private ownership boundary. Downed wood or slash piles should not be retained within 200 feet of the private ownership boundary in order to avoid fire spotting onto private inholdings in the event of a fire initiating on federal lands.

Key Ecosystem Components - Late Successional Old Growth (LSOG)

Late Successional Old Growth (LSOG) areas are found throughout the project area. Under survey protocols these areas must be surveyed for Survey and Manage species if ground disturbing activities such as mechanical thinning or mastication take place. If no ground disturbing activities take place these areas can be exempt from pre-disturbance surveys. The types of treatments exempt from pre-disturbance are described under the Pechman exemptions. For a detailed discussion of the Pechman exemptions see the botany section of this environmental assessment

Pechman exemption (d) would be applied to about 808 acres of LSOG that would be prescribed burned to reduce fuel loadings and maintain overstory ponderosa pine. Prior to burning trees < 8 in. dbh could be hand thinned in the understory to remove ladder fuels. Thinning slash would then be hand piled. No commercial harvest, biomass utilization, or mastication would take place. Table 188 displays the units and associated acreages where the Pechman exemption (d) would be applied.

Table 188 Pechman Exemption (d) treatment units and acres.

Pechman Exemption (d) Treatment Units	
EA Unit Number	**Unit Acres**
1	3.0
2	6.9
3	34.9
4	159.6
5	4.2
6	136.1
7	12
8	29.8
9	54.6
10	126.5
12	22.3
13	81.5
14	118.8
15	5.7
17	19.5
Total	**808.4**

The absence of fire over the last 100 years combined with the development of shrubs and dense thickets of regeneration in the understory has placed the ponderosa pine stands at high risk of stand replacing wildfire. Reintroduction of fire in these ponderosa pine type stands would be used as needed to achieve the desired conditions. Prescriptions would be developed for low intensity prescribed fire to start a return to historic fire regime conditions. Subsequent prescribed fire entries would be conducted, through time, to create a more fire resilient stand condition which would help in defending private lands and help preserve the ponderosa pine stand type. Interior project area treatments will focus on reducing ladder fuel loadings while utilizing small tree thinning and prescribed burning treatments designed to reduce surface fire spread rates in and around plantations. Emphasis on fuel reduction treatments will occur directly adjacent to wildlife retention and no treatment areas to protect the forests that are part of the wildlife connectivity strategy.

Developed Recreation Sites and Neighboring Bridge Creek Watershed

The recreation assets inside the project area include Upper and Lower Three Creek Sno-Parks, Triangle Hill Loop and portions of the Windigo Cross District Trail. Within a mile and south of the project area recreation sites include Trapper Meadow, Three Creek Lake, Driftwood Campgrounds and Park Meadow; Trapper Meadow, Tam McArthur Rim, Little Three Creek Trailheads. Further south approximately 3 miles away is the Bridge Creek Watershed an important municipal water source supplying the city of Bend. All sites listed are at risk from a crown fire initiating within the project area. Crowning fires are the most intense wildfires and usually produce long range spotting that hampers control efforts. Dense stands of timber support independent crown fires allowing fire to burn through the canopy of the trees independent of the surface fire. Torching and crowning with support of the surface fire is also a common problem during wildfires in denser stands of timber. Breaking up the continuity of the vegetation canopy in timber and in surface fuel loadings through thinning mowing and burning greatly decreases the chance of an active or passive crown fire. By maintaining stands at crown bulk densities of less than 0.10 kg/m^3, active or independent crown fire activity can be limited (Agee, 1996). Thinning from below, leaving

dominant and co-dominant trees with thick bark and high crowns significantly changes the potential for fire to move from surface up into the tree crowns (Fitzgerald, 2002) (See Figure 28).

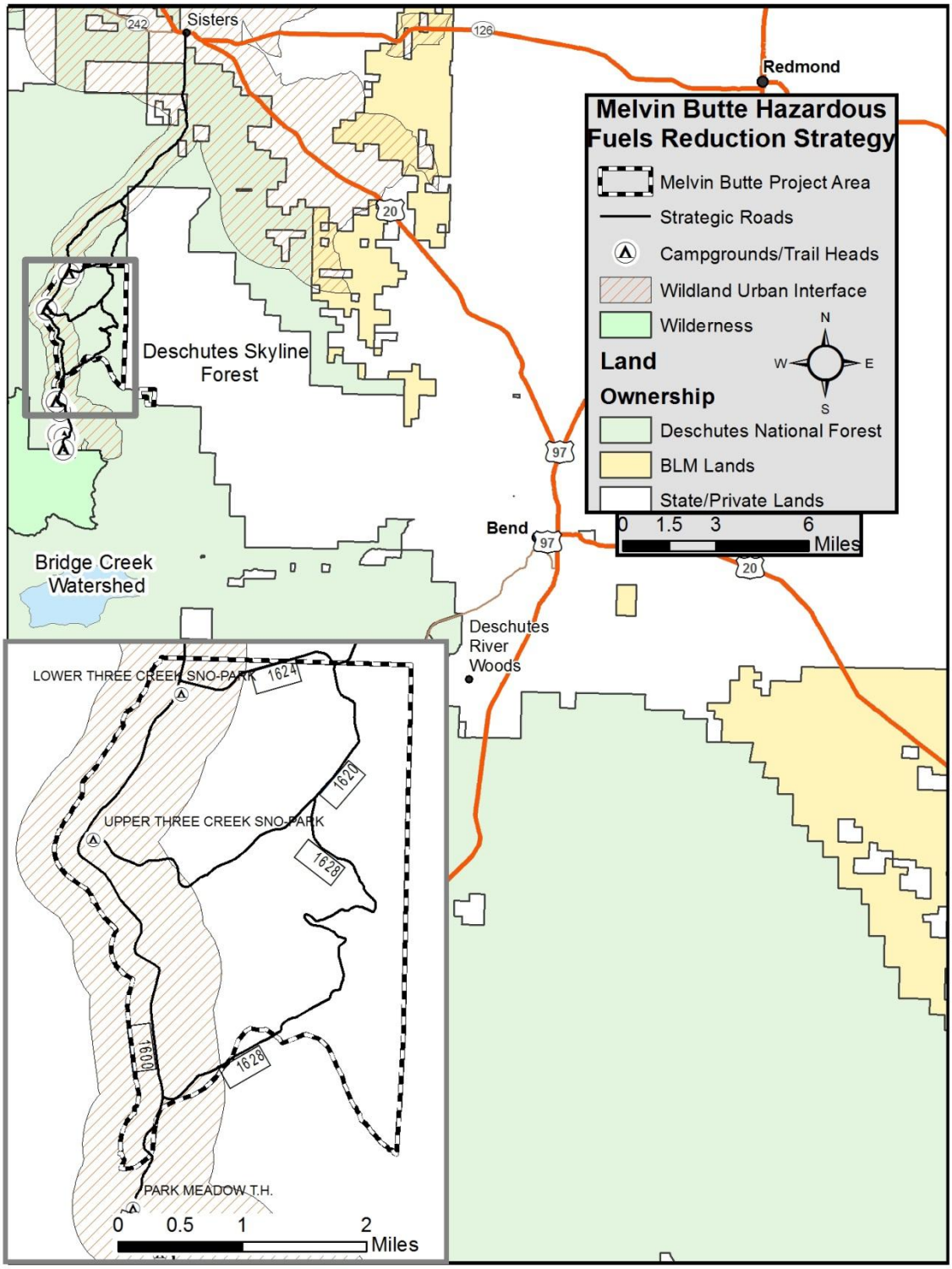


Figure 28 Vicinity map of values at risk associated with the Melvin Butte Hazardous Fuels Reduction Strategy.

Table 189 describes principles of fire resistance. Although this table was originally developed for ponderosa pine forests, the principles can be applied to the ponderosa pine dominated mixed conifer stands within Melvin Butte area. Mixed conifer treatments are aimed at reducing canopy base heights and crown bulk density. It is unlikely that these treatments alone would stop rapid moving wildfire displaying extreme fire behavior. However, the treatments will provide a place for firefighting resources to attempt to stop a wildfire through control actions such as backfire or burnout operation.

There are two components to crown fire hazard: crown fire initiation and crown fire propagation. Crown fire initiation is influenced by canopy base heights and surface fuels. Ladder fuel thinning and the reduction of surface fuel height through mechanical mowing will reduce a stands susceptibility to crown fire initiation. Ladder fuel thinning is the removal of sub-merchantable understory trees and shrubs in the lower canopy of the mixed conifer stands. Surface fuel loadings are reduced through piling and burning and ideally biomass utilization and underburning. Mastication is another method to reduce potential surface fire intensities. Mastication reduces the intensities by rearranging the forest fuels.

A stands susceptibility to active crowning (crown fire propagation) is most strongly affected by crown bulk density and, to a lesser extent, foliar moisture content (Scott J. H., 2001). Foliar moisture content is dependent on tree species composition and season, and cannot be modified by forest management except by altering species composition. Crown bulk density can be lowered through over-story thinning and, if the understory is well developed, through ladder fuel thinning.

Table 189 Principles of fire resistance for dry forests adapted from Agee 2002 and Hessburg & Agree 2003, and Agee & Skinner 2005.

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

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

The effects of thinning and burning on fire behavior and fuels have been well studied in the past decade. Evaluating fuel treatments from across the west, the reduction in fire behavior parameters and fuel loading is maximized by the combination of mechanical thinning plus burning (Schwilk et al. 2009). Thinning alone by traditional commercial harvest methods leads to increases in small diameter (<1 inch dbh) surface fuels immediately after treatments (Agee and Lolley 2006), but these fuels decrease to pre-treatment levels within 5 years (Youngblood et al. 2008). Amounts of larger fuels (>1 inch dbh) post-thinning can significantly increase and may not decrease for a long period without the use of prescribed burning. Pre-commercial thinning using mastication equipment can increase total fuel loading and fuel bed depths by as much as two inches, but the magnitude varies by fuels size class (Dodson et al. 2008a). Thinning followed by burning significantly decreases surface fuel loading (Stephens and Moghaddas 2005a, Agee and Lolley 2006, Youngblood et al. 2008, Harrod et al. 2008a) regardless of thinning method.

Canopy closure, canopy bulk density, canopy base height, and surface fuel loading influence torching and crowning fire behavior. Thinning generally reduces canopy closure and canopy bulk density, and

increases canopy base height (Stephens and Moghaddas 2005a, Agee and Lolley 2006, Harrod et al. 2007a, Harrod et al. 2007b, Harrod et al. 2008a, Harrod et al. 2009). Burning alone is less effective at altering these characteristics in mature stands (Stephens and Moghaddas 2005a, Agee and Lolley 2006, Harrod et al. 2007b, Harrod et al. 2009, Schwilk et al. 2009), but can reduce surface fuels loading (Youngblood et al. 2008), thereby decreasing surface fire behavior and the potential for fire to move into the canopy. However, burning alone can be effective in young coniferous forests for thinning stands from below, reducing surface fuels, and raising canopy base height (Peterson et al. 2007). Crown fire severity is generally mitigated by fuel treatment (prescribed fire only, thinning only, or combination), as compared to stands with no treatment (Pollet and Omi 2002, Finney et al. 2005).

Treatments may allow for increased solar radiation to reach the forest floor and may result in lower fuel moistures, higher wind speeds, and increased growth of flammable grasses, forbs, and shrubs. These conditions may actually increase the rate of spread and potentially flame lengths and crown damage, if a fire were to occur (Thompson and Spies 2009, Agee and Skinner 2005, Weatherspoon and Skinner 1995, Raymond 2004). However, where thinning is followed by sufficient treatment of surface fuels, the overall reduction in expected fire behavior and fire severity usually outweigh the changes in fire weather factors such as wind speed and fuel moisture (Weatherspoon 1996, Bigelow and North 2012). Additionally, these changes in canopy characteristics and surface fuels were incorporated into the modeling scenario and are reflected in the resulting hazard outputs. As forest conditions are not static, maintenance treatments will be required in order to maintain the previously described effects so that the growth of flammable material is maintained over time.

Fires in low hazard areas could be effectively suppressed using hand crews and direct fireline construction. Moderate and high hazard areas would require heavy equipment such as dozers, and/or aerial methods to effectively suppress a wildfire (NWCG 2006). Moderate and high hazard areas also have an increased likelihood of negative resource and social effects from wildfire such as fire fighter safety, public safety concerns, resource damage, and smoke production. Refer to other sections of this environmental assessment for information related to the effect of wildfire on specific resources.

Desired Condition

Wildfire hazard levels are moderate to high across the project area. Of particular concern is public and firefighter safety during a wildfire event along with the potential negative impacts to ecosystem resources. However, given the project areas adjacency to private lands and the amount of large wildfires within close proximity high intensity wildfire is not desirable within the planning area. Current fuel loadings, conducive to fire regime intervals and expected fire behavior, within the Melvin Butte project provide few opportunities to effectively manage wildfire. In order to provide opportunities for firefighters to contain a wildfire that originates in the project area or in the adjacent private lands there is a need for discontinuous fuels, which lessen the intensity and resistance to control of wildfire.

From a fuels perspective, the desired future condition would be a mosaic of landscape-scale treatments managed to reduce fire hazard to facilitate suppression of large high intensity wildfires, protect valuable resources, and allow the re-introduction of fire as a disturbance process at lower intensity levels. These conditions tier to the Forest-wide goal for Fire and Fuels management (see Table 182 in Management Direction section) by being responsive to resource management goals while improving the efficiency of future fire suppression efforts (Deschutes LRMP p 4-73). Specifically, the goals for Fire and Fuels Management include prevention of human caused wildfire in areas identified as high use and high risk including, major travel ways and firewood cutting areas, two major components of the Melvin Butte project area (Deschutes LRMP p 4-73, 4-74). Additionally, these conditions tier to several of the management area goals which encourage the use of prescribed fire to meet resource goals (e.g., timber and forage) and to reduce hazardous fuels (see Table 182 in Management Direction section; Deschutes LRMP p 4-119, p 4-131, p 4-139, p 4-144, p 4-162). At the stand level, in areas dominated by ponderosa

pine and in the WUI, this translates to canopy characteristics and a fuel profile which do not support high intensity fire behavior (i.e., crown fire, high resistance to control, high flame lengths) under severe fire weather conditions. To achieve this state of resiliency, stands should be maintained at a height to live crown that is well above the shrub and seedling components. Shrubs should be maintained at a height and continuity that would reduce the potential for rapid rates of spread and crown fire initiation. Dead and down material should not be overly extensive. Large trees more resistant to fire-induced mortality should be maintained (Agee 2002, Hessburg & Agee 2003). These conditions are supported by the Greater Sisters Country CWPP and Whychus Watershed Assessment and Updates, and can be achieved with a variety of methods including prescribed burning, mowing/mastication, pruning and thinning treatments.

Outside of the WUI, leaving some untreated areas at the landscape scale and providing for within-stand spatial heterogeneity of residual trees and shrubs are important components of treatment which help meet the goals of habitat loss due to stand replacement fire while restoring forest habitats as outlined in the Whychus Watershed Assessment and Updates (see Table 182 in Management Direction section). These desired conditions highlight the importance of maintaining large trees as well as variable spatial arrangements of residual trees to account for small and large scale variability in the historic range of natural variability (Larson and Churchill 2012, Baker et. al. 2007, Hessburg et. al. 2006).

The desired condition is a fire resilient forest. To meet this goal the fire regime of the entire project area would be in a condition of one where there is a natural or historical range of variability of fire frequency matched with expected severity. To facilitate effective direct attack with hand crews and equipment it is desired that fuel loadings spaced across the project area be reduced to a level that will not support potential flame lengths over four feet during mid-summer wildfire conditions.

Twenty one percent of the Melvin Butte planning area is within Fire Regime I. Within this fire regime surface fires are common and large stand-replacing fires can occur under certain weather conditions, but are rare events. Fire history studies in nearby pine stands show that the area experienced low-intensity surface fires every 5-20 years and open stands of large, long-lived fire resistant ponderosa pine were typical (Arno, 1996) (Bork, 1984) prior to the 1900's. A recent study performed by Heyerdahl et al. determined that fires occurred every 8 years on average ranging 4 to 16 years. To achieve this goal the desired surface vegetation would be characterized by potential fire behavior represented by Scott and Burgan, 2005 fuel models GS1 and TU1.

Desired post treatment ponderosa pine fuel loadings can be represented by the following photo series:

(Maxwell, W.G., Ward, F.R. 1980. Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest).

PNW-105: 1-PP-2, 1-PP-4, 4-PP-4, or 7-PP-4.

Sixty nine percent of the Melvin Butte planning area is within Fire Regime III. The forest fuel hazard concern in the mixed conifer is crown fire. In mixed conifer treatment units it is desired that crown bulk density be reduced to a level that will not support crown fire under 90th percentile weather conditions. The generally accepted crown bulk density threshold for crown fire is 0.10 kg/m3 (Agee J. K., The Influence of Forest Structure on Fire Behavior, 1996). Variability is both a historical norm and a future restoration goal in many forests with mixed severity fire regimes. Management objectives that aim to capture that variability within and among fuel beds can guide future restoration efforts. Scale of variability for all fuels strata is an important consideration in the planning and layout of restoration activities (Hudec and Peterson, 2012).

Desired post treatment mixed conifer fuel loadings can be represented by the following photo series:

PNW-105: 1-MC-3

Ten percent of the Melvin Butte planning area is within Fire Regime IV. The primary hazard concerns in the lodgepole pine stands is the potential of high surface fire intensities resulting from the large component of dead and down. To achieve this goal the desired surface vegetation would be characterized by potential fire behavior represented by Scott and Burgan fuel model TL1.

Desired post treatment in lodgepole pine fuels loadings can be represented by the following photo series:

PNW-105: 1-LP-2 or 1-LP-3

The desired condition is a wildfire hazard rating of low for the entire project area. It is recognized that it is not feasible to achieve low hazard rating for the entire project area and still satisfy other resource needs. The intent of the action alternatives is to reduce fire hazard over the greatest area possible while balancing other resource concerns and budget constraints. The landscape within the project area should display a mosaic of strategically placed areas with emphasis in travel corridors, and adjacent to private property, wildlife retention areas as well as other no treatment areas to reduce fire hazard.

Effects of Alternatives

Environmental effects are based on the following assumptions:

- Ignitions will continue within the Melvin Butte project area, wildland fire will not be eradicated, and it is not possible to determine the probability of future fire occurrence. The analysis presented assumes that the probability of future fire occurrence within the project area is 100%. In reality, the extent, likelihood, and/or severity of future wildfire is unknown. Assuming that the area *will* burn into the future provides a useful baseline from which to compare the effects of the alternatives. Given the recent fire history of the Sisters Ranger District, this assumption is not implausible.
- This analysis is landscape in scale. As with any landscape analysis, some level of error is to be expected, especially since treatments affect fine scale fuel loading and fire hazard in variable and complex ways (Waltz et al. 2003). Furthermore, there is no way to determine the finite scale at which the utility of this data dissolves. Given that the data was derived from 2012 Landfire satellite imagery, some of the more recent changes resulting from the mountain pine beetle outbreak may not be reflected. Efforts were made to field verify and update the data to reflect some of these recent vegetation changes across the modeling area, including the effects from recent fires (i.e., Rooster Rock) and vegetation management projects (i.e., Sisters Area Fuels Reduction). However, the amount and extent of error is unknown. Although this approach has limitations, model outputs yield useful information for comparisons of landscape fuel treatments (e.g. pre- and post-treatment effectiveness; Stratton 2004). See more detail in the modeling assumptions, inputs and limitations section.
- There are no treatments that will result in completely safe conditions for people, property, or important ecosystem components. Certain unknown combinations of an ignition(s) with vegetation under dry live and dead fuel moistures, high winds, and/or low relative humidity will continue to threaten social and natural resources.
- Public and firefighter safety is the top priority in fire management. Treatments will focus on creating a safe work environment for fire suppression forces.
- Tree mortality and other related resource damage from potential wildfire is not predicted by any of the models used in this analysis and thus is not measured in any quantifiable way. However, qualitative inferences about tree mortality and related resource damage can be inferred from this analysis as vegetation that burns while in a hazardous state (as defined in this analysis) influences a tree's probability of surviving fire (Regelbrugge and Conard 1993, Fowler et al. 2010).
- The full scope of treatment (thinning, piling, pile burning, mastication, prescribed fire, and maintenance of post treatment conditions) is implemented instantaneously through the modeling

process. In reality, it may take 2 or more years once thinning is initiated before the first entry of prescribed fire and the timing of secondary maintenance treatments will vary by stand conditions. This will result in variability in fire hazard. The extent and effect of this variability on fire hazard is unknown and not incorporated into this analysis.

- Within the group opening treatments planned within the mixed conifer plant association groups, some assumptions were made to address effects to canopy and fuel characteristics.
    - "Group opening" treatments within the mixed conifer plant association group were assumed to be variable in size, ranging from 1-3 acres (approximate planned size), and were randomly placed where applicable.

- "Wildfire" weather and fuel moistures used in FlamMap and the FOFEM simulations utilized 90th percentile "fire season" conditions. "Fire season" is typically defined as the 92 day period between July 1st and September 30th, during which most fires and acres burn. The 90th percentile is defined as the combination of live and dead fuel moisture, temperature, relative humidity, and wind speed on a summer day that is warmer, drier, and windier than 90% of all other recorded days within "fire season". This threshold establishes reasonable conditions for estimating "problem fire" behavior in the modeling environment. The effects of treatments other than the previously mentioned are assumed to cover 100% of the treatment area. Leaving certain areas untreated within units would likely reduce the effectiveness of fire hazard reduction indicated in the analysis, but to what extent is unknown.

Alternative 1– Ecological Trends

The purpose of the Melvin Butte project is to restore resiliency in a historic fire adapted ecosystem and reduce the risk of high intensity wildfire. Without treatments, a fire in the area will place the public, firefighters and ecosystem habitats at increased risk. Treatments are aimed at both providing rapid fire containment options and to prevent high intensity wildfires from threatening values at risk.

Fire Hazard

Direct effects of a no action alternative include the ongoing fire suppression efforts and natural ecosystem degradation that will contribute to an increase in flame lengths and risk of crown fire above historical range of variability resulting in an increase in active crown fire within the analysis area. Even though fuel reduction projects have been conducted within the watershed and with recent wildfire scars the area already is within its range in some respects. If no action was implemented, the continued accumulation of fuels leading to increased surface flame lengths and increased risk of crown fire would negate investments already implemented. The natural decay rate would reduce fuels at a much slower rate than they would accumulate through ordinary pruning and mortality. The higher flame lengths are likely to result in higher scorch heights, greater tree mortality, and greater fire severity than expected for this landscape when utilizing fire regimes as a reference condition. Wildfire would reduce fuels as well as return fire as an ecological process within the project area, however the severity and extent to which the wildfire would occur would fail to meet Forest Plan direction to; Limit acres of habitat damaged by wildfire, retain and enhance key wildlife habitat, reduce risk of large scale wildfire, while maintaining site productivity, place fire tolerant stands on maintenance schedule to meet management objectives, and maintain prescribed fire burning schedule to meet management objectives.

The indirect effects of a no action alternative would result in a shift in species composition, structure, and patterns that would support fire spread from the surface to the crowns over greater portions of the landscape than in the past and projected for the future. No action would result in continued connectivity of understory and overstory vegetation and would include secondary fire effects associated with higher flame lengths, and fire intensities, including soil damage, potential for insect and disease due to fire weakened canopy, cambium kill, loss of the coarse woody debris component, and a loss of fire resilient

species. Under a no action alternative, these fire behavior conditions associated with a departed landscape would continue and are likely to increase over time.

The potential for crown fire is the main concern in mixed conifer stands. There is very little that can be done once a crown fire starts (information from "Crown fire behavior and prediction in conifer forests: a state-of-knowledge synthesis", Alexander, Cruz, Vaillant, & Peterson, 2013):

Crown Fires Move Fast – At a minimum, a doubling or tripling in a fire's rate of advance follows the onset of crowning. Wind-driven crown fires have been documented to spread at up to 100 m/min (3.7mph) for several hours and in excess of 200 m/min (7.5mph) for up to an hour. A crown fire initiated in the Melvin Butte project area could threaten life, private property, ecosystem habitat and easily reach the Bend municipal watershed outside the planning area south 3.5 miles away within one burning period.

Crown Fires are Intense – A fire can easily quadruple its intensity in a matter of seconds when crowning takes place (e.g., from 3,000 kW/m to 12,000 kW/m). The resulting wall of flame, standing nearly erect, is on average up to two to three times the tree height and emits fierce levels of radiation. Flame fronts commonly exceed 30-45 m in depth. Once a crown fire initiates, suppression resources, including air tankers are ineffective.

Crown Fires get big quickly – The area burned by a crown fire is at least four to nine times greater than a surface fire for the same period of time. Assuming unlimited horizontal fuel continuity, crown fires are capable of burning an area of upwards to 173,000 acres with a perimeter length of 100 miles in a single burning period and have done so in the past in similar fuel profiles as present in the Melvin Butte planning area.

Crown Fires can spot long distances – Crown fires commonly display high-density, short range spotting (< 50 m). Spotting distances of up to about 1.25 miles, although less common, are frequently seen on crown fires, resulting in normal barriers to fire spread being breached. Many spot fires are simply overrun by the main advancing flame front of a crown fire before they effectively contribute to an increase in the fire's overall rate of advance. Cases of long-distance spotting have been reported of up to 2 miles on the Deschutes National Forest. It would not take much for a crown fire initiated in the Melvin Butte project area to send embers into the adjacent private lands or into the Bend watershed to the south.

A No Action approach to management would prevent the opportunity to reduce hazardous forest fuel loadings thereby increase the potential for crown fire and high intensity wildfire threatening fire fighter and public safety and important values at risk.

Air Quality

Under a no action alternative, smoke emissions associated with a wildfire under the current fuel loadings and stand structure departures within the Melvin Butte analysis area that have not been treated would result in higher particulate emissions than projected for future conditions.

The maximum number of treated acres proposed in the Melvin Butte project area is 4,465 acres. Therefore, under the No Action Alternative, this same number of acres would potentially not receive a prescribed fire treatment. Table 190 shows the potential PM production if a wildfire was to burn on these acres under the conditions previously described.

Table 190 Estimated total potential particulate matter emissions from total acres under wildfire condition without treatments.

Fire condition	Tons $PM_{2.5}$	Tons PM_{10}
Wildfire – 4,465 total acres	6,204	7,320

Smoke and PM emitted from wildfires within the Melvin Butte project area could impact the communities and outlying areas of Sisters, Redmond, and Bend. This is because under wildfire conditions, there is no ability to limit emissions by burning during favorable atmospheric conditions. It is possible that during a wildfire the air quality and visibility within the Three Sisters Wilderness, a Class 1 Airshed due west of the project area, would also be adversely affected. Recreational sites near and around the Melvin Butte planning area, such as the Three Creek Lake recreation area, Park Meadow Trail, and the Pole Creek Trail could also be adversely impacted by smoke when tourism and recreation are at their highest. The continued deferral of treatment within the project would only exacerbate the negative effects on air quality, when a wildfire does occur.

Air quality issues as a result of a wildfire in this area will result in the high particulate (hazardous to human health) levels for extended durations of 5 days or weeks. As compared to prescribed fire with low particulate levels for 3 to 24 hours. Figure 29 shows an example of worst case scenario prescribed fire particulate levels and duration compared with the 2012 Pole Creek Fire particulate levels and duration.

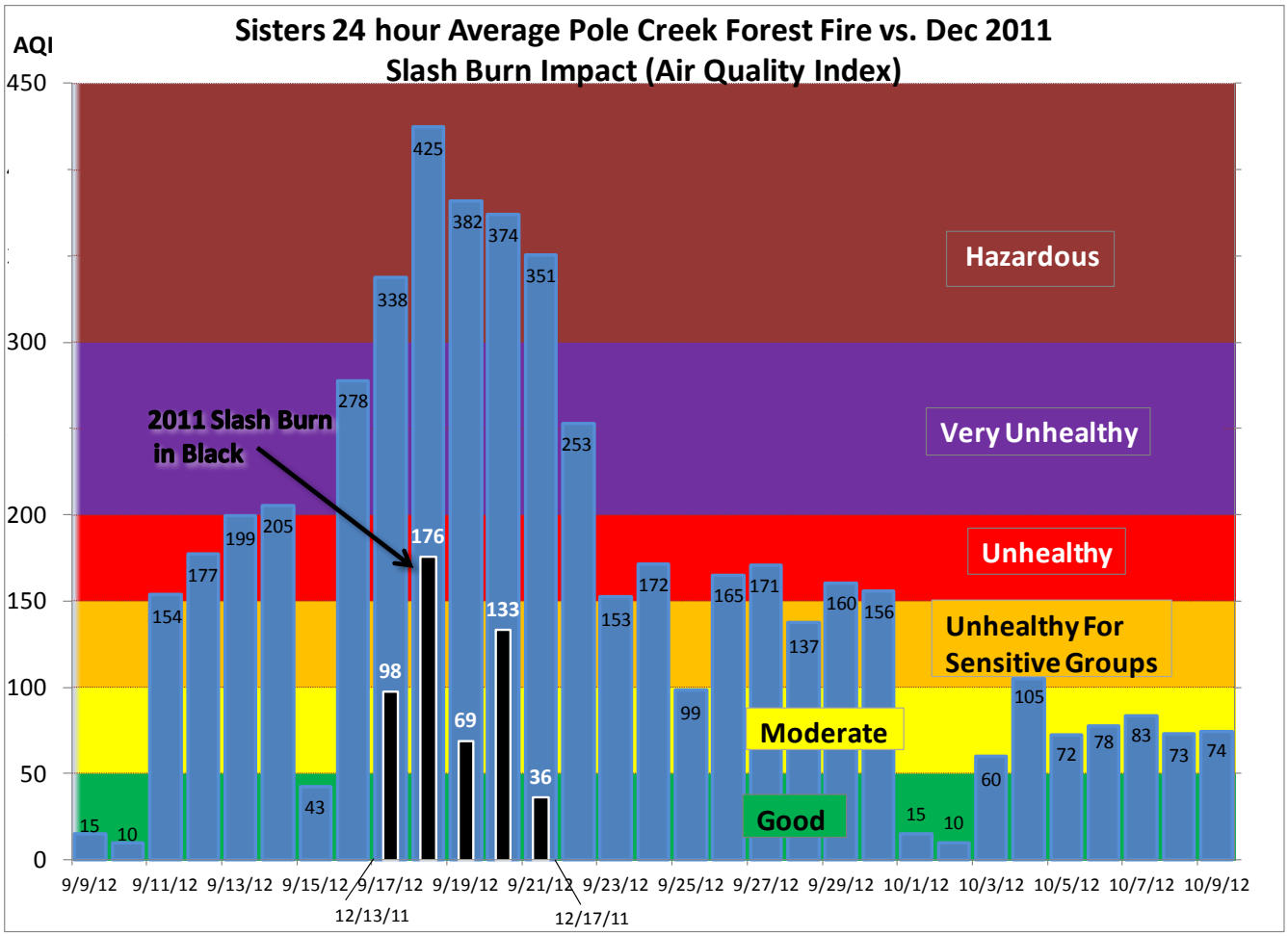


Figure 29 Data from Sisters Forest Service nephelometer. Image created by the Oregon

Alternative 2 and 3 - Direct and Indirect Effects

Fire Hazard

The differences in hazard supported by each alternative are largely determined by the fuel model changes associated with each proposed treatment. In Alternatives 2 and 3, treatment type and associated effects remain static however total number of acres and spatial arrangement is variable, resulting in differences in underlying effects on fire hazard. Table 190 and Figure 30 below, display the resulting treatment effect of each alternative on fire hazard within the project area and across the treatable acreage. Treatments proposed have the ability to reduce high fire hazard, as compared to the existing condition. The ability to use direct attack allows for a greater probability that unwanted fires can be contained at smaller fire sizes limiting resource damage and potential loss of values at risk.

Alternatives also vary in the treatment of stands infected with dwarf mistletoe, the effect of this on fire hazard is minimal as the variability is related to the treatment of overstory trees only and the goal of fuels treatment in these areas would not be to modify the overstory. Under Alternative 2, treatments in mixed conifer where fir encroachment is thick surrounding large pine, group openings ranging from 1-3 acres in size would be created and planted to ponderosa pine. In these units, fire hazard outside of these openings would remain high. Under Alternative 3, the fire hazard would drop to low across these units since these Alternatives propose general thinning; i.e. stands would not contain group openings.

The action alternatives provide for two non-significant Forest Plan amendments to meet the purpose and need for action. These amendments are primarily focused on treatments located in the Wildland Urban Interface. Treatments in Foreground areas located along Forest Road 16 would reduce the risk of high intensity stand replacement fire and help maintain old ponderosa pine trees over time. These amendments would help meet the goals stated in the Community Wildfire Protection Plan. Amendments would allow for areas larger than five acres for prescribed burning, increase the number of years for foreground slash cleanup to a five-year period, and increase scorch height of trees. These changes would allow for more effective fuels management and also help meet the scenic values described for these areas over the long-term.

For the purposes of this analysis, fire hazard is specifically defined as the combination of potential flame length and crown fire as defined in Table 191, Figure 30 and Figure 31.

Table 191 Fire hazard rating comparison by acres for no action and action alternatives in the Melvin Butte Project area.

	No Action 5,375 acres		**Alternative 2 4,465 acres treated**			**Alternative 3 4,395 acres treated**		
Hazard Rating	**Acres**	**%Area**	**Acres**	**%Area**	**Change Acres**	**Acres**	**%Area**	**Change Acres**
UNFORESTED	44	<1%	44	<1%	0	44	<1%	0
LOW	1,706	32%	3,503	79%	1,797	4,211	79%	2,505
MODERATE	1,226	23%	621	14%	-605	692	13%	-534
HIGH	2,399	45%	310	7%	-2,089	426	8%	-1,973

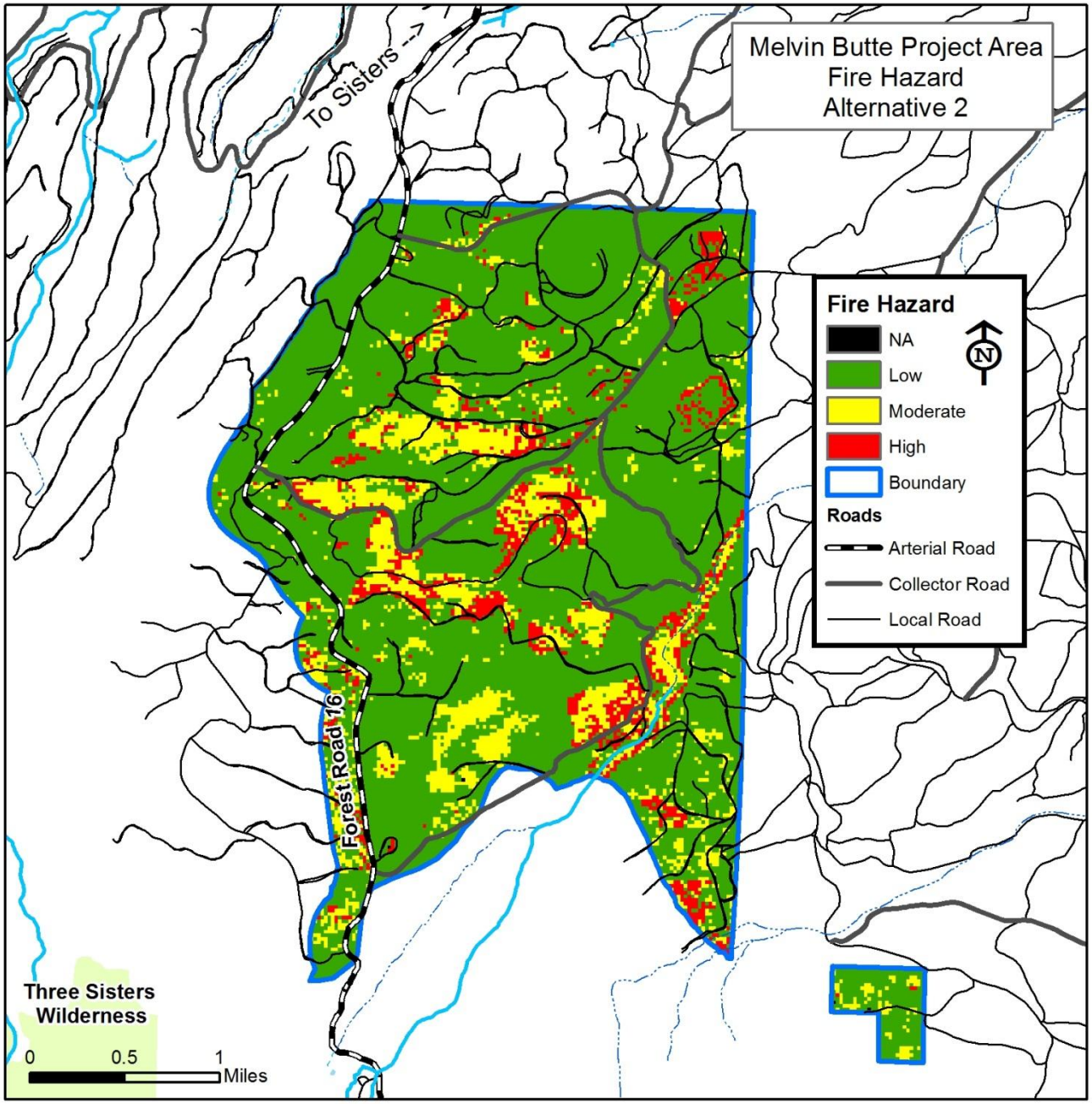


Figure 30 Fire hazard across project area under the 90th percentile fuel and weather conditions under Alternative 2.

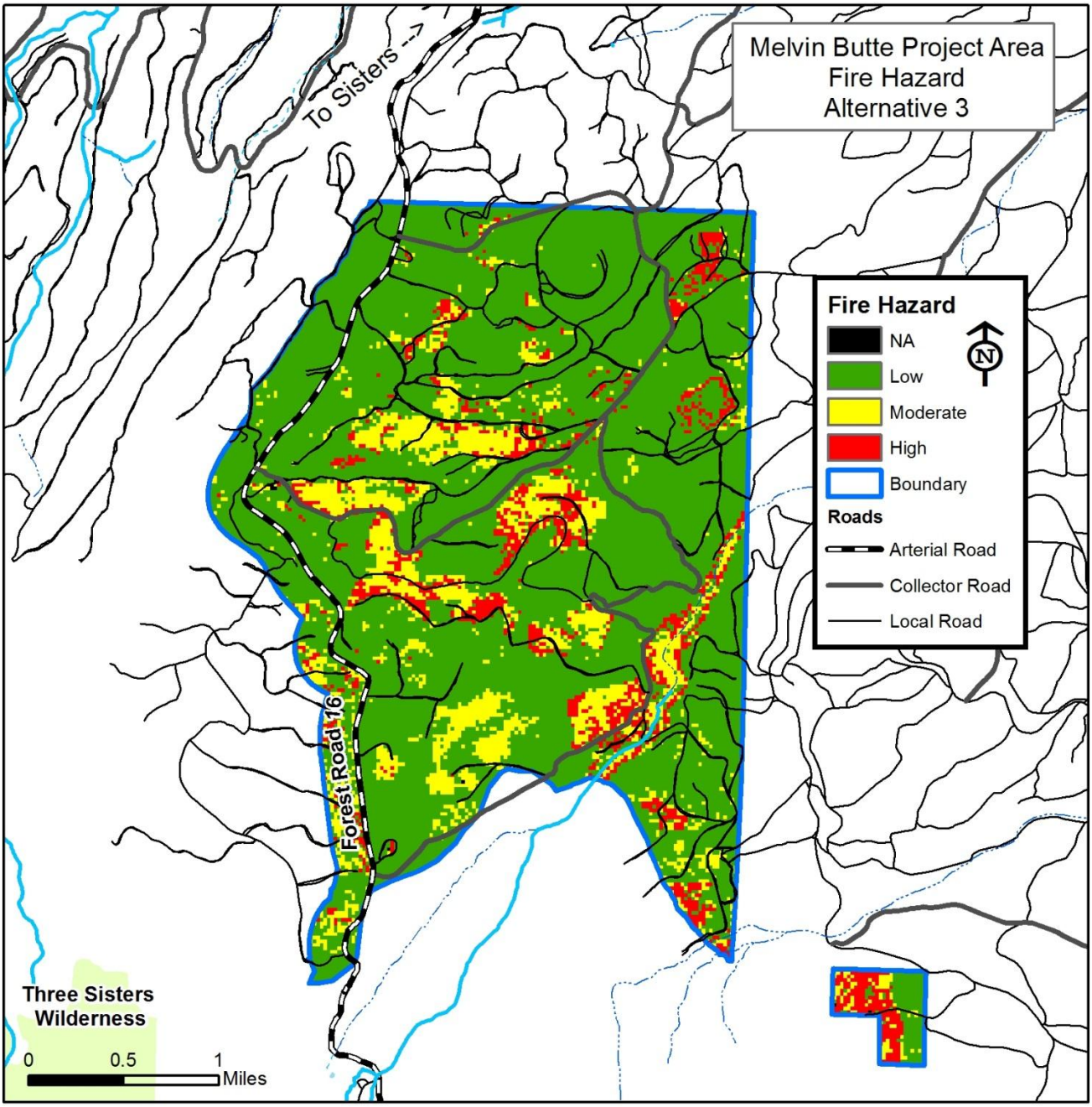


Figure 31 Fire hazard across project area under 90th percentile fuel and weather conditions under Alternative 3.

At the landscape scale, the spatial differnces between the Alternatives is subtle, with the exception being the units adjacent to the private property boundary on the southeastern side of the project area. Under Alternative 3, these areas remain threatened. This is primarily due to the conditions that remain hazardous and the direction of fire spread, from north to south (Figure 20). Historical fire spread direction in the Weather and Fuel Moisture Inputs section of this report) threatening the project area in the event of a fire start on private property values at risk outside the project area to the south.

Figure 30 and Figure 31 compares the fire hazard areas under each Alternative and indicates that treatments would reduce threatened acreage by 47% across the project area. While acres classified as low are not "fire proof", there is reduced likelihood of resource damage and increased likelihood of suppression success if an ignition were to occur.

Air Quality

PM emissions connected with Alternatives 2 and 3 are of concern due to the project area's proximity to several Central Oregon communities (e.g., Sisters, Redmond, Bend municipal watershed and residents in outlying areas) and the Three Sisters Wilderness, a Class 1 air shed.

Under Alternatives 2 and 3, air quality would be affected primarily by PM produced during prescribed burning and pile burning activities. The total area proposed for treatment with prescribed burning under Action Alternatives is 4,465. Comparing this amount of area burned under prescribed fire and wildfire conditions shows the potential reduction in total PM emissions between Action Alternatives and the No Action Alternative (Table 192). Results indicate that PM emissions created during wildfire conditions are approximately double that which would be potentially emitted under prescribed fire conditions.

Table 192 Estimated total potential PM emissions from Alternative 2 & 3 prescribed fire treatments compared to the same amount of acres consumed under wildfire conditions without treatment.

Fire Condition	Tons $PM_{2.5}$	Tons PM_{10}
Action Alternatives 4,465 acres prescribed fire	2,868	3,385
Wildfire under No Action 4,465 total acres	6,204	7,320

Cumulative Effects

The cumulative effects boundary for this analysis is defined as the Whychus Watershed boundary shown in Figure 32. A fireshed boundary is typically defined by the watershed boundary thus a reasonable boundary for cumulative effects analysis. Adding together management treatment acres plus wildfire acres occurring between 2009 thru 2014 there are approximately 60,000 or 25% of the Whychus Watershed acres recently touched by some form of treatment within the past 5 years.

Past and ongoing treatments in the cumulative effects area are anticipated to have a net positive landscape level effect on fire hazard reduction, using well supported documentation that treatments that reduce surface fuels and ladder fuels lower the susceptibility of forested ecosystems to problem wildfire (Agee and Skinner 2005). Within the last 20 years in this area, numerous fuels related activities have occurred associated with the SAFR, Hwy 20, McCache, Canal, and Underline projects. A total of 21,966 acres within this cumulative effects boundary have received some combination of fuels modifying treatment.

This total includes any area where there may have been or will be treatments where fuels reduction was the primary purpose such as pre-commercial thinning, mowing, and prescribed fire.

There are no other known reasonably foreseeable actions or projects within this cumulative effects area outside of those previously discussed. However, experience with fire suppression in Central Oregon shows that unless acres treated are in the immediate vicinity (less than approximately 1/4 mile) of the area in question, they would have no effect on fire behavior within the project area. Any fire behavior effect from treated acres within a ¼ mile of the Melvin Butte planning area are accounted for in the simulation modeling of predicted fire behavior for each alternative, and are therefore accounted for in the data analysis and reporting of direct and indirect fire behavior effects for each of the Alternatives. Firewood cutting is the primary on-going fuels modifying activity within the project area. This activity would

mitigate the fire hazard associated with slash left behind by fire wood cutters along with all other special forest product activities.

Proposed treatments cumulatively allow for more opportunities to use prescribed fire in the future across the landscape. Prescribed fire after vegetation treatment reduces the amount of smoke emissions generated by reducing the amount of fuel available for combustion.

All burning activity would be conducted in compliance with the Oregon Smoke Management Plan regulations and restrictions that function to track smoke produced and monitor emissions to ensure that there would be no cumulative effects on air quality (Oregon Revised Statute 477.013). Daily smoke management direction issued by the state can include restrictions on the spacing of prescribed burns and the number of acres permitted to be ignited on a given day in order to manage the potential smoke impacts over a larger area.

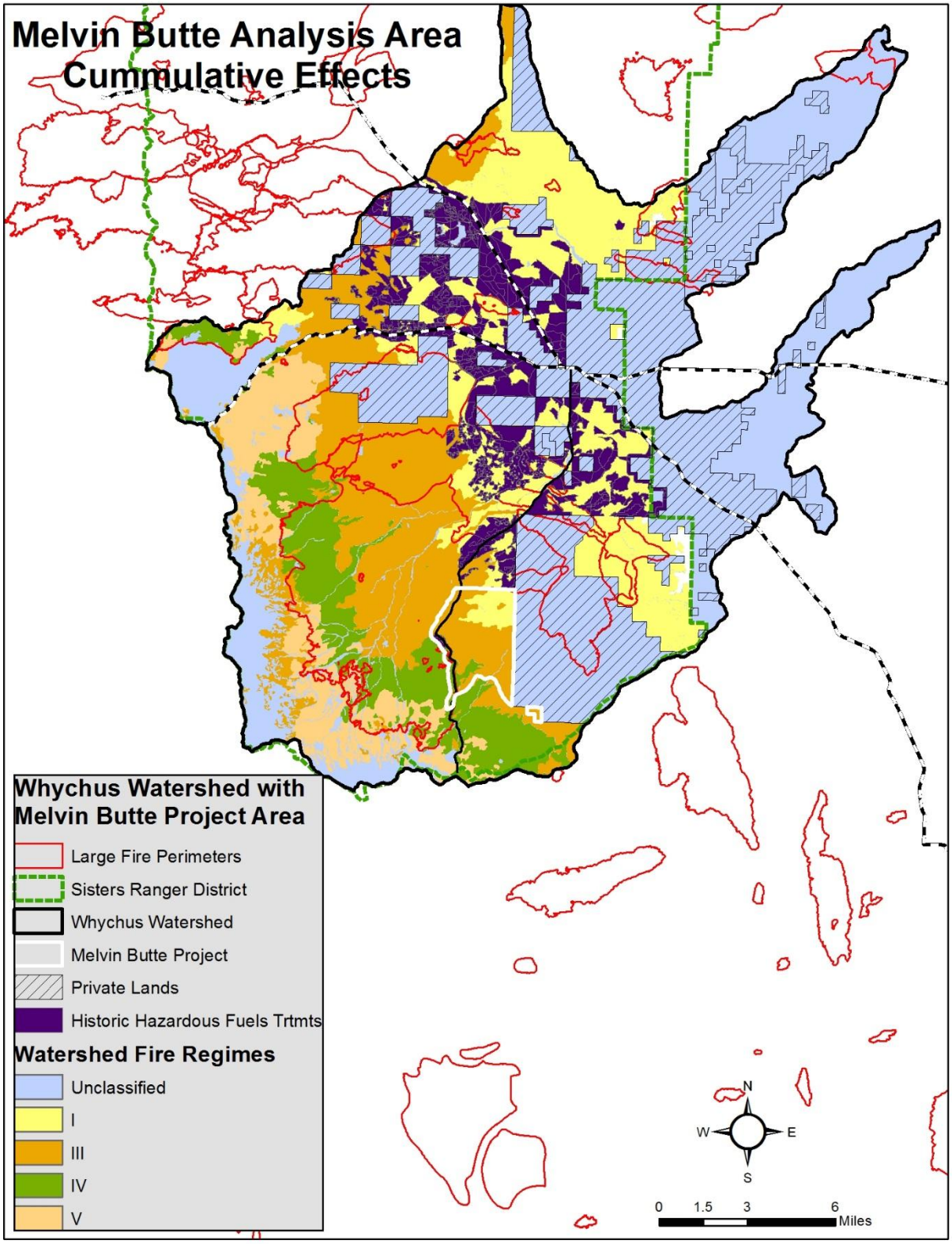


Figure 32 Watershed map with fire regime, hazardous fuels treatment, large wildfires, and the Melvin Butte Project area.

Conclusion

The No Action Alternative would not address issues in the project area associated with fire and fuels on the landscape. The potential for increased fire behavior, increased ladder fuel connectivity, and associated flame lengths and risk of crown fire would result in fire effects not moved toward the purpose and need of forest health and resiliency by reducing fire hazard. The risk to life, property, fire suppression crews, and natural resources would increase due to the widespread potential of crown fire risk and the continued increase of stand density, crown bulk density, ladder fuel connectivity, and fuel loading associated with unmanaged stands in a fire dominated ecosystem. Under the No Action alternative the high fire hazard is 45%.

Alternatives 2 or 3 would equally meet the objectives of moving this landscape toward structure, composition, and patterns on the landscape within the constraints of reducing the risk of high intensity wildfire to life, property, and fire suppression crews, as well as providing for wildlife habitat, maintaining natural processes, and helping to create and retain a fire resilient ecosystem now and into the future. Utilizing prescribed fire wherever possible would likely result in greater overall success. The ecosystems ability to tolerate fire within historical range of variability and move it toward a resilient future range of variability as a natural process depends on the degree to which the objectives for the Melvin Butte analysis area as well as all other projects achieved on the district. Treating surface fuels, reducing ladder fuels, and opening overstory forest canopies, have been seen to generally produce a more fire-safe forest condition (Brown, Agee, & Franklin, 2004). One effective substitute for natural fires and its infinite number of effects on ecosystems is prescribed fire (Kauffman, 2004). The treatments of forest overstory with selective tree removal is an important initial step in the restoration of forest stands, as these treatments assist in the ability of fire and fuels managers to properly modify fire severities by inputting prescribed burns into the system, affected by decades of fire exclusion and land use. This process is not the final step in the management of wildlands it is only one in a series that continues the trajectory of the affected landscape into the future. Due to the fact that it takes time to accomplish forest restoration, the goal of the planned treatments is to set particular stands on trajectories toward stand structural classes that may be next successionally and contribute to an overall landscape resiliency. Under the action alternatives the high fire hazard is lowered to about 7% to 8%.

The action alternatives would manage fire behavior with overstory, understory, and ground forest fuel treatments including hand and machine piling, mechanical mowing, in conjunction with prescribed burning to treat fuels in order to facilitate a fire resilient landscape consistent with the historical range of variability, as well as setting it up for future range of variability and providing for effective wildfire suppression adjacent to values at risk such as wildlife habitat, recreation assets, private timberlands, while reducing risk of crown fire threatening recreation values and Bend's municipal watershed. Lastly, both proposed actions result in treatments improving safety along Forest Road 16a designated WUI travel corridor, which would enable fire suppression resources to provide additional fire protection and reduce risk to life, property, and natural resources during wildfire events.

The project is consistent with the standards and guidelines as outlined in the Forest Plan and meets the desired future conditions outlines for the project area. The action alternatives are consistent with the Clean Air Act and all relevant national and regional guidance.

BOTANY

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Botany specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

This section documents consideration of Protected, Threatened, Endangered and Sensitive (TES), Survey and Manage, and Invasive plants related to the Melvin Butte Vegetation Management Project. The intent of this analysis is to comply with existing regulations and management direction to protect and sustain Sensitive and Survey and Manage Plant species and prevent and manage invasive plant species on public lands.

Sensitive Plant Species

Regulatory Framework/Management Direction

This analysis is prepared in compliance with the Forest Service Manual (FSM) 2672.4, and the Endangered Species Act of 1973 (Subpart B; 402.12, section 7 consultation). Effects of the proposal are evaluated for those TES plant species on the current Regional Forester's Sensitive Species List (RFSS 2670/1950, December 9, 2011) (See Appendix A) for those species documented or suspected to occur on the Deschutes National Forest. The Deschutes National Forest Land and Resource Management Plan has a number of standards for sensitive plant species which apply (USFS, 1990).

Analysis Methods

Analysis of the project included a pre field review of existing information on sensitive plants and their habitats. Portions of the area have been surveyed over the past 20 years and new and existing information was used for spatial analysis using Geographic Information Systems (GIS). Potential habitat for several sensitive species was identified in the project area and it was surveyed in 2007.

The direct and indirect effects of the action alternatives are evaluated and the cumulative effects of the project, considered with other activities in the past or near future are also discussed.

Measures to be used in the effects analysis include probability of detrimental impacts to rare plant species in number of plants affected and acres of habitat lost or gained. Expected impacts from the project are based on professional knowledge and experience of similar projects in the past.

Pre-field Review

Information about the area was consulted. Site conditions indicated potential habitat in forested areas for four R6 sensitive vascular plant species: 1) Peck's penstemon, *Penstemon peckii, 2)* Tall, Agoseris *Agoseris elata,3)* the Green Tinged Paintbrush, *Castilleja chlorotica* and 4) whitebark pine, *Pinus albicaulis*. There was also potential habitat for the sensitive fungi, *Hygrophorus caeruleus.* See Appendix A.

Survey Results

The area was surveyed in the summer of 2007 and portions were reexamined in the fall 2011 and 2012 during fungi surveys. No sensitive species or high probability potential habitat were found in the project area. However, six sites for whitebark pine were found to be adjacent to the project area.

Existing Condition

The project area is located on forested slopes northeast of the Three Sisters and Broken Top Cascade Mountains. The project area contains a gradation of plant habitats and associations tied to the elevation and precipitation gradient found between higher elevation moist mixed conifer forests to lower elevation dry mixed conifer and ponderosa pine forests. The area has only one stream, Three Creeks which is

transitions from perennial to intermittent in the project area. No sensitive plant species or high probability potential habitat, or other special habitats were found in the project area.

One sensitive plant species, whitebark pine, is located adjacent to the project area and could be indirectly affected by the project.

Whitebark pine- (*Pinus albicaulis)* is a five needle pine on the Regional Forester's Sensitive species list. Surveys for the species have been done across the forest and both permanent monitoring plots and select trees are identified and mapped. There are six sites for whitebark pine adjacent to the project area ranging at distances from 333 to 666 feet south of the boundary.

Figure 33 The white skeletons are dead whitebark pine in the Three Sisters Wilderness, approximately 4 miles west of the project area.

Whitebark pine are found in subalpine and timberline areas. They are in decline across most of their range in North America because of the combined effects of mountain pine beetle outbreaks, wildfires and fire exclusion, environmental effects from climate change and the exotic pathogen, *Cronartium ribicola*, which infects five-needle white pines and causes the disease white pine blister rust.

In 2011, whitebark pine was added to the list of Federal candidate species eligible for Endangered Species Act protection due to the high magnitude of threats. There is currently no known way to stop white pine blister rust or the mountain pine beetle from infecting trees (Figure 33). Progress has been made in development of more disease resistant trees. Over 100 Select trees have been designated on the Deschutes National Forest. These trees have had cones collected from them and are under blister rust screening at Dorena Genetic Resource Center.

In addition to the Select trees, 75 permanent monitoring plots have been installed in whitebark pine stands in the central Cascades. These monitoring plots are used to assess the overall health of the population.

Whitebark pine has a co-evolved dependence on the native bird, Clark's nutcracker and wildfire. The tree is dependent on the bird to disperse its large wingless seeds, and the nutcrackers utilize fresh whitebark pine seeds and cache thousands of seeds for later use (Keane et al 2012). Forgotten caches grow to create new whitebark pine trees. The exclusion of wildfire has led to the successional replacement of whitebark pine with late seral species on some more productive sites (Keane et al 2012). Whitebark pine are more fire resistant than some high elevation conifers and can withstand low intensity fire (Bower, 2014). Fires create a complex pattern on the ground and good caching habitat for Clark's nutcrackers. Post-fire areas provide better growing conditions for whitebark regeneration by removing competitors (Keane et al 2012). Fire regimes in whitebark pine forests are complex and variable and include a mixture of severities.

Recommendations to help sustain whitebark pine include: 1) Reducing the impacts of disturbances with proactive measures to reduce the risk of blister rust, mountain pine beetle, and wildfire on whitebark pine

forests. This may include pruning branches with cankers, spraying fungicide or insecticide, thinning, and treating fuels around rust-resistant trees to reduce wildfire-caused mortality; 2) Protecting rust-resistant seed sources from future mortality caused by disturbance, climate change, and competition; and 3) Implementing treatments to create conditions that encourage whitebark pine regeneration, conserve seed sources, and promote rust resistance. This includes creating nutcracker caching habitat, reducing competing vegetation, and decreasing surface and canopy fuels using direct or indirect treatments, manipulating forest composition, and diversifying age-class structure (Keane et al 2012).

Project design features and mitigation measures to protect botanical resources are found in the Resource Protection Measures Common to All Action Alternatives section of this environmental assessment.

Analysis Issues and Measures

The action alternatives have the potential to impact Botanical resources.

- Probability of detrimental impacts to plants as estimated by amount and degree of ground disturbance (acres).
- Potential for detrimental or beneficial effects to plants from wildfire or prescribed fire as measured by amount and risk (acres).
- Risk of invasive plant spread as estimated by amount and degree of ground disturbance (acres).

Alternative 1- Ecological trends

There are no direct effects to Sensitive plant species because no known populations or habitat were found in the project area. Indirect effects include an increased probability of potential damage to whitebark pine adjacent to the project area if a wildfire damages the seed trees. There is also a slightly higher probability of continued damage to whitebark pine from mountain pine beetles transferring hosts from lodgepole to whitebark pine. Fire risk and probability is discussed in the Fuels section. This probability is higher in Alternative 1 than in Alternative 2s or 3.

Alternative 2 - Direct and Indirect Effects

Alternative 2 has a low probability of direct effects to Sensitive plant species because no known populations or habitat were found in the project area. Beneficial indirect effects include the decreased probability of disturbance and potential fire damage to whitebark pine seed trees adjacent to the project area if a wildfire burns in the area. Reducing ladder fuels and adding gaps of young regeneration could help lower fire intensity. Fire risk is lowest in Alternative 2 since more acres would be treated.

Actions which benefit lodgepole pine and reduce its susceptibility to mountain pine beetle can also indirectly benefit whitebark pine. Mountain pine beetle can attack and kill whitebark pine in the transition zone between mid- to higher elevation forest types (Bower 2014). Much of the lodgepole forest in the area is dying or dead and at the end of its lifespan. Actions in the Lodgepole Pine Improvement Area (249 acres) would remove weakened and diseased trees which are most susceptible to mountain pine beetle and help stabilize beetle population levels. Mountain pine beetle generally attack larger/older lodgepole pine trees (Eglitis 2014).

Alternative 2 - Cumulative Effects-

This analysis considers the cumulative effects to whitebark pine within Whychus watershed (specifically the Headwaters, Upper, and Middle Whychus, Deep Canyon, Snow Creek Ditch, and Three Creek subwatersheds) over the past 100 years to 10 years into the future. This analysis area was chosen because it is where most of the whitebark population occurs on Sisters Ranger District.

The effects being considered are: potential for detrimental or beneficial effects from thinning, prescribed fire or wildfire as measured by amount and risk. Past management which has affected whitebark pine in the cumulative effects analysis area over the past 100 years includes: timber harvest, fuels reduction, grazing, fire exclusion, fire suppression actions, prescribed fires, and road construction.

Fire exclusion and suppression since the early 1900's have negatively affected whitebark pine because of the decline of open early seral habitats for seed caching by the Clarks nutcracker and tree regeneration from forgotten caches. Wildfires, under the influence of fire exclusion and suppression have burned 25% (45,319 acres) of the Whychus watershed since 1998 (USFS 2013). Wildfires such as the 2012 Pole creek fire burned whitebark pine habitat and had both positive and negative effects to whitebark pine as described above. Approximately 5,000 acres of whitebark habitat burned at varying intensities in the Pole creek fire with both positive and negative effects to the tree species. Approximately 40 acres of the Pole Creek fire area were planted with disease resistant whitebark pine seedlings to help compensate for impacts to seed trees from the fire.

Cattle and sheep grazing from the 1880s to about 1980 may have reduced vegetative and reproductive vigor within this species in the analysis area and caused short term compaction which reduced soil moisture infiltration. Cattle and sheep grazing occurred in high elevation forests and wilderness areas until approximately 30 years ago.

Past timber harvest, firewood cutting and road construction may have directly or indirectly damaged whitebark pine in the higher elevations of the watershed by destroying or injuring trees or compacting soils. Soil disturbance from machinery may have also created open areas for seed caching. Recent Forest Service activities within the lower elevations of cumulative effects analysis area are trending to reduce the risk of fire spread into higher elevation forests by thinning trees, reintroducing prescribed fire, and reducing the potential intensity of wildfires that may destroy seed trees.

There are no planned foreseeable future actions in the next 10 years that may affect whitebark in the subwatershed.

Alternative 3 - Direct and Indirect Effects

Alternative 3 has no direct effects to Sensitive plant species because no known populations or habitat were found in the project area. Beneficial indirect are similar but slightly less than Alternative 2 because less fuels reduction and thinning occurs. Fire risk is discussed in the Fuels section.

Alternative 3 - Cumulative Effects

The cumulative effects of Alternative 3 are similar to Alterative 2.

Conclusion:

There are no direct effects to sensitive plants under any alternative. There is a potential for indirect effects to whitebark pine from wildfire or mountain pine beetles. This potential is greatest with Alterative 1, and least in Alternative 2, followed by Alterative 3. The cumulative effects to whitebark pine are mixed. The project has beneficial effects and does not add to a negative trend.

Survey and Manage Plant Species

Regulatory Framework/Management Direction

This analysis is prepared in compliance with the Northwest Forest Plan.

Northwest Forest Plan (1994)

The Northwest Forest Plan is a series of federal policies and guidelines governing land use on federal lands in the Pacific Northwest region of the United States. The Plan was developed with the intent of protecting habitat for the northern spotted owl, but came to include much broader habitat protection goals. It creates a network of Riparian Reserves and Late Successional Reserves to conserve and protect habitat and amends the Deschutes National Forest Land and Resource Management Plan (USDA 1990).

Requirements for surveys and management of vascular plants, bryophytes, lichens and fungi apply. Direction is to implement the 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* (2001 ROD). This is discussed in more detail below.

Project Consistency

The project is consistent with the January 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*. This project utilizes the December 2003 species list. This list incorporates plant species changes and removals made as a result of the 2001, 2002, and 2003 Annual Species Reviews.

In addition, there are three species receiving special consideration as directed in the May 13, 2014 Regional Forester letter. These species are *Cladonia norvegica*, *Chaenotheca furfuracea*, and *Clavariadelphus truncatus*. We reviewed these species and conducted pre-disturbance surveys for the lichen *Cladonia norvegica* and *Clavariadelphus truncatus*. The species *Chaenotheca furfuracea* does not require surveys but does require management of known sites if they exist. No known sites for this species are found in the project area.

Details of the project surveys, site management and compliance with Survey and Manage Guidelines is discussed below and detailed in Appendix B and Appendix F of this environmental assessment.

Pechman Exemptions

The Melvin Butte Vegetation Management Project applies two exemptions from a stipulation entered by the court in litigation regarding Survey and Manage species and the 2004 Record of Decision related to Survey and Manage Mitigation Measure in *Northwest Ecosystem Alliance v. Rey*, No. 04-844-MJP (W.D. Wash., Oct. 10, 2006). Previously, in 2006, the District Court (Judge Pechman) invalidated the agencies' 2004 RODs eliminating Survey and Manage due to NEPA violations.

Following the District Court's 2006 ruling, parties to the litigation entered into a stipulation exempting certain categories of activities from the Survey and Manage standards and guidelines, including both pre-disturbance surveys and known site management. Also known as the "Pechman Exemptions", the Court's Order from October 11, 2006 directs:

"Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

> *a. Thinning projects in stands younger than 80 years old:*
>
> *b. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;*

c. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and

d. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."

Exemptions Utilized

Two of the Pechman Exemptions (a & d.) were applied to specific stand types in the project area: plantations and late successional old growth (LSOG). The exemptions allow these areas to be treated without pre-disturbance surveys.

For more information about why plantations were proposed for treatment see the Forest vegetation section. For more information about why late successional old growth (LSOG) were proposed for treatment see the Fire and Fuels section of this environmental assessment. The project meets the Pechman Exemptions as described below (Table 193):

Table 193 Consistency with the Pechman Exemptions in the Melvin Butte Project area.

Pechman Exemptions as applied in the Melvin Vegetation Management Project		
Exemption	**Where applied/Number of acres**	**How applied**
a. Thinning projects in stands younger than 80 years old	Plantations – Thinning prescription 1,174 acres. Units 58-111 and 115.	Plantation between ages of 23-35 years old will be thinned. Plantations were surveyed for invasive species only.
d. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old under subparagraph a. of this paragraph."	Prescribed Fire /Fuels Treatments Prescription. 808.4 acres. Units 1-10, 12-15, and 17.	Late successional forest areas are slated for fire/fuels treatments including pre-commercial thinning and prescribed fire. No commercial timber harvest would occur; trees < 8" dbh may be thinned. Pre-disturbance surveys are not required.

Analysis Methods

Analysis of the project included a pre field review of existing information on Survey and Manage plants and their habitats and surveys where required. The direct and indirect effects of the action alternatives are evaluated and the cumulative effects of the project, considered with other activities in the past or near future are also discussed.

Measures to be used in the effects analysis include probability of detrimental impacts to Survey and Manage plant species in number of plants affected and acres of habitat lost or gained. Expected impacts from the project are based on professional knowledge and experience of similar projects in the past.

Prefield Review: The lichen, *Cladonia norvegica* has a known site along Snow Creek, 1 mile west of the project area. Several bryophytes and vascular plants had potential habitat. In addition 64 fungi species were identified which could have potential habitat in old growth areas. See Appendix B.

Survey Results: Surveys for Category A and non-fungi Category B Survey and Manage species were completed in 2007. Two years of surveys for Fungi on the Survey and Manage List as a Category B species were completed in 2011 and 2012 according to protocol. These species require surveys if old growth habitat will be disturbed. No Survey and Manage species were found in the project area. The species, *Clavariadelphus truncatus* was surveyed for in fungi surveys and was not found.

Surveys for *Cladonia norvegica* were completed in 2011and 2012 on 1,241 acres of old growth habitats, as part of the larger Popper Vegetation Management Project which burned in the 2012 Pole Creek Fire. The unburned portion of the Popper project was modified to create the Melvin Vegetation Management Project. A few suspect lichens were found outside the Melvin project area near the wilderness boundary, however, these sites burned that year in the Pole Creek fire and the plants habitat, old decomposing down logs, were lost before they could be confirmed. No *Cladonia norvegica* was found in the Melvin Butte Project area.

Effects Analysis

Alternative 1- Ecological trends

No known populations or habitat for Survey and Manage species were found or known to exist in the project area.

Alternative 2 and Alternative 3 - Direct and Indirect Effects

There are no known direct or indirect effects to Survey and Manage plant species (See Appendix B) because no known sites exist in the project area and no populations or habitat were found in areas that were surveyed to protocol in the project area.

Hazardous fuel treatments, using prescribed fire for noncommercial treatments, would be conducted on about 808.8 acres of late successional old growth. This treatment is exempt from survey and management requirements per Pechman exemption (d) (see discussion above). The exemption allows for ladder fuels less than 8 inches diameter at breast height to be cut, if necessary, and the area prescribed burned. Pre-disturbance surveys are not required. No survey and manage species or probable habitat is known from the area.

Additionally, about 1,174 acres of plantations planted from 1981-1993 (ranging from 22 – 34 years old) would be thinned using a variable density prescription. Stands less than 80 years old are exempt from pre-disturbance surveys under the Pechman exemption (a). No survey and manage species or probable habitat is known from the area.

Alternative 2 and Alternative 3 - Cumulative Effects

There are no cumulative effects to Survey and Manage plant species because there are no effects to Survey and Manage species.

Conclusion

There are no direct, indirect or cumulative effects to Survey and Manage plant species under any alternative because no known populations or habitat were found in areas surveyed to protocol in the project area.

INVASIVE PLANT SPECIES

Regulatory Framework/Management Direction

Forest Service Manual (FSM) direction requires that an Invasive Plant (formerly called noxious weeds) Risk Assessments be prepared for all projects involving ground-disturbing activities. For projects that have a moderate to high risk of introducing or spreading invasive plants, Forest Service policy requires that decision documents must identify control measures that will be undertaken during project implementation (FSM 2081.03, 29 November 1995).

This analysis is tiered to a broader scale analysis, the Pacific Northwest Region Final Environmental Impact Statement for the Invasive Plant Program (USFS 2005). The associated Record of Decision amended the Deschutes National Forest Plan by adding management direction relative to prevention and treatment of invasive plants. The Deschutes and Ochoco National Forest Invasive Plant Treatments Environmental Impact Statement (USFS 2012a) also applies to the project area in approving treatments to existing invasive plant populations in the project area, and providing a process (Early Detection Rapid Response) for allowing new infestations to be controlled.

Invasive plants are identified from the Deschutes National Forest Invasive Plant List (See Appendix B). Effects of the activities of the project on the introduction, spread and enhancement of invasive plant populations and required mitigation measures for projects that have a moderate to high risk of introducing or spreading invasive plants (FSM 2081.03, 1995) are addressed in the Invasive plant Risk Assessment section of this document.

Analysis Methods

Risk factors and vectors are considered in determining the level of potential harm in the introduction or spread of invasive plants. The direct and indirect effects of the action alternatives are evaluated and the cumulative effects of the project, considered with other activities in the past or near future, are also discussed.

Prefield Review: Analysis of the project included a pre field review of existing information on invasive plants. The area has been surveyed several times in the past 20 years and existing information was available for spatial analysis using Geographic Information Systems (GIS).

Survey Results: The area was surveyed in 2007 and portions were reexamined in 2011 and 2012. No invasive species were found in the project area.

Invasive Plant Species Risk Assessment: Forest Service Manual direction requires that Invasive Plants Risk Assessments be prepared for all projects involving ground-disturbing activities. For projects that have a moderate to high risk of introducing or spreading invasive plants, Forest Service policy requires that decision documents must identify invasive plants control measures that will be undertaken during project implementation.

Risk Ranking

Deschutes National Forest has developed a standardized invasive plants risk assessment process to be conducted as a part of the project planning process. Risk rankings are based on the following sets of criteria.

High Risk results if (all 3):

1. Known invasive plants in or adjacent to project area. YES on lower portions of access routes
2. Any of vector #s 1-8 in project area. YES
3. And Project operations in or adjacent to invasive plant sites. NO

Moderate Risk results if:

1. Any of vector #s 1-5 are present in project area. YES

Low Risk results if:

1. Any of vector #s 6-8 present in project area,
2. OR
3. Known invasive plants present in or adjacent to project area, even if vectors lacking.

Vectors ranked in order of invasive plant introduction/spread risk:

1. Heavy equipment (implied ground disturbance). YES
2. Importing soil/cinders/gravel. NO
3. Use by OHVs. YES
4. Grazing (long-term disturbance). NO
5. Pack animals (short-term disturbance) NO
6. Plant restoration. NO
7. Use by recreationists. YES
8. Presence of USFS project vehicles. YES

Using this system of analysis, the risk of introduction and spread of invasive plants due to the implementation of this project has been determined to be **MODERATE**. This rating is attributable to the presence of weed populations and vectors. Resource protection measures are required to reduce this risk.

Existing Condition

Aggressive, non-native, invasive plant species can displace native plant communities causing long-lasting management problems. In displacing native vegetation, invasive plant species can increase fire hazards, reduce the quality of recreational experiences, poison livestock, and replace wildlife forage. By simplifying complex plant communities, invasive plants reduce biological diversity and threaten rare habitats.

There are no known populations of invasive plants in the project area, however, invasive plants such as diffuse and spotted knapweed are known within the subwatersheds adjacent to the project and on lower portions of major roads such as Forest Road 16. Control efforts are ongoing through the Forest Invasive Plant Program and manual control is occurring at these sites to hand pull plants before flowering occurs. Invasive species can spread into forest areas along roads and can be introduced by vehicles and equipment. There is a moderate risk of introduction and spread from activities which open forest canopies, use prescribed fire, and utilize heavy equipment without mitigation.

Effects Analysis

Alternative 1- Direct and Indirect Effects

Under the No action alternative the risk of Invasive Plant introduction is likely to continue as motorized use and some minor recreation use in the area continues (see assessment below). Seeds are spread by vehicles, wildlife, wind, and water movement. Peoples clothing and shoes can also act as vectors which spread invasive plant seeds (Mount and Pickering 2009).

Of the three alternatives associated with this project, the No Action Alternative poses the least risk of introducing, exporting, or moving existing weeds about within the project area because of the lack of ground disturbance, fire, and vehicles and the retention of tree canopy/shade.

Alternative 2- Direct and Indirect Effects

Alternative 2 poses the greatest risk of invasive plant introduction and spread because the most acres are treated (4,469 acres) with ground disturbance by heavy equipment and prescribed fire. Of that, 830 acres are treated to create openings (up to 30%) which will be more vulnerable to early seral species, including invasive plants, than a thinned forest with more canopy shade. Actions to reduce, but not eliminate this risk, are included in the Resource Protection Measures section of this document.

Alternative 2- Cumulative Effects

This analysis considers the cumulative effects of invasive species risk within Whychus watershed (specifically the Headwaters, Upper, and Middle Whychus, Deep Canyon, Snow Creek Ditch, and Three Creek subwatersheds) over the past 100 years to 10 years into the future. This analysis area was chosen because invasive species disperse by a number of agents but the most relevant project related cumulative effects for invasive species expansion and its impacts on rare and riparian habitats is concentrated in these subwatersheds. The effect being considered is the increased risk of invasive plant introduction and spread.

Past management which has affected invasive plant risk in the cumulative effects analysis area over the past 100 years includes: timber harvest, livestock use, fire suppression, wildfires, recreation, utility line installations, development on private lands, and trail and road use and construction. There are over 2,785 acres of land with invasive species in the cumulative effects analysis area. With the knapweed species, both species are often found in the same areas and these acres are double counted. Densities vary and populations are generally light and widely scattered with some areas of higher concentrations.

The heaviest concentrations of invasive plant populations are associated with areas of past timber harvest (Upper Whychus) and with the irrigation district system (Middle Whychus) or associated with the urban interface (Deep Canyon, Middle Whychus). Table 194 displays invasive plants found in the cumulative effects area.

Table 194 Invasive plants in the Melvin Butte cumulative effects analysis area.

Invasive Species in the Melvin Butte Cumulative Effects Analysis Area		
Species	*Subwatershed*	*Acres*
Diffuse knapweed	Deep Canyon	177
	Middle Whychus	611
	Upper Whychus	790
	Headwaters	1
	TOTAL	**1579**

Spotted knapweed	Deep Canyon	25
	Middle Whychus	416
	Upper Whychus	721
	TOTAL	**1162**
Tansy Ragwort	Upper Whychus	32
	TOTAL	**32**
Canada Thistle	Upper Whychus	12
	TOTAL	**12**
TOTAL		**2,785**

Invasive plant populations are expanding in the subwatershed on public and private lands stimulated by timber harvest, grazing, wildfires, prescribed fires, and land developments. Two large wildfires since 2010 (Rooster Rock, 6119 acres and Pole Creek, 26,538 acres) created more open conditions in the analysis area and fire suppression may have introduced invasive species. Highest risk areas of these two fires and the Pole Creek Fire salvage (discussed below) are being monitored and new invasive starts removed.

Large scale thinning/fuels reduction projects such as the Highway 20 Project, Black Butte Ranch Fuels Project, and the Glaze Forest Restoration Project have improved habitat conditions for invasive plants with thinning and prescribed fire. Mechanical entries and resultant soil disturbance associated with road repairs, utility installations, have further promoted establishment and spread. Numerous invasive plant sites occur along roadsides and within areas experiencing moderate to heavy recreational use by vehicles and equestrians which provide additional opportunities for invasive plant introduction and dispersal

Forest Service streamside restoration activities within the cumulative effects analysis area in the past 15 years have begun to improve riparian and forest conditions vulnerable to invasive plant invasion reducing riparian trampling and devegetation, by defining access and closing streamfords at 59 sites along Whychus Creek. Increased management controls in riparian areas, roads and trails, along with revegetation of unneeded roads with native plants would combine with other efforts of streamside and forest restoration in the watershed to cumulatively improve vegetative conditions and native plant habitat quality by restoring habitat and reducing impacts from unmanaged recreation. The Whychus Portal project reduced vehicle access and unmanaged use along Whychus Creek and has reduced invasive plant risk by removing vectors for spread and restoring devegetated areas.

The largest area of invasive plant infestation in the watershed is in the ongoing Whychus Floodplain project which is restoring altered channels and floodplain of Whychus Creek to their historic function. About 11,000 plants of diffuse and spotted knapweed (*Centaurea diffusa* and *Centaurea stoebe*) were found scattered over 81 sites in the Whychus Floodplain project area. Intensive management by hand removal has occurred yearly for the past decade on a portion of these populations. New populations were discovered in 2011. The ground disturbance involved with the restoration includes: digging channels and filling areas and increases some habitats likely to be invaded by invasive plants (like new floodplain) while reducing others (such as eroding streambanks). The project will reduce actively eroding streambanks (from 75% to 10%) and thus reduce vulnerable habitats next to the creek. Active revegetation of 34 acres will also reduce invasive plant habitat. Riparian vegetation will increase from 18 acres to 42 acres, however 24 acres of reconnected floodplain will be more vulnerable as seeds are a carried across the floodplain. These effects add to the effects of other watershed restoration projects in

the creek channels area upstream and downstream and restore hydrological function to benefit native plants and reduce disturbed habitats for invasives but also provide new ways for seeds to be carried.

Climate change is expected to affect invasive species in the future. A comprehensive review (Vose, et.al 2012) concluded that invasive species will likely become more widespread, especially in areas of disturbance and in dry forest ecosystems. Vose notes that plant invasions can be influenced by warmer temperatures, earlier springs and earlier snowmelt, reduced snowpack, changes in fire regimes, elevated nitrogen deposition, and elevated carbon dioxide concentrations. Invasive species common to the Sisters Ranger District, such as spotted and diffuse knapweeds (*Centurea* spp.), Canada thistle (*Cirsium arvense*), and cheatgrass (*Bromus tectorum*) showed increased productivity in response to elevated carbon dioxide under controlled conditions. Risk of exotic invasive plants entering forests is likely highest in mountainous ecosystems, such as the cumulative effects analysis area, where historically cooler temperatures and closed-canopy forests may have limited invasives.

Funding, monitoring, and control efforts for invasive plants have increased over the past decade with the designation of the Collaborative Forest Landscape Restoration Act area for the Whychus watershed. Fewer plants are being allowed to produce seed. As stream flows are incrementally restored, less habitat would be available for invasive plants. If the mitigation measures are followed the invasive populations should stabilize or be reduced.

Other ongoing and foreseeable actions in the next 10 years that may affect invasive species risk in the subwatershed include 1) Continuation of the Sisters Area Fuels Reduction (SAFR) project and the Pole Creek Salvage project will create ground disturbance and open conditions favorable for invasive plant spread over 18,000 acres , 2) The Travel Management Plan, will reduce vehicle access and reduce risk of invasive plant spread and 3) Invasive plant control on public lands through the Deschutes/Ochoco Invasive Plant program, which will reduce invasive plant species abundance and the risk of spread.

Considered as a whole, the factors which most influences invasive plant spread in the analysis area are vectors that spread invasive plants in vulnerable habitats such as open canopied forests and disturbed soil. The project will add incrementally to the risk of invasive plant populations being introduced to new areas. The project will cause a cumulative increase in the risk of invasive plant populations expanding in the subwatersheds as equipment and project vehicles enter 4,469 acres of land. This risk can be partly mitigated but increased monitoring and control efforts will be needed.

Alternative 3 - Direct and Indirect Effects

Alternative 3 poses the second greatest risk of invasive plant introduction and spread because areas treated (4,405 acres) with ground disturbance by heavy equipment and prescribed fire will be vulnerable to early seral species, such as invasive plants. It is slightly less of a risk than Alterative 2 because no openings or temporary roads would be created. Actions to reduce, but not eliminate this risk, are included in the Resource Protection Measures section of this document.

Cumulative Effects

The cumulative effects of Alternative 3 are similar to Alternative 2- see discussion above.

Conclusion

There is an increased risk of invasive plant introduction and spread under all Alternatives. This risk is highest in Alternative 2, followed by Alternative 3, and then Alternative 1. The project adds incrementally to the cumulative increase in invasive species risk from past practices, wildfire, and ongoing projects. Actions to reduce, but not eliminate this risk, are included in the project Design Criteria/Mitigations section of this document.

RECREATION

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Recreation specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

This section addresses the effects of the proposed Melvin Butte Vegetation Management Project on the existing social character and condition (setting), as well as on recreation opportunities and experiences for the area.

The primary recreation activities and opportunities that occur within the Melvin Butte project area are winter recreation use including cross-country skiing and snowmobiling. The area also includes Forest Road 16 with provides access to a popular summer and winter recreation area south of the project area. There are no non-motorized/summer trails and limited dispersed camp sites known in the project area. There is some evidence of unauthorized off-road recreational all-terrain vehicle use in the project area.

Vegetation management activities such as tree thinning, group openings, mowing of shrubs, prescribed burning, and reforestation may affect recreation areas and access routes. Changes in road status (closure or decommission) may affect recreational activities within the project area.

There is one outfitter and guide in the project area and recreation events. Occasional group use activities may be authorized within the project area, but are infrequent and non-recurring. Permit holders typically use the two developed sno-parks and Forest Road 16 within the project area.

Regulatory Framework / Management Direction

Management Plans

Management direction is contained in the Deschutes National Forest Land and Resource Management Plan (LRMP), as amended. Recreation activities within the project area occur in lands designated for MA-18 Front Country and MA-9 Scenic Views. The LRMP also provides standards and guidelines for Trail System Management which also applies to trails within the project area. The LRMP was amended in 1994 by the Northwest Forest Plan which further allocated the Scenic Views (MA-9) and Front Country (MA-18) Management Areas as Matrix.

MA-9 Scenic Views (includes Upper and Lower Three Creeks Sno-Parks; FSR 16, and Cross-District and Three Creek Lake XC Trails)

MA-9 Goal/Theme The overall goal for MA 9 is “To provide Forest visitors with high quality scenery that represents the natural character of Central Oregon” (LRMP 4-121). The general theme and objectives of Scenic Views is for landscapes seen from selected travel routes and use areas to be managed to maintain or enhance the appearance of the areas being viewed. To the casual observer, results of activities would either not be evident or would be visually subordinate to the natural landscape.

MA-9 Standards and Guidelines

M9-1 New recreational developments and changes to existing developments are permitted as long as they are consistent with the desired visual condition. When viewed from significant viewer locations, recreational facilities will meet the established visual quality standards. For viewer locations within the recreational development being viewed, established visual quality standards may not always be met.

MA-18 Front Country (includes portions of the Triangle Tie and Triangle Hill Loop snowmobile trails)

MA-18 Goal/Theme The overall goal for MA-18 is "To provide and maintain a natural appearing forested landscape on the slopes northeast of the Three Sisters and Tam MacArthur Rim while providing high and sustainable levels of timber production".

MA-18 Standards and Guidelines

M18-18 New recreational developments and changes to existing developments are permitted as long as they are consistent with the desired visual condition.

M18-21 Traditional informal campsites, hunter camps, or areas where concentrated recreation use occurs will be recognized as being significant in producing and utilizing dispersed recreation opportunities. Prescriptions for harvesting, cleanup, site preparation, and thinning will consider the environmental setting that contributes to the attraction of these sites for recreation purposes. The attempt will be made to retain this attractive character during and after treatments.

Forest-wide: Trail System Management

Goal To maintain the existing trail system and provide additions or modifications to the system which will meet the increasing and changing demands in dispersed recreation. To the extent possible this system will provide trails of all difficulty levels, trails in visually appealing settings, and trails for those modes of travel appropriate for the Forest in both winter and/or summer.

TR-3 Trails will be located or relocated whenever possible where they will not be disrupted by developmental activities such as logging or road building. Where disturbance of a trail cannot be avoided cleanup should be concurrent. Reassurance markers and signing will be maintained to avoid inconveniencing trail users.

TR-6 Volunteer groups and individuals will be encouraged to maintain and construct parts of the trail system.

TR-21 In addition to winter use of OHV's, the Forest will provide additional opportunities for summer use of OHV's and other OHV's such as motorcycles. Part of the Forest service road system that is not maintained for public use and that is not involved in logging operations may be opened for this use.

TR-25 The trail will coexist in harmony with all other uses and activities of the land as determined through the land management process.

TR-26 When resource activities occur immediately adjacent to or across the trail the integrity of the trail proper will be protected by modified management practices as needed.

Travel Management

In accordance with the Deschutes National Forest and Ochoco National Forest and Crooked River National Grassland Final Environmental Impact Statement and Record of Decision (8/4/2011), summer-time motorized access off of the open designated road system (cross-country travel) is, with some exceptions, prohibited. Exceptions include over-snow vehicles (winter only); and motorized access for emergencies or authorized by permit. The Deschutes and Ochoco National Forests Motor Vehicle Use Maps (2011) prohibit motorized access off designated roads and establishes access conditions for dispersed camping. Summer motorized use for both highway legal and non-highway legal vehicles is currently allowed on most Maintenance Level 2 roads within the project area (See Roads Analysis report).

Conditions of use established by these new regulations are considered part of the existing condition for the Melvin Butte project.

Recreational Opportunity Spectrum

The Recreation Opportunity Spectrum (ROS) is a description of various attributes that contribute to a particular recreational setting. The ROS describes recreational settings in terms of the, "combination of physical, biological, social, and managerial conditions that give value to a place." (Clark and Stankey 1979). Figure 34 shows the ROS settings for the project area. The ROS settings that apply to the Melvin Butte project include:

Roaded Natural – This is the setting for most (>99%) of the project area. "The area is characterized by predominately natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction among users may be low to moderate, but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities. Large mammals tolerant of humans may be present; those not tolerant present infrequently. There is a prevalence of smaller species." (Deschutes National Forest LRMP, Appendix 2-1)

Roaded Modified – This is a very small portion of the project area (< 1%) and does not contain any recreation resources.

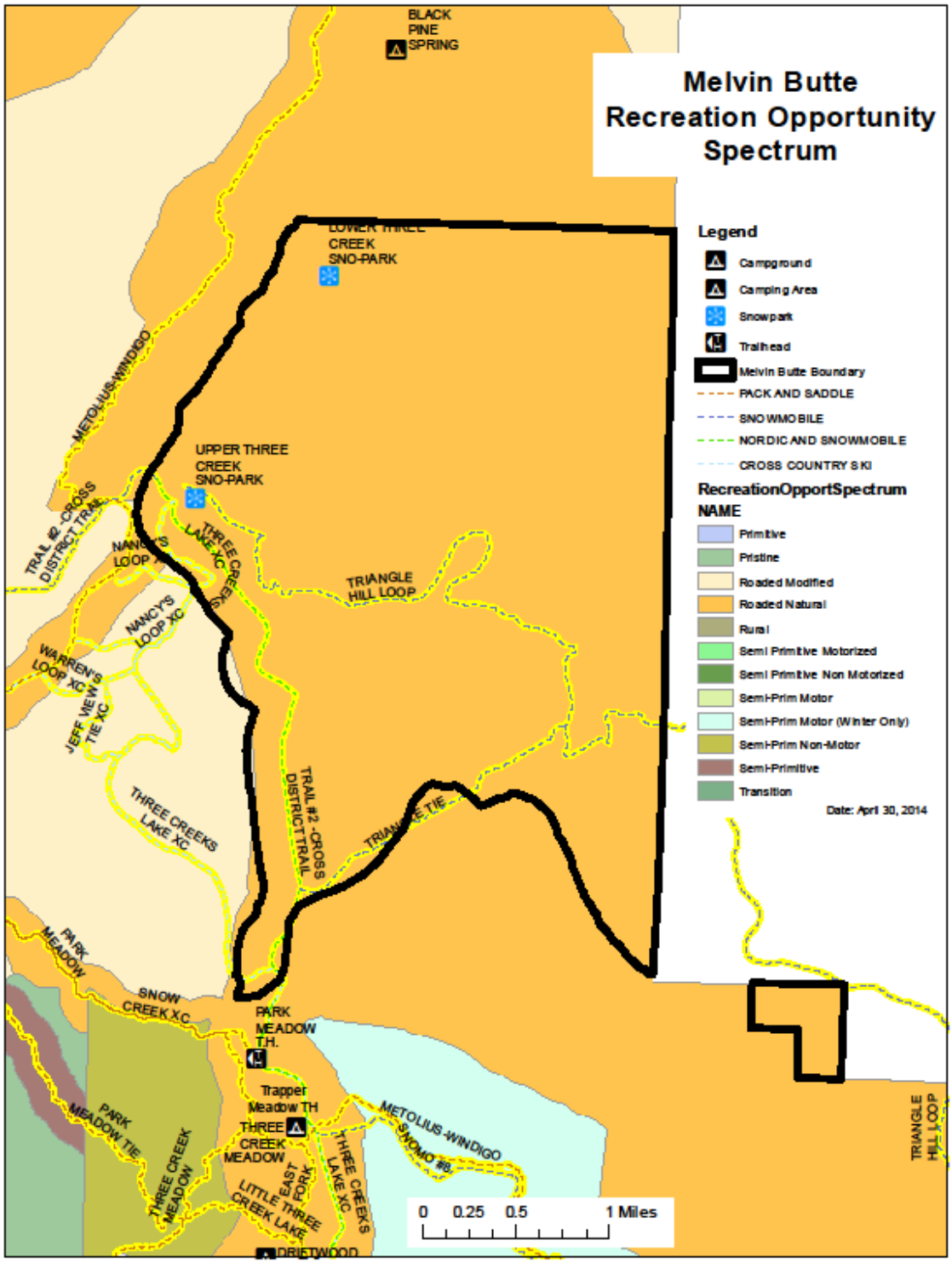


Figure 34 Recreation opportunity spectrum

Analysis Methods

Direct, indirect, and cumulative effects to recreation resources were analyzed by determining the degree of disturbance directly associated with the different types of proposed activities, any secondary effect indirectly associated with the proposed action, and the cumulative effects of all actions affecting the resource within the area of potential effect.

Project Design Criteria

Project design criteria for the Recreation resource is described in the Resource Protection Measures section of this environmental assessment. Project design criteria were used to frame the recreation effects analysis.

A. Analysis Assumptions and Methodology

The analysis of effects of the action alternative is based on the following assumptions:

A. Detailed descriptions of the proposed action and alternatives are included in Chapter 2 of the Melvin Butte EA. Effects of the alternatives are based on those descriptions.

B. Public access to the Three Creek Recreation Area via Forest Road 16 would be allowed during the operational period.

C. FSR 16 would not be used for vegetation management operations during the winter recreation season (snow dependent from November to May) from the Upper Three Creek Sno-Park to the southern end of the project boundary. An alternate route using FSR 1628 and 1620 would be used. Portions of FSR 1628 are also used as the Triangle Tie and Triangle Hill Loop snowmobile routes. Winter recreation on these roads/trails would temporarily be closed on these snowmobile trails.

D. Within the project boundary, FSR 16 would not be used during the summer recreation months (snow dependent from June to October) on holidays or weekends for vegetation management operations.

E. Public safety concerns resulting in public access would be mitigated as deemed necessary by the Forest Service.

F. Effects of the action alternative is based on the assumptions that the following recreational resource project design criteria would be incorporated:

B. Key attributes that contribute to the recreational value of the area

The key attributes that contribute to the recreational value of this area that would be affected by proposed Melvin Butte project activities include scenery from recreational infrastructure; timing and access to recreational activities and permitted special use activities, public safety, and revenues that could be affected by the changes from the proposed action and alternatives.

Scenery – How might scenery as viewed from the Sno-Parks and trails, and FSR16 be changed by the proposed actions? How does that affect the physical recreational setting and people's perception of the "natural" quality of their recreational experience? (See Scenic Views Analysis)

Access – What kind of access (motorized or non-motorized) is affected by the project, what is the timing or season when recreational access may be affected, and what access to what facilities or opportunities

may be affected? How might changes in access affect user convenience and recreational opportunities, or access for facility maintenance?

Safety – How might the proposed project affect the public's safety, including ingress and egress to the Three Creek recreation area south of the project area?

Existing Condition

The Melvin Butte project area includes developed sites, including two sno-parks, groomed snowmobile trails, cross-country ski trails, and roads. There are no non-motorized/summer trails or inventoried dispersed camping sites in the project area. There is some evidence of dispersed recreation such as camping that occurs in the area. Figures 35 and 36 display recreation assests by alternative in the project area.

Within the project area is the Upper and Lower Three Creek Sno-Parks and 10.55 miles of winter ski and snowmobile trails. Lower Three Creek Sno-Park receives limited use in the summer, and has not been plowed or received use in the winter for more than 5 years. The Upper Three Creek Sno-Park is heavily used in the winter and gated closed in the summer. Many snowmobile and ski trails originate from the Upper Three Creek Sno-Park. The Triangle Hill/Tie complex of snowmobile trails inside the project area offer winter snowmobile opportunities and receives limited use and has not been groomed for the past 5 years due to poor snow conditions. The Triangle Hill/Tie complex connects to Snowmobile Trail #8 outside of the project area. A small portion of the Three Creeks Lake XC trail originates from Upper Three Creek Sno-Park inside of the project area and connects to a system of cross-county Nordic ski trails west of the project area.

During the winter Forest Road 16 is gated from around November to May (snow dependent) and converts to a popular groomed snowmobile and cross-country ski trail. These trails connect to the Cascade Lakes snowmobile trail complex, outside of the project area.

During the summer Forest Road 16 provides access to the Three Creek Lake Recreation Area, an intensive recreation area south of the project area for summer activities such as overnight camping, hiking, lakeside day use, non-motorized boating, and riding horses. FSR16 also provides access to Three Sisters Wilderness trailheads during the summer.

Three Sisters Backcountry Incorporated uses the Upper Three Creek Sno-Park as a temporary office location under special use permit by the Forest Service. They offer avalanche courses and outfitter services for backcountry ski huts. Other special uses in the area include recreation events such as cycling on Forest Road 16, Boy Scout adventure race and training events near the sno-parks. The Upper Three Creek Sno-Park is closed during the summer unless permitted for a special use. The Lower Three Creek Sno-Park remains open. Another special use, non-recreational, is the Snow Creek Irrigation Ditch which is no longer in use with no valid water rights on file within the eastern portion of the project boundary (Forest Road 480). See Table 197 for Special Use permits in the project area; Table 196 shows trails in the project area; and Table 195 shows developed site.

Dispersed recreation opportunities that may occur in the project area, besides use of the winter trails already mentioned, include driving for pleasure, birding, hunting, and other types of dispersed activities.

Although there are no designated summer trails in the project area, the Metolius-Windigo Trail and Petersen Ridge Mountain trail systems receive heavy mountain biking and equestrian use and are located the west and northeast and of project area.

Within project area, the primary facilities that are used by recreationists in the area and are likely to be affected by the proposed action and alternatives are:

- Upper and Lower Three Creek Snow-Parks
- Forest Roads 16 and other portions of the roads system provide snowmobile and cross-country ski trail opportunities
- Outfitter and Guide operations, and recreation events permitted
- Snowplow and facility maintenance operations at the Sno-Parks
- Motorized-access to undocumented dispersed recreation opportunities along Forest Roads (driving for pleasure, birding, hunting, target shooting)

Outside of the project area, the primary facilities that are used by recreationists in the area and are likely to be affected by the proposed action and alternatives are:

- The Metolius-Windigo trail west of the project area
- Forest Road 16 access to Three Creek Lake recreation area and trails south of the project area

Table 195 Developed sites in the Melvin Butte Project area.

Facility Name	Facility Type and Capacity	Management Area
Upper Three Creek Sno-Park	70 car parking capacity	Scenic Views
Lower Three Creek Sno-Park	70 car parking capacity	Scenic Views

Table 196 Trails in Melvin Butte Project area.

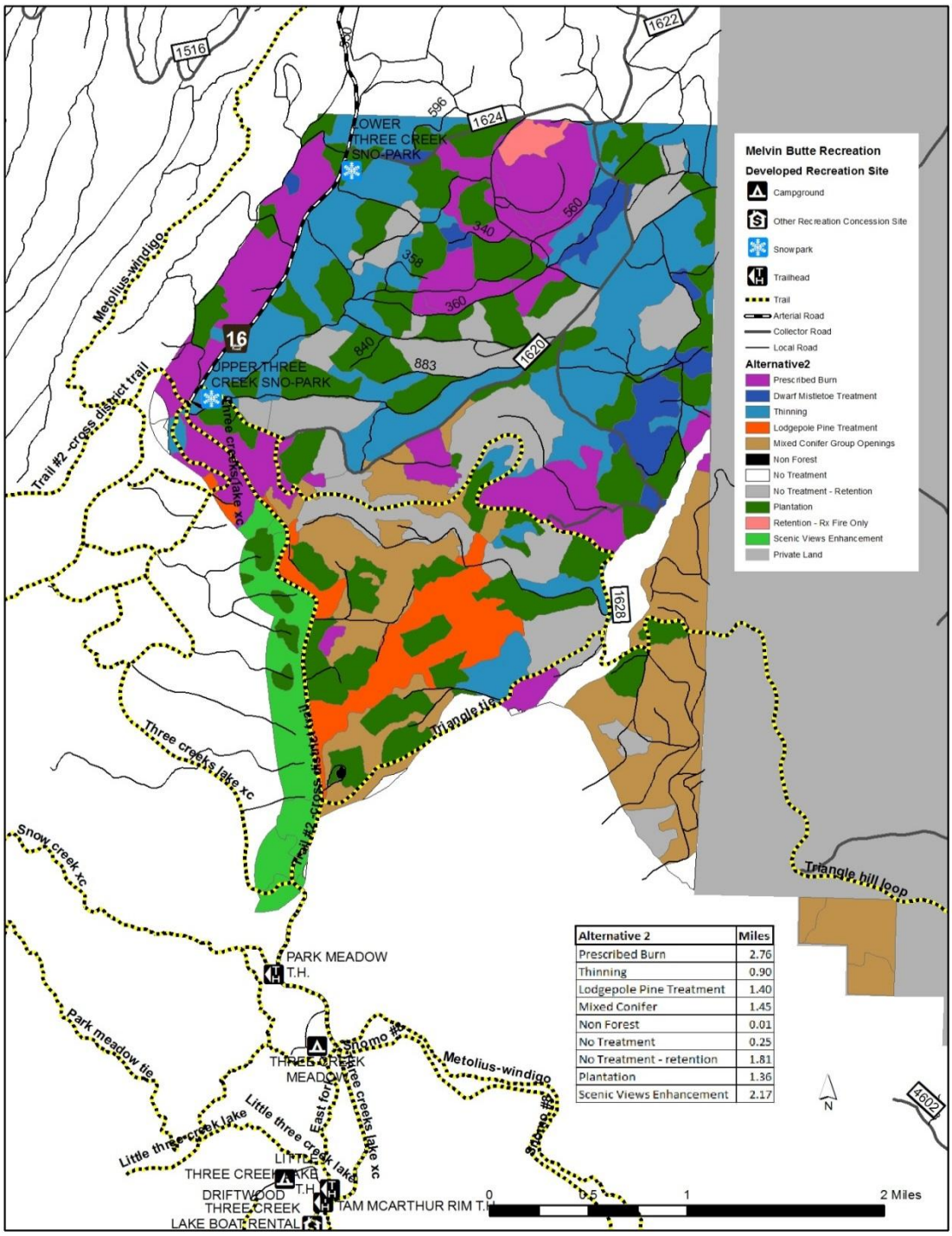
Trail Type	Name	Miles of Trail Within Project Area	Total Trails Miles (within and outside of project area)	Deschutes LRMP Management Area/NWFP Allocation
Snowmobile	Cross-District Trail	3.03	38.95	Scenic Views/Matrix
Snowmobile	Triangle Hill Loop	5.16	15.6	Scenic Views/Matrix, Front Country/Matrix
Snowmobile	Triangle Tie	1.34	1.7	Scenic Views/Matrix, Front Country/Matrix
Total Snowmobile		**9.53**	**56.25**	
X-C Ski	Cross-District Trail	(3.03*)		Scenic Views/Matrix, Front Country/Matrix
X-C Ski	Three Creek Lake XC	1.02	5.5	Scenic Views/Matrix Front Country/Matrix
Total X-C Ski		**1.02**	**5.5**	
Grand Total		**10.55**	**61.75**	

*Mileage not included in "Total X-C" as this trail mileage was accounted for under the snowmobile.

Table 197 Special uses in Melvin Butte Project area.

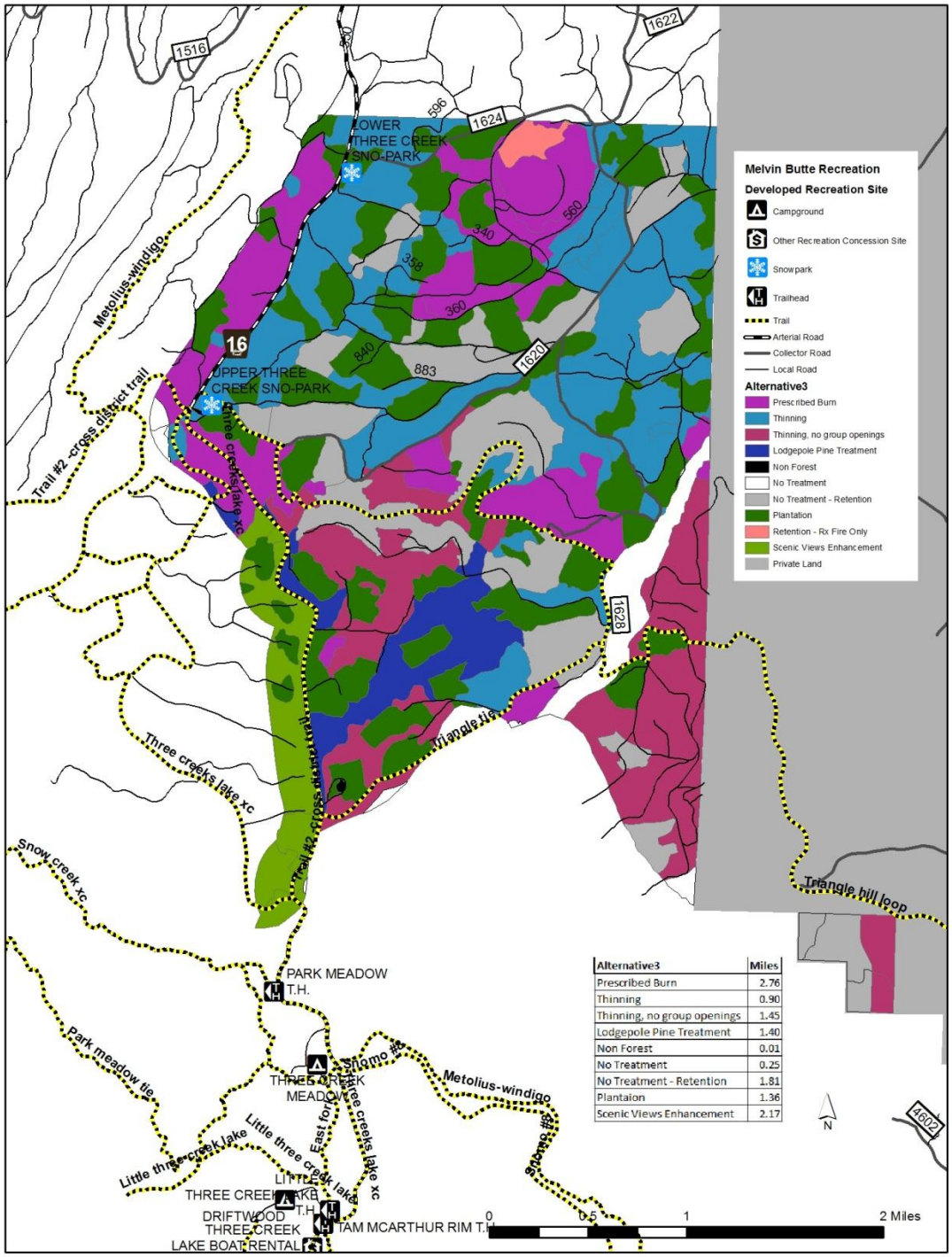
Special Use Permit	Type of Use	Season of Use	Associated Facilities
Three Sisters Backcountry	Outfitter & Guide, Yurt rental, snowmobile and XC Ski	October to May	Upper Three Creeks Sno-Park, FSR16, Cross-District Trail.

Recreation Events (differ year-to-year) Examples: *Boy Scout Freeze-O-Ree *Cascade Cycling Classic *Trainings *Adventure Race	Biking Youth Education Training		Upper and Lower Three Creeks Sno-Parks, FSR16



Alternative 2	Miles
Prescribed Burn	2.76
Thinning	0.90
Lodgepole Pine Treatment	1.40
Mixed Conifer	1.45
Non Forest	0.01
No Treatment	0.25
No Treatment - retention	1.81
Plantation	1.36
Scenic Views Enhancement	2.17

Figure 35 Alternative 2 recreation infrastructure within Melvin Butte Project area, Melvin Butte project treatments.



Alternative3	Miles
Prescribed Burn	2.76
Thinning	0.90
Thinning, no group openings	1.45
Lodgepole Pine Treatment	1.40
Non Forest	0.01
No Treatment	0.25
No Treatment - Retention	1.81
Plantaion	1.36
Scenic Views Enhancement	2.17

Figure 36 Alternative 3 recreation infrastructure within the Melvin Butte Project area, Melvin Butte Project treatments.

Effects Analysis

Alternative 1 Social Trends - Direct and Indirect Effects

No vegetation management activities would occur under the No Action alternative. There would be no change in current management direction or in the level of management activities. General recreational use and special use authorizations within the Melvin Butte project area would continually occur. The greatest threat to winter recreation trail and sno-park infrastructure would be from wildfire. The high risk of wildfire that exists within the area would not be reduced if no treatments are conducted. Wildfire could damage or destroy trail and facility infrastructure such as site identification features, restrooms, and trail markers.

Alternatives 2 and 3 - Direct and Indirect Effects

The effects to recreation resources would be similar for Alternatives 2 and 3 and are combined in this narrative, with any marked changes between the alternatives specifically described as needed.

Sno-Parks

The two developed sno-parks, Upper Three Creek Sno-Park and Lower Three Creek Sno-Park are located within Thinning or Plantation vegetation management units. This proposed thinning and fuel treatment would open up treated areas that could facilitate an increase in use, and unauthorized access, construction to, or expansion of dispersed campsites, trials, and roads. This is a concern at both sno-parks since unauthorized cross-country motorized travel is already occurring at the sno-parks. Recreation Resource Protection Measures are described in the Resource Protection Measure section of this environmental assessment.

Views would be opened adjacent to the sno-parks which may increase the satisfaction for visitors where views and forest access are improved. The aesthetic value surrounding the sno-parks would be changed by thinning and residual stumps and slash. Burning adjacent to the sno-parks would leave the area with affects from blackened ground vegetation and potential scorching of trees from pile burning.

Sno-parks would not be used for staging or landing areas, thus alleviating direct effects from such use. Access to the sno-parks by way of Forest Road16, a haul route, could result in the direct effect of a temporary delay for forest visitors and increased truck traffic along the shared corridor. This will be mitigated by limited vegetation operations during weekends and holidays, and informing the public of timing and locations of treatments as described in the Analysis Methods, Project Design Criteria section of this report.

Winter Trails

Snowmobile and cross-county ski trails within the proposed project area include portions of the Cross-District trail, Triangle Hill Loop trail, Triangle Tie, and Three Creek Lake XC trail (total 10.55 miles).

Treatments along trails (units 4, 10, 12, 28, 31, 35, 39, 40, 41, 42, 44, 48, 49, 50, 56, 57, 72, 76, 85, 86, 87, 90, 108, 110, 113, 114) include thinning, pruning, mowing of shrubs, prescribed fire, and patch cuts. There is increased mixed-conifer group opening treatment near snowmobile trails in Alternative 2 (MCGO - 1.86 miles) where Alternative 3 has increased harvest thinning (HTH).

- Short-term effects (0 to 3 years) include evidence of treatment operations including painted trees and temporary roads. Evidence of ground disturbance such as log skidding and hauling and evidence of stumps is hidden by snow.
- Mid-term effects (3 to 10 years) include evidence of harvest operations and treatments. The effect to scenery would be most evident in group openings. In many cases, removal of vegetation

provides new opportunities for snow play because the more open areas collect more snow and allow for easier access from the trails. The reduction of vegetation may also encourage off-highway vehicle users to illegally travel cross-country. Removal of dead and dying trees would benefit the scenic values throughout the area. Some areas would also benefit from expanded view sheds.

- Longer-term effect includes the reduced risk of catastrophic wildfire and invasive plants, improving overall forest health, would maintain the scenic quality surrounding these trails in the long-term.

Access: The most popular route, the Cross-District trail/Forest Road 16 would stay open during winter operations. Proposed haul routes are use Forest Road 1628 and Forest Road 1620. Snowmobilers and other winter users may be displaced from portions of the Triangle Tie (Forest Road 1628) and Triangle Hill Loop (Forest Roads1620/300) snowmobile trails because these trails would be temporarily closed during hauling operations to increase public safety and reduce conflicts with recreationists. Due to the lower elevation, snow conditions on these trails can be poor and have received limited use. Grooming occurs by Forest volunteers although the Triangle Tie and Triangle Hill Loop trails have not been groomed in at least 4 years due to poor snow conditions. If the trail is closed in the winter, volunteers would not be able to groom the trail and snowmobilers would not be able to access the trail. Snowmobilers will be informed to use other open trail systems.

Dispersed Use/General Recreation Use

Although there are no inventoried dispersed campsites within the project area, camping is known to occur. If roads are closed during implementation, the closure would be temporary and campers would likely find alternate sites to use in the surrounding area, or ignore road closures and continue to access the sites with motorized vehicles. Decommissioning of campsites is not proposed; the sites would continue to be available for camping or be allowed to naturally return to an untrammeled condition. Logging traffic, chainsaw and timber felling noise, and smoke would likely disrupt recreational activities in the project area. This will be mitigated by informing the public of timing and locations of treatments as described in the Analysis Methods, Project Design Criteria section of this report.

Public access to the Three Creek Recreation Area (south of the project area) via Forest Road16 would be allowed during the operational period. The indirect effect to recreationist utilizing this area may include the temporary delay and increased truck traffic along the Forest Road16.

Special Use Permits

Three Sisters Backcountry, Inc. outfitter and guide operation that stages at Upper Three Creek Sno-Park from October through May and may be impacted by sight and sound of hauling trucks passing on nearby roads or thinning operations surrounding the Sno-Park.

Effects to other existing Special Use permit holders and gatherers of special forest products would be similar to those of general recreational users. The most likely effects would be temporary travel delays along access routes which are also used as haul routes. Future requests for Special permits that would occur during vegetation management operations could be accommodated by authorization use in alternate locations, avoiding areas under temporary use restrictions, and/or informing the proponent of potential impacts to the propose special use activity. Summer events may occur on the weekend or holidays when hauling would not occur.

Travel Management

Alternatives 2 and 3 would reduce the total miles of open system roads from 49.20 miles to 37.65 miles, a reduction of 11.55 miles. There is no inventoried or developed recreation infrastructure on or along these

roads. The use of these roads for activities such as sight-seeing is unknown. Motorized vehicle recreationists will have less miles of road to travel on, and management activities would reduce the amount of area available to motorized access. This would result in a reduction of motorized routes on the Motor Vehicle Use Map designated 36 CFR 212.51. See the Transportation Analysis section for effects and mitigation measures.

Recreation Opportunity Spectrum

More than 99% of the project area is located within the ROS category Roaded Natural. The management actions proposed in Alternative 2 and 3 will not change the Roaded Natural recreational setting. Long term, the environment shall stay predominately natural appearing. Interaction among users may increase due the reduction of vegetation cover which increases visual range, dispersed camping opportunity, and cross-county travel (e.g., snowmobile use, hiking).

Cumulative Effects

Cumulative effects are associated with past, present, and future projects that overlap in time and space. The cumulative effects area for the recreation analysis is the boundaries of the Melvin Butte project area.

Alternatives 2 and 3 – Cumulative Effects

Recreation use in the area is expected to grow as both population and the outdoor recreation based economy grows in central Oregon. With this increased use comes an increase in risk of human-caused fire. Past projects within and surrounding the project area have not resulted in large enough fuels treatments to reduce the high risk of wildfire. Without actions as proposed in alternatives 2 and 3, there is increased risk that these fires would be larger and burn more intensely, and impact recreation experience and infrastructure.

The existing condition (recreational physical setting) described earlier is a composite of completed and ongoing activities. Some of the ongoing activities of note are hazard tree removal and maintenance at the sno-parks, grooming of the snowmobile trails, and ongoing administration of special permits which would not likely have a lasting effect on forest visitors.

The closure and decommissioning of approximately 14 miles of existing roads within the project area is also included in the proposed action. This proposal coupled with the Forest Travel Management plan which designate open roads and trails for motorized uses, would further reduce the amount of area available to motorized access and connected dispersed camping opportunities. Off-highway vehicle enthusiasts would likely use alternate routes or ignore restoration efforts on closed roads. Proposed closures would likely result in the dissatisfaction of some visitors that once used the roads for dispersed camping, hunting, gathering of forest products, or other recreational activities.

Proposed and approved projects adjacent to the Melvin Butte project area include Ursus vegetation project that may displace snowmobilers and other winter users from snowmobile Trail #8 and Triangle Hill #88 during operations. Winter recreationists use the Triangle Tie Trail (in the project area) to access Triangle Loop Trail #88 on the Bend-Fort Rock Ranger District south of the project area (via private property). Depending on the Melvin Butte and Ursus implementation operations timeframe, temporary snowmobile trail closures within the same region may occur. The snowmobile trails impacted are low use due to snow conditions. Forest visitors who recreate within the project area may choose alternate locations during implementation. Cumulatively, in the longer term, reduction of forest densities typically would enhance winter recreation opportunities – both motorized and non-motorized.

Conclusion

Direct and indirect effects to forest visitors of Alternative 2 and 3 would occur due to the presence of machinery, which would create added noise, dust, possible traffic delays, and visual evidence such as marked trees and skid trails. Snowmobilers and other winter users may be displaced from portions of the Triangle Tie (FSR1628) and Triangle Hill Loop (1620/300) snowmobile trails because these trails would be temporarily closed during hauling operations. Short-term impacts to Three Sisters Backcountry, Inc. outfitter and guide operation may also occur at the Upper Three Creek Sno-Park staging area due to the sight and sound of hauling trucks passing on nearby roads, or implementation operations surrounding the Sno-Park.

Cumulatively, the effects of the proposed action are not likely to have a long-term adverse effect to Forest visitors accessing the area, or in the recreational experience they seek when coming to or travelling through the area. While access to snowmobile trails may be affected in the short-term depending on the project length of operations, this would not have an adverse effect far into the future. Numerous areas on the Forest are open to snowmobiles and the public has the option of using these areas. The spatial effects of the projects which relate to scenery, recreation use, and experience, would be positive effects in the long-term, as the area would experience improved forest health. Reduction in forest densities typically also enhances winter recreation opportunities and dispersed camping opportunities. Removal of hazard trees near sno-parks would increase visitor safety. The Forest Plan standards and guidelines would be met through the use of the Resource Protection Measures outlined previously in this environmental assessment.

SCENIC VIEWS

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Scenic Views specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

This section provides an effects analysis for proposed restoration and maintenance of forest health treatments in stands that provide habitat for interior forest wildlife species and present a potential risk of large scale wildfires in the Melvin Butte area. Proposed actions developed include general strategies for conifer retention and the wildland urban interface with specific treatment options similar to those developed for the Popper Vegetation Management Project. This analysis describes anticipated effects on scenery, aesthetics, and visitor experience within the Scenic Views and Front Country management areas that are visible from main scenic travel routes such as Forest Road 16, other access roads, recreation sites, trails and overlooks, and from the Three Sisters Wilderness to the west, Whychus Wild and Scenic River corridor to the north, and from viewer locations along US Highway 20 to the northeast of the planning area.

The 5,375 acre planning area is located south of the city of Sisters, Oregon. The western portion of the planning area is approximately 1,000 feet west of Forest Road 16 into the Pole Creek Fire boundary, the southern portion is bounded by the Three Creeks LSR and Inventoried Roadless Area, the eastern portion is bounded by private lands owned by Fidelity Insurance Company, and the northern portion is bounded by the Sisters Area Fuels Reduction (SAFR) project area and the Whychus Wild and Scenic River Corridor.

Management Direction

The Forest Plan for the Deschutes National Forest provides standards and guidelines for an array of land uses referred to as management areas. This analysis focuses on the management areas for Scenic Views and Front Country which are referred to by page number in the Deschutes National Forest Land and Resource Management Plan and described in terms of desired future conditions for various settings and how these are to be met by specified activities or actions. The Scenery Management System (SMS) is the methodology used by Forest Service landscape architects since 1996 to provide a visual impact assessment of effects to scenic resources which integrates social impacts to recreation visitors with physical impacts to the visitor experience.

The previous outdated Visual Management System (VMS) of 1974 which continues to be referenced in Forest Plans has not yet been updated to reference the currently applied Scenery Management System (SMS). To facilitate this change in methodology to SMS, a crosswalk is used to reference both systems in the following manner with current SMS methodology in bold and outdated VMS in parentheses: ***High Scenic Integrity - SMS*** (Retention - VMS)

There are 5,375 acres within the planning area which include 1,265 acres in the Scenic Views (MA-9) management area, 3,942 acres in the Front Country Seen/Unseen (MA-18) management area, and 167 acres in the Old Growth (MA-15) management area.

Scenic Views - MA9 (LRMP page 4-121): The goal of the Scenic Views management area is to provide high quality scenery representing the natural character of Central Oregon. The general theme and objectives of Scenic Views is for landscapes seen from selected travel routes and use areas to be managed to maintain or enhance the appearance of the areas being viewed. To the casual observer, results of activities will either not be evident or will be visually subordinate to the natural landscape.

Timber harvest is permitted but only to protect and improve the scenic quality for the stands in both the short-term and long-term time frames. Timber stands, which have remained unmanaged in the past because of their visual sensitivity, will begin receiving treatment to avoid loss of the stand to natural causes. Landscapes containing negative visual elements, such as skid roads, activity residue, or cable corridors, will be rehabilitated.

The desired condition for ponderosa pine is to achieve and maintain visual diversity through variation of stand densities and size classes. Large, old-growth pine will remain an important constituent, with trees achieving 30 inches in diameter or larger and having deeply furrowed, yellow bark characteristics.

For other species, the desired condition requires obtaining visual diversity through either spatial distribution of age classes and mix of species through density manipulation or openings, or through a mixture of age classes within stands.

Ponderosa Pine in Scenic Views - Foreground M9-4 (LRMP page 4-122): Ponderosa pine in Scenic Views - Foreground management areas will be managed to maintain or create a visual mosaic of numerous, large diameter, yellow-barked trees with stands of younger trees offering visual diversity and a sense of depth in landscapes viewed from travel routes, recreation use areas and other sensitive viewer locations.

Old growth characteristics, such as yellow, deeply-fissured bark are desirable. Diversity in species, where biologically possible, is desirable. Species such as vine maple, aspen and occasional stands of fir or lodgepole pine are desirable for added visual interest. Shrubs and groundcover species are also a desirable component. Small natural-appearing open spaces help provide a sense of depth and are a desirable visual component in these landscapes.

In Scenic Views – Foreground management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS), visual changes will not be noticeable to the casual forest visitor. The casual forest visitor is the recreation-oriented person or motorist traveling through a portion of the forest who would relate to the visual environment based on the context of a landscape viewed, rather than focusing on an individual acre within a landscape. For the occasional pedestrian who wanders off a designated trail and views an individual acre where a management activity has recently taken place, visual changes will be noticeable, even in Scenic Views - Foreground management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS).

In Scenic Views – Foreground management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS), the timing of clean-up activities, slash from a thinning or tree removal activity, or other visible results of management activities, will not be visible to the casual forest visitor one year after the work has been completed. In regards to stand densities for immature trees, management practices will normally not focus on maximum growth, due to the emphasis on scenic quality. As a result, stand densities may be heavier or lighter than what would be considered necessary for optimum growth.

Visual openings in Scenic Views management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS) areas will result from management activities which harvest natural mortality (dying or severely diseased trees which occur in scattered pockets.) Some of these pockets may be enlarged by removing overstory trees, including large trees, where necessary to permit ponderosa pine regeneration where understory is lacking, or to release existing reproduction where it is suppressed.

Openings in Scenic Views – Foreground management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS) will range from ¼ acre to 2 acres. An opening is visually in an “open” or untimbered condition until trees are an average of 10 feet tall on slopes less than 30 percent, and an average of 15 feet tall on slopes greater than 30 percent. Openings in Scenic Views management areas classified as ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS) areas will range from ¼ acre to 5 acres and may include additional openings where size class diversity is visually insufficient.

Immature trees in Scenic Views – Foreground management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS) and as ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS) are to be thinned to maintain acceptable health and vigor of stands, with the objective of eventually producing replacement trees of 24 inch diameter and larger. In Scenic Views - Foreground areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS), thin to slightly closer than normal spacing in order to provide full crowns and some screening. In areas classified as ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS), normal silviculturally prescribed spacing are acceptable.

Ponderosa Pine in Scenic Views – Middleground and Background M9-15 (LRMP page 4-124): The desired condition for ponderosa pine is to provide a strong textural element when visible from viewer locations. Large full-crowned individual trees are a primary visual element to this landscape along with immature stands which add strong contrasts in color, texture and size. Over time, the immature stands will gradually replace the larger, old growth trees that perpetuate the desired coarsely-textured character. Small and natural appearing openings are also desired especially in areas where similar openings exist.

Immature stands are also important in Scenic Views – Middleground and Background management areas because of the dramatic effect provided with color contrasts, and they eventually become replacements for the larger, old growth trees that perpetuate the desired coarsely-textured character. Visible untimbered openings are desirable where the natural landscape contains similar openings, or where natural-appearing openings can provide additional diversity in landscapes where diversity is visually lacking. Immature trees, groundcover vegetation and mature overstory trees will remain important elements in these landscapes.

In Scenic Views – Middleground and Background management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS), slash from a thinning or tree removal activity, or other visible results of management activities, will not be visible to the casual forest visitor one year after the work has been completed. In areas classified as ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS), logging residue or other results of management activities will not be obvious to the casual forest visitor two years following the activity.

In Scenic Views – Middleground and Background management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS), the scale of man-caused openings must be similar to naturally-occurring openings. If natural openings do not exist, and there is a need to create openings, the openings will be designed to be as small as possible (considering the biological condition, technical feasibility, economics, etc.), and be designed to appear as naturally-occurring openings. In areas classified as ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS), man-caused openings, where visually appropriate, will normally range from ¼ acre to 20 acres.

Lodgepole Pine in Scenic Views - Foreground M9-51 (LRMP page 4-127): Lodgepole Pine in Scenic Views - Foreground management areas are often older trees lacking diversity in species and size class. These older trees tend to have a deteriorating appearance with relatively small crowns so the management emphasis is on managing for healthier and fuller crowned younger trees instead of producing larger diameter, older trees.

The desired visual condition is a mosaic of even-aged stands with additional visual diversity provided by occasional groups of other tree and shrub species. Natural-appearing openings of varying sizes as well as the re-introduction of ponderosa pine whenever biologically feasible in stands that have reverted to pure lodgepole pine are desirable. The forest floor is often open and park-like with ground litter, shrubs and grasses providing additional variety.

Diversity in size classes, and the presence of natural-appearing openings that appear to rotate through time as younger stands grow up, will permit more of a visual perception of “depth” especially when viewing these Scenic Views - Foreground management areas from scenic travel routes or trails. Instead of the traditional “wall” of mature lodgepole along travel routes and adjacent to recreation use areas, younger lodgepole stands will eventually replace the older mature trees to create a transitional effect. The viewer will have views looking through a forested setting instead of an unnatural “wall” or an unsightly clearcut. Many of the mature and over mature lodgepole stands on the Forest have been heavily impacted by the ongoing mountain pine beetle epidemic. Some landscapes have been severely changed as a result of catastrophic losses due to mountain pine beetles.

In Scenic Views – Foreground management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS), slash from a thinning or tree removal activity, or other visible results of management activities, will not be visible to the casual forest visitor one year after the work has been completed. In Scenic Views management areas classified as ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS), logging residue or other results of management activities will not be obvious to the casual forest visitor two years following the activity.

Lodgepole Pine in Scenic Views - Middleground and Background M9-64 (LRMP page 4-129): In Scenic Views - Middleground and Background management areas, lodgepole pine provides a primarily textural landscape element. Individual trees and the size of trees are not visually as important as the constant and often uniform texture and color the trees provide. For this reason, the desired visual condition in these viewing distances is a mosaic of relatively uniform textures created by maintaining canopy closure and healthy crowns. Variety is provided by the overall affect of the mosaic.

On the Forest, options to manage lodgepole stands for long periods of time are limited. By the time lodgepole stands reach about 80 to 100 years of age, increased susceptibility to insect and disease normally requires a regeneration treatment to maintain these landscapes in a healthy appearance. Because the life expectancy for these trees is relatively short, more acres will be in a recently-regenerated appearance at any single point in time. Natural-appearing openings in the forest canopy are desirable as long as they are shaped so that soil color contrasts do not dominate the landscape when viewed from significant viewer locations.

In Scenic Views – Middleground and Background management areas classified as ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS), LRMP standards and guidelines will be met where regeneration openings appear to be natural, follow the horizontal character of the landscape and are of a proper scale as to not dominate the landscape. These natural-appearing openings will appear to rotate through time as younger stands mature.

Many of the mature and over mature lodgepole stands on the Forest have been heavily impacted by the ongoing mountain pine beetle epidemic. Some landscapes have been severely changed as a result of catastrophic losses due to mountain pine beetles, and may require many years to meet the desired visual condition.

Logging residue resulting from management activities will not be visible to the casual forest visitor two years after the work has been completed. Management practices will focus on healthy, full-crowned trees and as a result, stand densities may be lighter than they presently are. Openings resulting from regeneration activities will normally range from 3 acres to 40 acres. Larger openings may be necessary to deal with mountain pine beetle problems.

The desired condition for lodgepole pine is to provide primarily a textural element in the landscape. A larger swath of uniform texture and color in a middleground zone often provides a more positive visual effect. A mosaic of relatively uniform textures created by maintaining tree canopy closure is an essential part of achieving this level of high quality scenery. Natural appearing openings are also desired as opposed to large shapes and sizes that provide too much contrast in soil color or sharp edges.

Mixed Conifer in Scenic Views - ***Foreground M9-20*** *(LRMP page 4-124)*

The desired condition for mixed conifer is to provide diversity in tree and shrub species, various age and size classes in order to perpetuate and enhance the character of the surrounding and natural landscape.

In Scenic Views – Foreground management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS), slash from a thinning or tree removal activity, or other visible results of management activities, will not be visible to the casual forest visitor one year after the work has been completed. In Scenic Views management areas classified as ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS), logging residue or other results of management activities will not be obvious to the casual forest visitor two years following the activity.

Small, natural-appearing openings, where they are lacking, should be created to achieve the desired visual character. These openings shall be planted with species that will result in visual variety and especially species offering fall color. In Scenic Views – Foreground management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS), these openings will range from less than ¼ acre to 2 acres. In Scenic Views management areas classified as ***Moderate Scenic Integrity- SMS*** (Partial Retention - VMS), openings will range from less than ¼ acre to 5 acres.

Mixed Conifer in Scenic Views - Middleground and Background M9-34 (LRMP page 4-126): Mixed conifer stands viewed as Middleground and Background will be managed to maintain or create a mosaic of stands with essentially continuous tree canopies with visual diversity provided by occasional natural-

appearing openings which resemble those openings found in the natural landscape. From these viewing distances, immature trees are visually more important than larger old-growth trees, because the crowns of the younger trees are normally fuller and contribute to the overall textural element when viewed from a distance. However, some scattered larger trees will provide textural diversity and are sometimes discernible as individual forms on these landscapes.

Species and size class diversity is also important in these viewing distances, but only when viewed as relatively small, natural appearing patches on the landscape, rather than isolated, individual trees or shrubs. These patches create a visual mosaic that may provide additional visual variety through the changing seasons. Trees of all sizes may be removed from mixed conifer middleground and background where necessary to perpetuate the desired visual condition, control or prevent major insect and disease problems, enhance unique landscape features, and provide access for recreation, special uses, mineral activities, and administrative purposes. Large diameter trees (24 inches dbh. or greater) will remain a significant component in mixed conifer within Scenic Views – Middleground and Background management areas.

In Scenic Views - Middleground and Background management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS), the scale of man-caused openings must be similar to naturally-occurring openings. If natural openings do not exist, and there is a need to create openings, the openings will be designed to be as small as possible (considering the biological condition, technical feasibility, economics, etc.), and be designed to appear as naturally-occurring openings. In ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS), man-caused openings, where visually appropriate, will normally range from ¼ acre to 20 acres.

In Scenic Views – Middleground and Background management areas classified as ***High Scenic Integrity - SMS*** (Retention - VMS), slash from a thinning or tree removal activity, or other visible results of management activities, will not be visible to the casual forest visitor one year after the work has been completed. In ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS), logging residue or other results of management activities will not be obvious to the casual forest visitor two years following the activity.

Front Country Seen/Unseen – MA18 (LRMP page 4-159): The goal of the Front Country management area is to provide and maintain a natural appearing forested landscape on the slopes northeast of the Three Sisters and Tam MacArthur Rim while providing high and sustainable levels of timber production. This management area occupies a place between Scenic Views and General Forest which calls for a greater emphasis on timber production rather than on scenic views. The Scenery Management System objective for Front Country management areas is ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS) as compared to ***Low Scenic Integrity - SMS*** (Modification - VMS) in General Forest management areas which may apply to areas which are “unseen” from the viewing locations described in the next paragraph.

Certain viewer locations are considered important toward maintaining the desired visual condition of this management area. These significant viewer locations are along the Three Creeks Road, west from Highway 20 between Bend and Sisters, Awbrey Butte, the Redmond-Sisters Highway (126), and to the south from McKenzie Scenic Byway (242) west of Sisters.

The lower slopes of the viewed area are predominately Ponderosa pine and the upper portion ranges from Ponderosa pine overstory with dense white fir to pure lodgepole pine understory. Viewer distance to these areas ranges from 6 to 20 miles, making individual trees and tree sizes indistinguishable. These stands are visually important because they provide a strong textural element that forefronts the dramatic Three Sisters.

The desired visual condition is a landscape where color contrasts are minimal and the full crowns of younger trees create a visually uniform, primarily dark green, gently rolling landscape. Management activities should not result in shapes or lines that are visible from significant viewer locations. Openings and textural changes are, and should be, generally small and remain subordinate in this landscape except during the winter months, when snow, weather and lighting conditions exaggerate color contrasts making openings more evident.

Scenic Views M18-1 (LRMP page 4-159): In areas visible from significant viewer locations, management emphasis will focus on maintaining a uniform tree canopy. Openings are acceptable but should not dominate the landscape when uniform tree canopies cannot be maintained because of biological or topographic conditions.

Scenic Views M18-2 (LRMP page 4-160): Openings resulting from vegetative management activities in areas viewed from significant viewer locations will be designed to follow natural topographic features, to avoid geometric shapes and straight lines, and to be sized to simulate naturally occurring openings. For management activities which may result in visible openings in the forest canopy, consult a landscape architect on the location, size and configuration for treatment units.

Scenic Views M18-3 (LRMP page 4-160): Portions of the area which cannot be seen from the significant viewer locations will be managed similarly to land in the General Forest management area.

Scenic Views for Fire M18-27 (LRMP page 4-162): Low intensity prescribed fires will be used to meet and promote the scenery objectives. This and other fuel management techniques will be used to minimize the hazard of a large high-intensity fire. If at any time during the course of the prescribed burn it appears that the objectives for the burn are not being met, all burning will cease.

Scenic Views for Fire M18-28 (LRMP page 4-162): Wildfires can be suppressed using standard techniques. Control strategies will be developed to minimize impacts from suppression activities on the landscape. Visual contrasts will not be created through suppression techniques unless absolutely necessary.

Scenic Views for Fire M18-30 (LRMP page4-162): A landscape architect shall be consulted for recommended restoration measures following wildfire suppression activities in this management area.

Analysis Methods

Methodology used for analyzing impacts to scenic resources is the Scenery Management System (SMS) which uses ***"Landscape Aesthetics: A Handbook for Scenery Management"*** issued in 1996. This new handbook replaces ***"Agriculture Handbook 462 – The Visual Management System (VMS)"*** issued in 1974. While many of the basic inventory elements of the Visual Management System are retained, the Scenery Management System incorporates both the natural and human processes into the ideas of managing for ecosystems and is the current methodology used by the Forest Service to inventory and evaluate impacts to scenic resources.

Scenery Management Objectives are defined in terms of Scenic Integrity Levels which describe existing conditions and whether the landscape is visually perceived to be "complete" or not. The most complete or highest rating for Scenic Integrity Levels means having little or no deviation from the landscape character that makes it appealing and attractive to visitors and local residents. In addition to describing existing conditions, Scenic Integrity Levels also describe the level of development allowed and ways to mitigate deviations from the area's landscape character.

The Forest Service implementing regulations currently establish a variety of Scenic Integrity Levels for Scenic Views – MA9 (LMRP page 4-121). These standards and guidelines include:

- **High Scenic Integrity - SMS** - Natural Appearing Landscape (Retention – VMS) - MA 9, SV-1 Foreground, SV-3 Middleground
- **Moderate Scenic Integrity - SMS** - Slightly Altered Landscape (Partial Retention – VMS) - MA 9, SV-2 Foreground, SV-4 Middleground
- **Low Scenic Integrity - SMS** - Altered Landscape (Modification – VMS or General Forest) - MA 8, GFO within Foreground as well as Middleground

The distance zones for Scenic Views management areas for an observer are as follows:

- Immediate Foreground 0 - 300 feet
- Foreground 0 - ½ mile
- Middleground ½ mile - 4 miles
- Background 4 miles - horizon

Existing Condition

The planning area is visible from the top of Black Butte, Tam McArthur Rim, adjacent recreation trails and roads, and from the main travel corridor US Highway 20 located to the north of the planning area between Sisters and Bend. Dispersed camping, hiking, mountain biking, and hunting in this area provide a more wilderness-type of recreational experience than in other surrounding recreation areas on the Forest. Previous landscape treatments and the recent Pole Creek Fire have created larger openings and an ever increasingly mottled forest canopy that are visible from higher elevation recreation sites and viewpoints and for those traveling along the Forest Road 16, the main scenic travel access to the highly popular Three Creeks Lake recreation campground complex.

Other nearby popular recreation areas with scenic views include the Metolius-Windigo Trail for bikers and equestrians and the Whychus Creek Wild and Scenic River Corridor located to the northwest of the planning area. It has a Scenic section which is designated for its Outstandingly Remarkable Value of its unique geological and hydrological features. Most visitors access Whychus Creek from Forest Road 16.

There are 1,265 acres of Scenic Views management area classified as ***High Scenic Integrity - SMS*** (Retention - VMS) within the planning area. Most of these Scenic Views - Foreground management areas are along Forest Road 16.

There are 3,942 acres of Front Country Seen/Unseen management classified as ***Moderate Scenic Integrity - SMS*** (Partial Retention - VMS) within the planning area. Most of the Front Country Seen areas are located on the east side of the planning area on the lower slopes of the Cascades Range. These areas are mostly visible from significant viewer locations along Highway 20 between Bend and Sisters. Most of the Front Country Seen/Unseen management areas are located to the east of the Scenic views management area along Road 16.

Environmental Consequences

The purpose of the project is to restore and maintain forest health in stands that provides habitat for interior forest wildlife species and present a potential risk of large scale wildfires in the Melvin Butte area. Proposed actions developed include general strategies for conifer retention and the wildland urban interface.

There is a need to reduce fuel loadings and forest vegetation density to lessen the risk of large wildfires to nearby communities and key ecosystem components, such as large old trees. Recent large wildfires have

dramatically changed the landscape leaving the project area isolated and thereby increasing the urgency to protect what remains as unburned forest. The project area is currently at risk of stand replacement wildfire associated with insects, disease, and overstocking. This project would also meet a need to provide wood products to the local and regional economy.

Direct, indirect, and cumulative effects on scenic resources are analyzed for possible impacts to scenic views and whether proposed actions and mitigations will meet the standards and guidelines in the LRMP for Scenic Views and Front Country Seen/Unseen management areas. Cleanup must occur within one or two years depending upon the Scenery Management classification. Prescribed fire must be less than 5 acres with a naturally appearing shape and scorching must be limited to the lower 1/3 of the forest canopy. If the requirements for the timing of cleanup, size of burn area, and amount of scorch cannot be met, the Forest Plan may be amended if reasons for the proposed actions are justified in accomplishing Forest goals.

Within the Scenic Views management areas, impacts that potentially affect the visitor expectations and experience are analyzed within short-term (within 5 years) and long-term (beyond 5 years) timeframes. Often the short-term impacts are most evident to visitors within immediate Scenic Views – Immediate Foreground landscapes (0-300 feet) as well as Foreground landscapes (300 feet to ½ mile) along main access roads, scenic travel corridors, recreation trails, and developed or dispersed recreation sites. These are the most critical corridors requiring cleanup as soon as possible or other mitigation measures to ensure restoration or recovery of scenic views within a reasonable timeframe.

The Front Country Seen/Unseen management areas are often middleground (1/2 mile to 4 miles) and background landscapes (4 miles to horizon). There are usually prominent landscape features such as buttes or mountain range slopes and foothills that are visible from viewer locations along major travel corridors or from recreational trails, sites, and overlooks. Cleanup usually occurs within two years of proposed actions in order to provide and maintain a uniform tree canopy as seen from major travel corridors or viewpoints.

Alternative 1

There would be no reduction of hazardous ladder fuels in foreground areas of Forest Roads 16, 1620, and 1628 and there would be no reduction of hazardous ladder fuels along the western boundary of the Cascade Timberlands property and along the eastern edge of the project area would help prevent fires from moving from National Forest lands onto private property and vice versa.

Although previous treatments along Forest Road 16 have opened up some views in Scenic Views - Foreground management areas and enhanced visibility of old growth trees in the past, the lack of future treatments would result in diminished scenic views to the desired natural character of the surrounding landscape and a changed visitor experience for those anticipating and expecting to see open views and a healthy forest with safe easy access to recreation areas.

Alternative 2 and 3 - Direct and Indirect Effects

In Scenic Views – Foreground management areas along Forest Road 16 classified as High Scenic Integrity – SMS (Retention – VMS), the blackening and scorching of vegetation and tree trunks and slash cleanup would be visible for more than one year and would not meet standards and guidelines for scenic quality. In Scenic Views – Foreground management areas along Forest Road 16 classified as Moderate Scenic Integrity – SMS (Partial Retention – VMS), the blackening and scorching of vegetation and tree trunks and slash cleanup would be visible for more than two years and would not meet standards and guidelines for scenic quality. A Forest Plan amendment is required to increase this from one year and two years to a five year period to meet Scenic Views and fire management objectives..

In Scenic Views – Foreground management areas along Road 16, prescribed fire is proposed to reduce the risk of wildfire, create a defensible fuel break, and provide for safe ingress of fire suppression resources and egress of the public in the event of a wildfire event. Allowing for prescribed burn units exceeding the five acre limitation for fuels treatments would not meet standards and guidelines for scenic quality. A Forest Plan amendment is required to exceed the five acre limitation for fuels treatment in Foreground areas.

About 1,217 acres in the Scenic Views – Foreground management area are included in this proposed Forest Plan amendment for Alternative 2 and Alternative 3. All units would be prescribed burned. The proposed underburning units are: Units 2, 4, 5, 6, 18, 19, 29, 31, 38, 39, 40, 41, 42, 43, 44, 48, 49, 52, 56, 63, 64, 66, 67, 68, 69, 70, 75, 82, 84, 85, 88, 91, 92, 94, 97, 108, 109, and 110.

Scenic Views Enhancement Treatment Area (240 acres): The goal is to meet the direction for the Scenic Views management area.

Due to a stand replacement fire that occurred during the 2012 Pole Creek Fire along a Scenic Views - Foreground management area adjacent to and west of Forest Road 16, scenic quality standards and guidelines are not being met. The recreating public travels on Forest Road 16 to recreation sites in the area. In order to meet the long-term goals for this Scenic Views – Foreground management area that is classified as High Scenic Integrity – SMS (Retention – VMS), green trees and scattered clusters of fire killed trees would remain in order to slowly transition the area to become scenic once again in the future. It would also require removal of some of the fire killed trees to create a random cluster grouping and feathered edge instead of a uniformed shape and straight edge appearance of trees when viewed from the road. Newly planted trees in the open areas surrounding the scattered clusters of dead trees would restore scenic quality over time by eventually changing the appearance of this edge of the forest over time from burned to green. Logging debris would be disposed of adjacent to the road to meet scenic quality standards and guidelines.

Cumulative Effects

See the section Cumulative Effects of Site-Specific Forest Plan Amendments at the Forest Plan Level on page 32 of this environmental assessment for a discussion of the overall cumulative effects based on the proposed Melvin Butte project Forest Plan amendments.

HERITAGE

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Heritage specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Existing Condition

A review of the proposed action and known archaeological sites was conducted, along with a literature review, to determine the possible presence of unknown cultural sites. The Deschutes National Forest high probability model was used to help establish survey areas within the Area of Potential Effect (APE). One hundred percent of the identified high probability areas have been surveyed while forty percent of identified low probability areas have been surveyed. The low probability areas surveyed were chosen as a representative sample of all low probability areas within the APE.

Seventeen previous surveys have taken place within the APE and as part of those surveys eleven cultural sites were identified. Monitoring of the eleven previously identified sites took place when sites had the

potential to be impacted by proposed treatments. Two of the previously identified sites have been determined ineligible for inclusion to the National Register of Historic Places (NRHP). The remaining eight sites have not been evaluated for their eligibility for listing on the NRHP. Therefore, the sites will be treated as eligible until a formal determination of eligibility can be made. The sites will be flagged for avoidance prior to commencement of the project.

Consultation History

On August 14, 2014 the Heritage report for the Melvin Butte Vegetation Management project was sent to the Oregon State Preservation Office (SHPO). This constituted the initiation of the formal consultation with the Oregon SHPO. No formal response was received from the Oregon SHPO within the 30-day period open for response. Because of changes to the project, a second addendum report was sent to the Oregon SHPO on August 13, 2015 and a second 30-day response period was initiated. Oregon SHPO did not respond to the second period. A “no response” from the Oregon SHPO is considered to be concurrence with the Heritage reports finding of no effect.

Effects Analysis

Alternative 1

No treatments of any type would occur under this alternative. There would be no change in current management direction or in the level of ongoing management activities.

Effects would derive from unmanaged fuels consumed during a wildfire event. By not treating the fuels, burn temperatures in many areas would likely be extreme, endangering cultural resource sites and artifacts. The analysis value of obsidian artifacts for chronology and sourcing information would be compromised by extreme temperatures. Metal artifacts would be further oxidized, becoming more brittle. Glass melts and fractures. Ceramic objects fracture and lose decorative elements from smoke and heat. Organic materials such as wood shell, bone, antler, horn, leather and fabric may be consumed by fire or altered by smoke.

The loss of surface litter from intense wildfire combined with increased hydrophobic soil conditions could lead to erosion due to runoff of surface water. Erosion across sites can remove artifacts or deposit sediment from slopes above. Increased trampling from deer and elk on thinner forest floors has also resulted from wildfires.

Alternative 2 and 3 - Direct and Indirect Effects

Known eligible or potentially eligible heritage sites would be avoided and/or protected; therefore, no known heritages resources would be affected by this project. Because 60 percent of low probability areas for cultural resources were not surveyed as part of this project, mitigation measures are in place that would be part of contract specification should any new cultural sites be discovered during project activities. In areas of the project not surveyed there is a possibility of inadvertent direct or indirect effects to unknown cultural resources by some of the proposed actions.

Mechanical harvesting of trees within the project area could include various types of machinery. Harvesters, feller bunchers and skidders are the most common equipment used. Harvesters and feller bunchers operate in a similar manner with the only real difference being the length of the equipment arm. Both machines are often tracked but can have rubber tires. Both machines have a hydraulic arm with a device that grabs and cuts a tree which allows the machine to carry and stack the logs without the tree touching the ground. The impacts from Harvester and feller bunchers comes from off road travel where the tracked version can cause direct effects in the form of displacing, crushing, breaking, or otherwise affecting the integrity of site materials, especially while turning. The rubber tire variant

can have significantly less impact but still has the potential for similar direct effects as tracked variants. Rubber tire variants also cause less damage to brush then tracked versions and can lead to less indirect effects in the form of post operations erosion. Yarders are used to move larger trees or piles of trees to landings. This involves grappling the tree or trees and dragging the trees. Yarders also have a cable attached that can be used to drag a tree or trees to a landing area. Yarders can cause a direct effect on a cultural resource site by gouging, displacing, crushing, breaking, or otherwise affecting the integrity of site materials.

Two types of machinery are used for mechanical shrub treatments (mowing). The first is a rubber tired tractor using a rotary mower for slopes under 20%. Steeper slopes require a light tracked machine with a front-mounted mow deck that provides greater stability. The weight rating for the equipment is low, between 4-5 pounds per square inch (psi), and has a limited potential to cause damage more typical of the heavier skidders, shearing machines, and biomass machinery. The one function of the mowing equipment that causes some churning, mixing, and displacement of soils is when the machinery makes a turn; the tighter the turn the greater the amount of disturbance. The only direct effect that could occur from mowing would be when the equipment turns around.

Slash disposal using burn piles directly effect the more “durable” artifacts (made of inorganic materials) as well as perishable artifacts (made from organic materials). Burn temperatures reached in slash piles (up to 800 degrees F) are much higher than those in a broadcast underburn in light fuels conditions (250 to 300 degrees F).

Underburning poses a potential effect where fuels are greater than 2.5 tons per acre, or classified as more than light fuels. Research on prescribed fire and obsidian indicates that hydration rind analysis results are not affected when temperatures are 149 degrees C (300 degrees F) or less. Obsidian sourcing analysis using trace elements does not appear to be affected at temperatures below 100 degrees C. Obsidian hydration rinds are obliterated at temperatures over 425 degrees C (797 degrees F). If underburning is kept to temperatures below 100 degrees C then a positive effect could take place since the reduced fuel load will mitigate intense wildfires that would have a negative effect on unknown cultural resources.

Fire line construction by hand poses a potential for direct effects on significant cultural resource sites from displacement, churning, mixing, and breakage of artifacts. Loss of artifact associations and context are examples of lost site integrity. Hand line construction is more limited in effect than using machinery, since it is generally a much smaller fuel break.

Road reconstruction, road maintenance, and temporary road development in or through a previously unknown cultural resource site would have a direct effect on site integrity with damage from crushing, breaking, mixing, displacing, compacting, and otherwise disturbing the context of the artifacts. Road reconstruction effects may be limited to potential impacts from restoring drainage features when they are related to the out sloping or water barring needed in association with culverts as well as without culverts. Activities that occur within an established road prism, including applying surface treatments of any sort, watering and blading, or slope stabilization within the road prism would generally have a positive effect since the maintenance would reduce erosion and the possibility of a road blowout.

Temporary road development through an unknown site could have a direct effect on site integrity from crushing, breaking, mixing, displacing, compacting, and otherwise disturbing the unknown site’s context.

Felling danger trees along travel routes and where units border roads may have a direct effect on cultural resource sites due to the potential use of equipment off of existing disturbed areas. The effects of machinery on site integrity would be similar to other proposed treatments using heavy equipment.

Additionally, there may be a direct effect similar to that from skidding if the trees or portions thereof are dragged to the road.

Should any new cultural resource site be discovered during project implementation, there would likely be an effect because the site was not discovered in advance. An example of this could be a small site that had previously only been identified as an isolated find due to a limited number of artifacts (less than 10 items) observed at the time of initial discovery. Often, by the time that such a site is relocated, some physical damage has already occurred, since increased visibility through mechanical disturbances lead to discovery.

Mowing shrubs and underburning the resulting slash material would reduce fuel loads and positively affect cultural materials sensitive to high intensity fires. Underburning would also remove vegetation that currently obscures artifacts on the ground surface and increases surface visibility. Greater visibility that exposes sensitive materials affects site integrity, since these materials could become more vulnerable to looting and vandalism.

Cultural resource sites located on sloping ground below treatment units may experience erosion and run-off of surface water, melting snow, and heavy rains. While not a direct effect of harvest, fuels, or reforestation activities, a site located down slope and outside of a harvest unit may be affected by either erosion or the depositing of sediments from outside the site proper, or both

With the design criteria included for this project Alternatives 2 and 3 are consistent with federal laws and guidelines for the protection of NRHP eligible sites.

Cumulative Effects – All Alternatives

There are no direct or indirect effects to heritage resources from any alternatives. There would be no cumulative effects from this project.

INVENTORIED ROADLESS AREAS

This environmental assessment incorporates by reference (as per 40 CFR 1502.21) the Inventoried Roadless Areas specialists report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office, Sisters, Oregon.

Effects of the Action Alternatives on Inventoried Roadless Areas

Issue: The action alternatives have the potential to affect Inventoried Roadless Areas by harvesting trees and conducting post-harvest activities in the project area.

Measure: Measures used to address this issue include acres of Inventoried Roadless Areas located within the project area, the distance from harvest units to Inventoried Roadless Areas, and activities associated with the harvesting of trees.

Affected Environment

Inventoried Roadless Areas (IRAs) are areas identified in the 2001 Roadless Area Conservation Rule in a set of inventoried roadless area maps, contained in the Forest Service Roadless Area Conservation Final Environmental Impact Statement, Volume 2, dated November 2000, which are held at the National headquarters office of the Forest Service, or any subsequent update or revision of those maps (36 CFR 294.1). These areas were set aside through administrative rulemaking and have provisions, within the context of multiple use management, for the protection of inventoried roadless areas. Most IRA

boundaries are substantially identical to those identified as “Roadless Areas”, referred to in the 1982 planning rule (36 CFR 219.17) and identified by the Forest Plan and Final Environmental Impact Statement (FEIS), Appendix C; however, some localized, minor differences in the boundaries may exist.

The following list outlines roadless area characteristics as defined by the January 12, 2001 Roadless Rule

Resources or features that are often present in and characterize inventoried roadless areas, including:

(1) High quality or undisturbed soil, water, and air;

(2) Sources of public drinking water;

(3) Diversity of plant and animal communities;

(4) Habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land;

(5) Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation;

(6) Reference landscapes;

(7) Natural appearing landscapes with high scenic quality;

(8) Traditional cultural properties and sacred sites; and

(9) Other locally identified unique characteristics.

There are two Inventoried Roadless Areas in the general vicinity of the project area. The acres associated with these Inventoried Roadless Areas are shown below in Table 198.

Table 198 Inventoried roadless areas in the general vicinity of the Melvin Butte Vegetation Management Project.

Name of IRA	Total Size
Bearwallows	7,316 acres
Three Sisters	2,690 acres
Total	10,006 acres

Actions and Effects Common to All Action Alternatives

Timber Harvest and Associated Activities

The action alternatives would harvest trees of all species to meet forest restoration goals as well as to realize their economic value. The planning area is about 5,375 acres. Alternative 2 would treat about 4,469 acres and harvest about 6.6 million board feet of timber. Alternative 3 would treat about 4,405 acres and harvest about 6.3 million board feet of timber. In addition, each action alternative would close about 6 miles of Forest System roads and decommission about 8 miles of Forest System roads. Alternative 2 would construct about 0.80 miles of temporary road; no temporary road would be constructed in Alternative 3

Figure 37 that shows the relationship of the action alternatives to the Inventoried Roadless Areas in the general vicinity of the project area.

Alternative 1 – No Action

There would be no management actions under the No Action alternative. Biological and ecosystem functions would continue.

Alternatives 2 and 3 - Direct and Indirect Effects

There would be no direct effects to the Three Sisters or Bearwallows Inventoried Roadless Areas; no trees would be harvested in any Inventoried Roadless Area as a result of the action alternatives. There would be no direct effects to the roadless characteristics such as soil, water, sources of drinking water, habitat for Threatened and Endangered and candidate species, dispersed recreation, cultural properties, unique characteristics, and plant and animal community diversity.

Five timber harvest units (units 12, 51, 53, 54, and 57) are contiguous with the Bearwallow Inventoried Roadless in Alternative 2; three timber harvest units (units 12, 53, and 57) are contiguous with the Bearwallow Inventoried Roadless Area in Alternative 3. The location of these harvest units in the forest in any of the action alternatives would be determined using a GPS device to ensure the integrity of the Bearwallow Inventoried Roadless Area.

No timber harvest units are contiguous with the Three Sisters Inventoried Roadless Area. Three timber harvest units (units 31, 40, and 48), however, are in close proximity to the Three Sisters Roadless Area. Table 199 shows their distance in feet from the IRA.

Table 199 Harvest units in proximity to the Three Sisters Inventoried Roadless Area.

Unit	Distance to the Three Sisters IRA
31	1,092 feet
40	397 feet
48	666 feet

There may be indirect effects to the Three Sisters and Bearwallow Inventoried Roadless Area as a result of the action alternatives. Timber harvest activities may generate dust and noise that are usually associated with ground-based logging systems. This effect would be limited to the duration of a timber sale; likely 1 year at the most. Those recreating in an Inventoried Roadless Area would potentially hear noise associated with heavy equipment. Dust may also be seen by recreationists in an Inventoried Roadless Area as a result of a timber sale.

Wildlife species such as mule deer and black-backed woodpecker, both of which represent a broad range of Management Indicator Species (MIS), may be affected by disturbance. These species may disperse from the area while operations are being conducted, likely returning after operations have ceased as habitat in the Inventoried Roadless Area would not be affected by timber harvest operations.

Table 200 shows the number of acres of Inventoried Roadless Area impacted by the project.

Table 200 Inventoried roadless areas that overlap Alternative 2 and Alternative 3.

	Alternative 2	Alternative 3	Acres
Timber Harvest in an Inventoried Roadless Area	0	0	0
Total	**0**	**0**	**0**

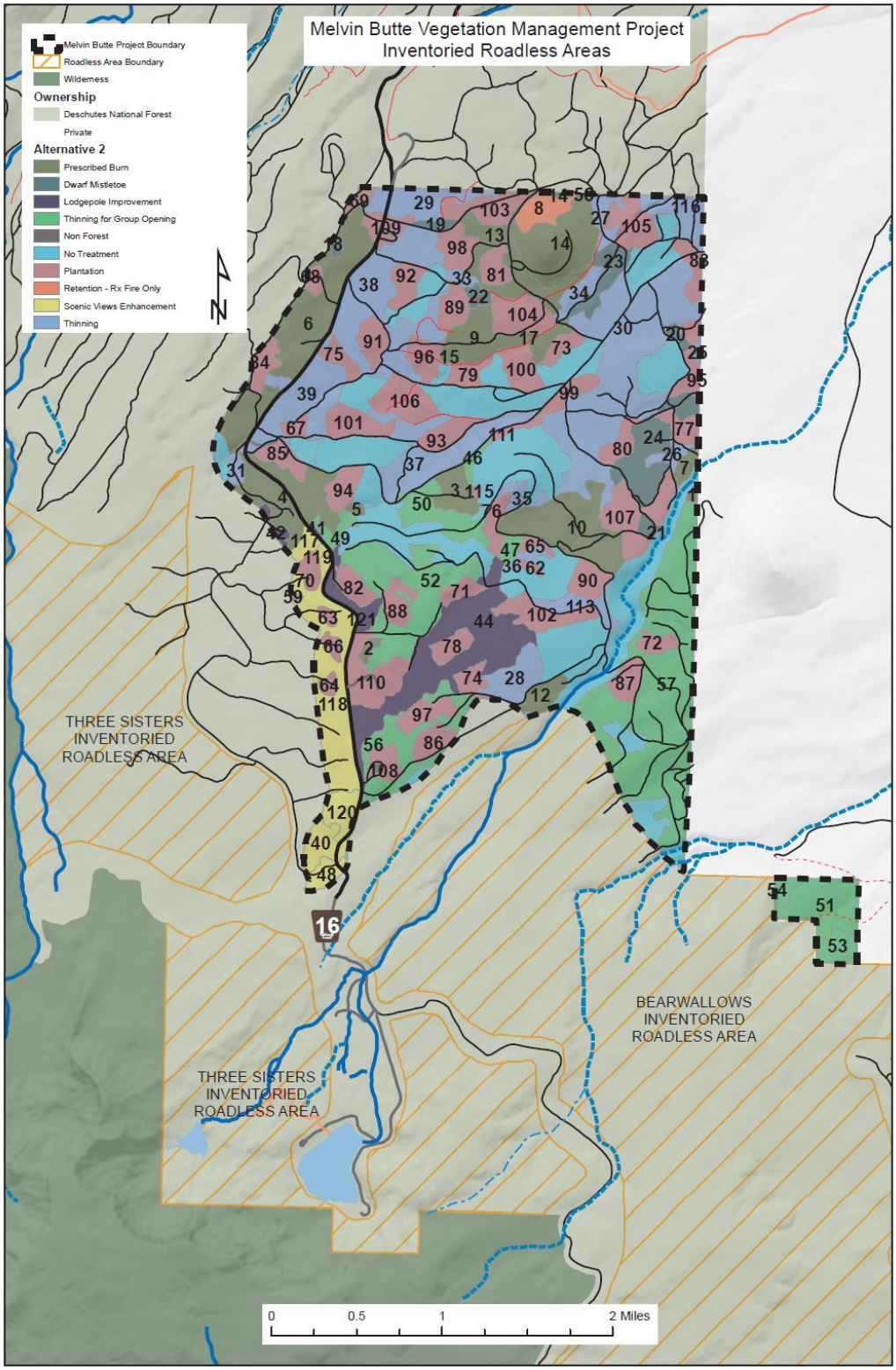


Figure 37 The relationship of the IRAs to the action alternatives.

Cumulative Effects

The cumulative effects area is the Melvin Butte Vegetation Management project area and the time frame is the next 5 years.

There are no planned future foreseeable actions that would take place in the Three Sisters and Bearwallows Inventoried Roadless Areas. These areas would maintain their roadless and ecological characteristics. Any necessary timber cutting or any road construction or road reconstruction in emergency situations involving wildfire suppression, search and rescue, or other threats to public health and safety in inventoried roadless areas would require review by the Regional Forester.

There may be indirect effects to the Inventoried Roadless Areas as a result of the action alternatives because of the dust and noise that are usually associated with ground-based logging systems. These indirect effects would be limited in duration and intensity and would not affect the integrity of Inventoried Roadless Areas located outside the project area boundary.

Conclusion

The action alternatives may have indirect effects to Inventoried Roadless Areas as a result of the Melvin Butte Vegetation Management Project.

POTENTIAL WILDERNESS AREAS

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Potential Wilderness Areas specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

Regulatory Framework/Management Direction

To comply with the requirements established in the Forest Service Handbook (FSH) 1909.12, Chapter 70, Wilderness Evaluation, the Sisters Ranger District conducted an inventory to identify areas meeting the potential wilderness criteria using the criteria found in FSH Chapter 71.1. The inventory is conducted to assess whether project related actions have impacts on the ability of an undeveloped area to be considered in a future potential wilderness inventory. In an effort to streamline the inventory and analysis, a Geographic Information System (GIS) model was built considering corporate data in FACTS and INFRA to draw information regarding past tree cutting activities and to identify roads and other major elements to be considered while conducting the inventory. The process is composed of GIS analysis with validation of the model utilizing satellite imagery, local knowledge, field reconnaissance and or a combination of the above. The GIS model produces a preliminary layer of polygons without past tree cutting activities and outside of a road effect area. A road effect is defined as an area adjacent to the road where impacts from past firewood cutting, danger tree removal, brushing and other road maintenance activities have most likely occurred considering topography, vegetative conditions and soil characteristics. Further site specific analysis is needed, polygon by polygon, to make a final determination if the polygon meets the criteria established in Chapter 71.1.

Analysis Method

Four basic criteria are used to evaluate individual polygons for inclusion as meeting the inventory criteria for potential wilderness (FSH 1909.12 Chapter 71.1):

(1) Area is more than 5,000 acres in size;

(2) Area contains less than 5,000 acres but can meet one or more of the following criteria:

2a. Area can be preserved due to physical terrain and natural conditions

2b. Areas are self-contained ecosystems, such as an island, that can be effectively managed as a separate unit of the Natural Wilderness preservation System

2c. Areas are contiguous to existing wilderness, primitive areas, Administration-endorsed wilderness, or potential wilderness in other Federal ownership, regardless their size. The Forest Service relied on local knowledge and judgment regarding unique, site specific conditions of each area being considered for placement on the inventory of potential wilderness. Delineation of areas for potential wilderness inventory; locate boundaries at prominent natural or semi-permanent human-made features to facilitate easy of the ground identification

3. Areas do not contain forest roads (36 CFR 212.1) or other permanently authorized roads, except as permitted east of the 100th meridian (sec. 71.12).

The model includes tables for data entry to capture the disposition of each polygon on whether it meets the criteria for inclusion in the potential wilderness inventory. It should be noted that wilderness evaluation is not to be conducted with this analysis, only the identification of areas meeting the potential wilderness area inventory criteria. The final disposition of potential wilderness would take place during Forest Plan revision.

Results

The analysis looked at 72 individual polygons regardless of size to determine if they met the inventory criteria as potential wilderness areas.

Seven polygons met the inventory criteria found at FSH 1909.12 Chapter 71.1. Five polygons (#57, 58, 59, 62, and 64) meet criteria 2a (area can be preserved due to physical terrain and natural conditions) and criteria 2c (areas are contiguous to existing wilderness). One polygon (#16) meet criteria 2a and criteria 3 (areas do not contain roads); and one polygon (#56) met criteria 2a, criteria 2c, and criteria 3. This resulted in about 7,395 acres that met the inventory criteria for wilderness. See the Table 201 for the final results of the Potential Wilderness Area analysis.

Table 201 Final results of the potential wilderness analysis.

Potential Wilderness Polygon	FSH Inventory Criteria	GIS Acres	Acres after Analysis
16	2a and 3	4199	4151
56	2a, 2c, and 3	3356	3238
57	2a and 2c	10	6
58	2a and 2c	0.0002	0.0002
59	2a and 2c	0.003	0.003
62	2a and 2c	0.002	0.002
64	2a and 2c	0.01	0.01
	Total	**7,565 acres**	**7,395 acres**

As mentioned above, potential wilderness area polygons were initially screened using the FACTS database. This database is a record of all timber harvest or other stump producing activities on the ranger district. However, the database is incomplete. Many past or ongoing timber harvest activities such as firewood cutting or sanitation-salvage cutting were not recorded in FACTS. To facilitate a more detailed

review of the polygons that were not recorded in FACTS, district personnel were consulted who had a long tenure on the ranger district and who had knowledge of past timber harvest practices in the project area. This review resulted in forty nine polygons not meeting the criteria for the inventory. These polygons either had extensive firewood cutting or some form of sanitation-salvage cutting in which dead and dying trees were harvested according to a risk rating system. In addition, many of these polygons are isolated by the Forest Road system.

This analysis process also resulted in the creation of potentially more logical subdivisions. These subdivisions were initially part of an original polygon (s) that met one or more of the FSH handbooks criteria but in which some portions of the polygon had been subjected to firewood cutting, other types of timber practices, or created a more logical subdivision that would better fit the landscape.

Three polygons were subject to this process. Polygon 56 could be divided into five subdivisions at a narrow "necks" resulting in PWA polygon that better fit the landscape; this created polygons 68, 69, 70, 71, and 73. Polygon 16 could be divided into three subdivisions at a narrow "necks" also resulting in a PWA polygon that better fit the landscape; this created polygons 65, 66, and 67. Last, polygon 57 could be divided into one subdivision; this created polygon 72.

It should be noted that the creation of these subdivisions are *strictly provisional* and does not imply any sort of management decision. A table outlining the ranking of each individual polygon is contained in Appendix H.

Existing Condition

About 8,800 acres were evaluated using the inventory criteria found at FSH 1909.12, Chapter 71.

Effects of the Action Alternatives on Areas meeting the inventory Criteria for Potential Wilderness Areas

Issue: The action alternatives have the potential to adversely affect the areas meeting the inventory criteria for potential wilderness.

Measure: the number of acres of areas meeting the criteria for potential wilderness area affected by the proposed harvest activities in each of the action alternatives.

Alternative 1 – -Ecological Trends

No management activities associated with the purpose and need for the project would occur under the No Action alternative.

Alternative 2 and 3 - Direct and Indirect Effects

The Melvin Butte Vegetation Management Project proposes to silviculturally treat conifer stands to increase their resiliency and to restore and maintain fire climax ponderosa pine.

The silviculture treatment of unit 57 would directly affect about 16 acres of polygon 16 that meet the criteria found at Forest Service Handbook 1909.12 Chapter 72. Depending on stand conditions, these areas maybe thinned from below or have a group opening under Alternative 2 or thinned from below only under Alternative 3. Harvest would remove this 16 acre area from the Potential Wilderness Area (PWA) inventory. This area is located outside of the Inventoried Roadless Area (IRA) boundary.

An indirect effect of harvesting the 16 acres in unit 57 is the effect to the 13 acres that are immediately adjacent to unit 57 to the northwest. This portion of polygon 16 is located in a Riparian Reserve and

would not be treated in the action alternatives. However, the configuration of this area may preclude it from future consideration as a potential wilderness area.

Other Indirect effects to areas identified as PWA are expected to be minimal.

Polygon 56 is located west of Forest Road 16; no timber harvest would occur in the vicinity of this polygon. This area was burned at various intensities during the 2012 Pole Creek fire; no harvest units for the salvage operation were located in this polygon. Polygon 16 would be affected as described above but additional harvest units are located north of Forest Road 1628, are outside the Inventoried Roadless Area (IRA) and some noise or dust from logging activities maybe noticed.

See the Table 202 for a summary of effects of the action alternatives.

Table 202 Summary of the effects of the action alternatives on the final PWA inventory.

Total Number of Acres that meet FSH Handbook Inventory Criteria (2a; 2c; and 3)	FSH Handbook Inventory Criteria Acres Affected by Alternative 2	FSH Handbook Inventory Criteria Acres Affected by Alternative 3
7,395 acres	16 acres	16 acres

See the Figure 38 and Figure 39 for the final disposition of the polygons meeting FSH evaluation criteria and their relationship to the action alternatives.

Cumulative Effects

The analysis area is the PWA analysis area and the time frame is the next ten years. The majority of areas that meet the PWA requirements as potential wilderness areas are located either in Inventoried Roadless Areas (IRA) or immediately adjacent to designated Wilderness. No ongoing or reasonably foreseeable actions such as timber sales or fuels reduction projects are planned for these areas. These areas could experience wildfire; however, wildfire in and of its self would not effect the PWA status for these areas but fire suppression efforts such as dozer line construction, if authorized, could affect the wilderness quality of these areas.

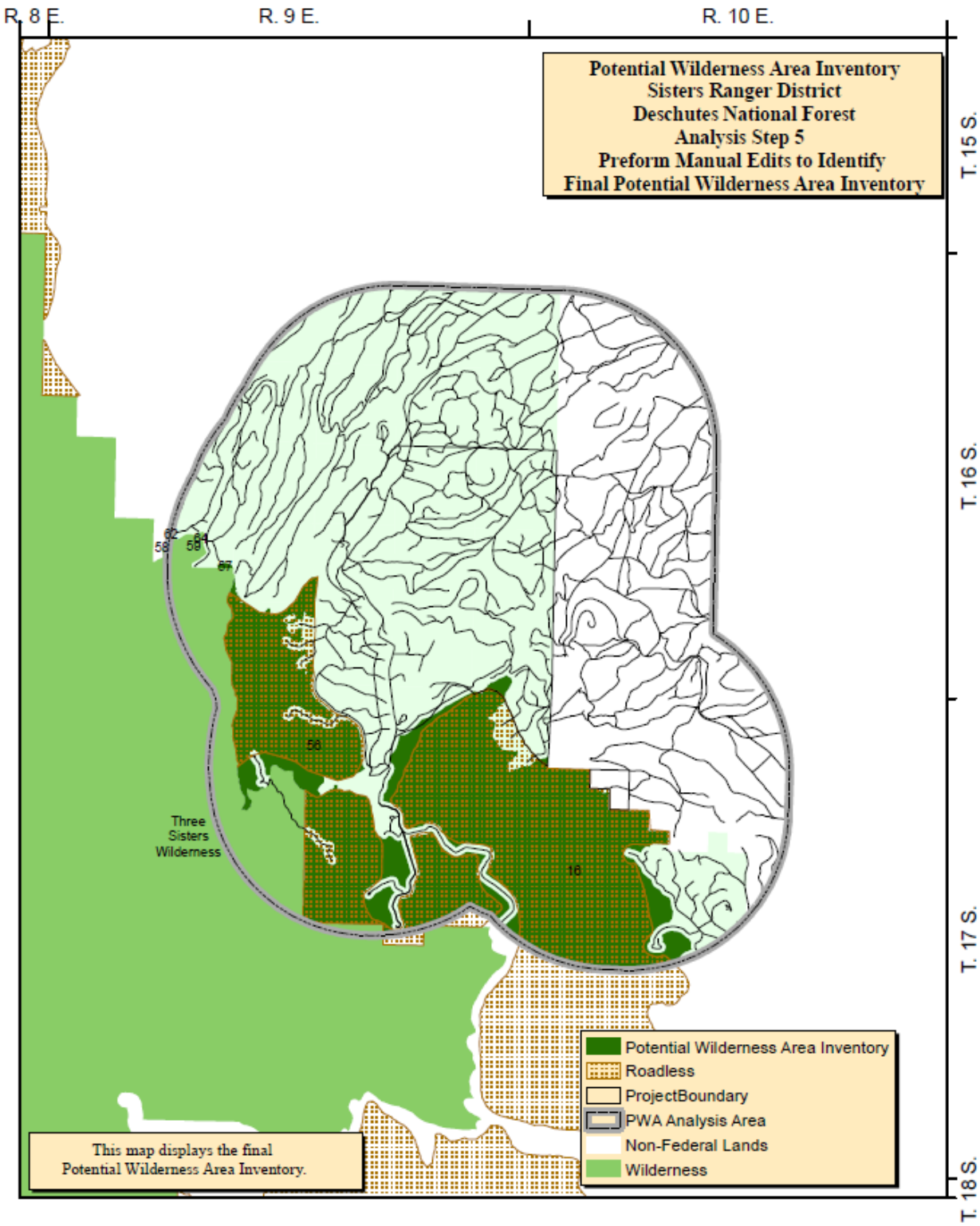


Figure 38 Final map of the potential wilderness area inventory.

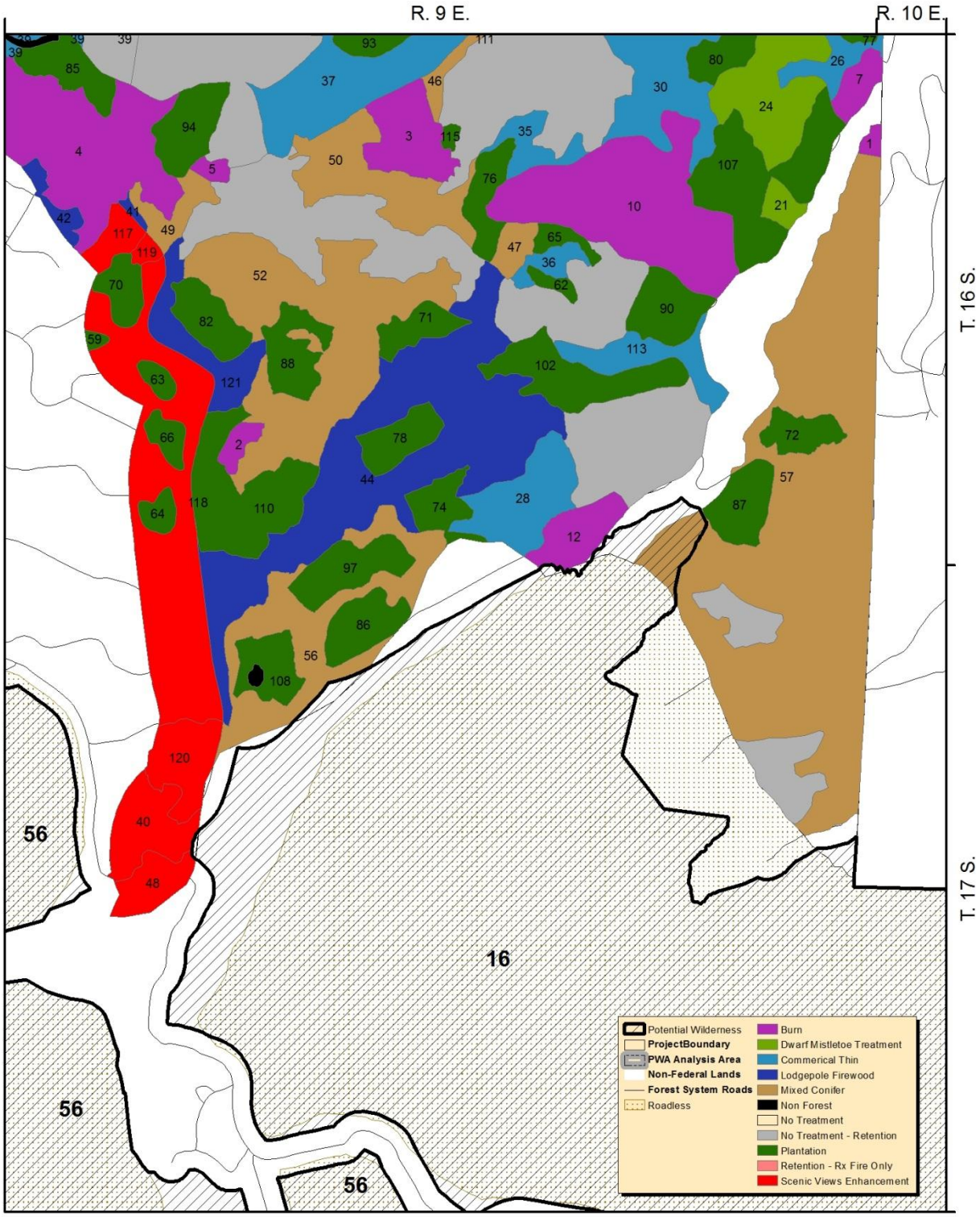


Figure 39 Effects on Alternative 2 and 3 on the potential wilderness inventory.

CITIZEN UNROADED AREAS

This environmental assessment incorporates by reference (as per 40 CFR 1502.21) the Citizen Identified Unroaded Areas specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District in Sisters, Oregon.

In the early 2000s Oregon Wild, an Oregon state environmental interest group, conducted their own unroaded area inventory across Oregon, including the Deschutes National Forest, using inventory criteria they developed for their own purposes. A map of Oregon Wild's unroaded areas was provided in response to the scoping letter for the proposed action for the Melvin Butte Vegetation Management Project in March 2014. The majority of lands included in the Oregon Wild unroaded inventory overlap with Inventoried Roadless Areas (IRA).

Effects of the Action Alternatives on Citizen Identified Unroaded Areas

Issue: The action alternatives have the potential to effect areas identified as unroaded in the Oregon Wild unroaded forest inventory.

Measure: the number of acres of unroaded forest inventory affected by project activities in each of the action alternatives.

Alternative 1 – No Action

There would be no management actions implemented in the Oregon Wild unroaded areas under the No Action alternative. Biological and ecosystem functions would continue in the project area. Areas could be affected by fire management activities in the event of a wildfire.

Actions and Effects Common to All Action Alternatives

Silviculture and Associated Activities

The action alternatives would silviculturally treat stands and use prescribed fire to maintain and restore fire climax ponderosa, provide stand diversity in plantations, and manage in-growth of trees. Alternative 2 would treat about 4,469 acres and includes management of dwarf mistletoe in ponderosa pine stands. Alternative 2 would require about 0.80 miles of temporary road to facilitate stand treatments. Alternative 3 would treat about 4,405 acres. Each action alternative would administratively close about 6 miles of roads; and decommission about 8 miles of road. See Chapter 2 of the environmental assessment for a more complete discussion of the action alternatives.

Alternatives 2 and Alternative 3 - Direct and Indirect Effects

The action alternatives would impact about 46 acres of the Oregon Wild Unroaded Area inventory (Table 203). The Oregon Wild roadless inventory that would be affected does not include any Inventoried Roadless Areas (IRA). No temporary roads would be built in the Oregon Wild unroaded inventory areas.

Harvest units in the inventory that would be affected include units 4, 31, 40, 48, and 56. Unit 4 would be Burn Only. The other units would be thinned from below depending on the harvest prescription. Table 203 describes harvest units by acres.

Table 203 Oregon Wild unroaded inventory affected by stand level prescriptions.

Unit Number	Silviculture Prescription	Acres
4	Prescribed Fire (Burn Only)	26.12
31	Thinning	2.36
40	Scenic Views Enhancement	1.80
48	Scenic Views Enhancement	7.87
56	Mixed Conifer Treatment	7.86

Table 204 Oregon Wild unroaded areas that overlap Alternative 2 and Alternative 3.

Alternatives 2 and 3	Total Acres
	46

There may be indirect effects to the Oregon Wild Unroaded inventory that is outside the project area as a result of the action alternatives because of the dust and noise that are usually associated with ground-based logging systems. These indirect effects would be limited in duration and intensity and would not affect the integrity of the Oregon Wild Unroaded inventory.

Figure 40 shows the relationship of the Oregon Wild Unroaded Areas to the action alternatives.

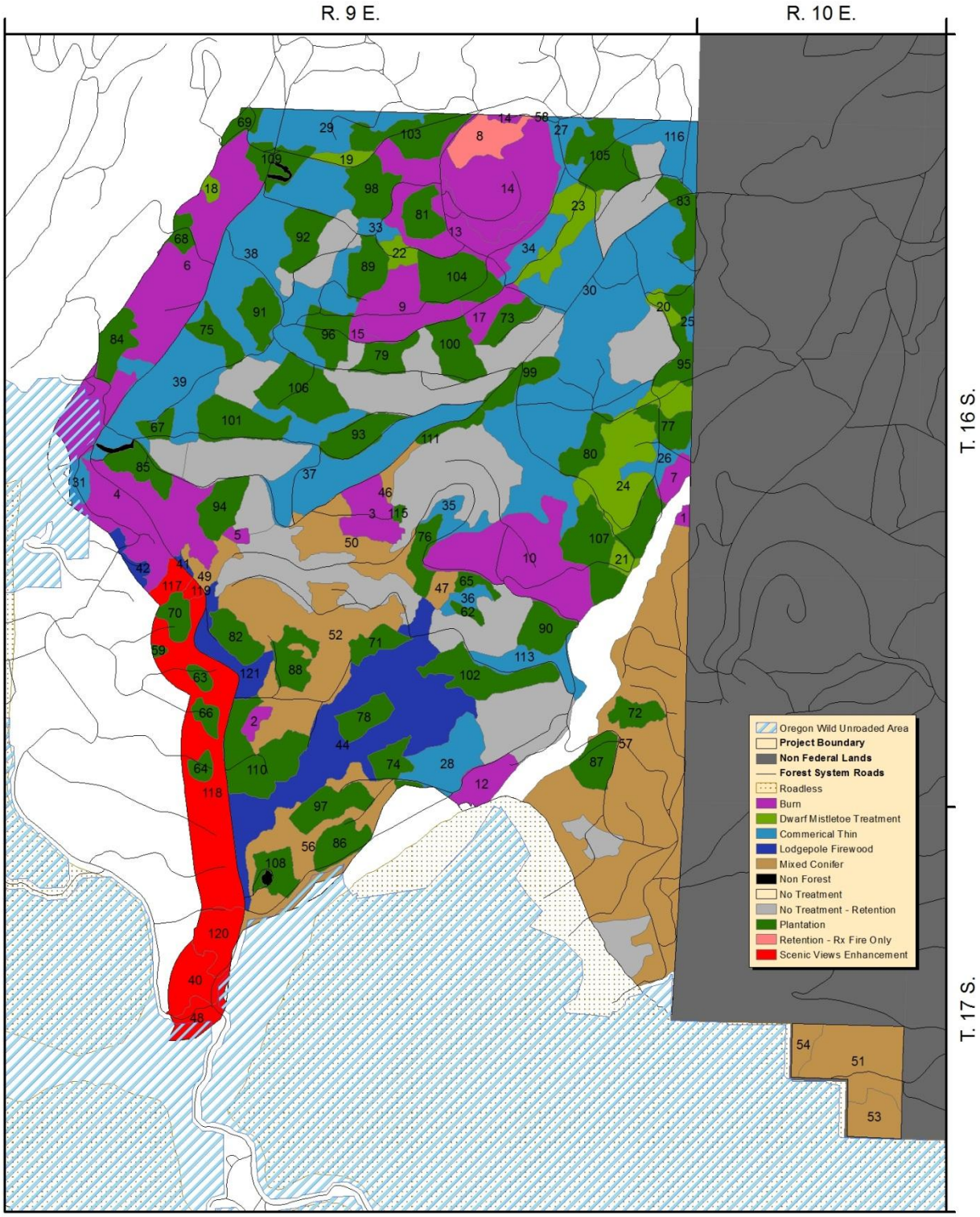


Figure 40 Oregon Wild unroaded inventory and impacts of the action alternatives.

Cumulative Effects

The cumulative effects area is the Melvin Butte Vegetation Management Project and 2012 Pole Creek fire area and the time frame is the past ten years and the next ten years. Future foreseeable management activities that could occur over the next ten years include maintenance underburning of previously thinned areas and thinning of small diameter trees and associated pile burning in stands located in the Wildland Urban Interface. Areas that were thinned from below for the Melvin project would most likely see their next entry for thinning at year 15 or 25. Stands that are located in the Oregon Wild Unroaded Inventory would continue to receive treatment over the long term and would be recorded in the district silviculture database. Fire suppression activities may also occur in the Oregon Wild unroaded inventory.

Past actions that have affected the Oregon Wild inventory include the 2012 Pole Creek fire. The fire burned through the unroaded inventory at various intensities. The 2013 Pole Creek Fire Timber Salvage project did not harvest stands in the Oregon Wild inventory.

The proposed action, combined with cumulative effects, is not considred a significant effect on the Oregon Wild roadless inventory.

Conclusion

The action alternatives would impact about 46 acres of the Oregon Wild Unroaded Inventory as a result of the Melvin Butte Vegetation Management Project.

CLIMATE CHANGE

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Climate Change specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

This section discusses potential interactions between the Melvin Butte Vegetation Management Project and climate change. It focuses on predicted regional changes to temperature and precipitation patterns in central Oregon that can influence vegetation and therefore the ecosystem services forested landscapes provide.

Forests play are integral in the global carbon cycle as atmospheric carbon is fixed during photosynthesis and stored in biomass, detritus and soil organic matter. In 2011 U.S. forests and associated wood products absorb and store the equivalent of 16% of the Carbon Dioxide (CO2) emitted by fossil fuels in the U.S. each year (Joyce Et Al. 2014). Forest carbon sequestration can help mitigate climate change effects by capturing future emissions and greenhouse gasses. Carbon stored in coniferous forests has been estimated to account for a third of terrestrial carbon (Kashian et al. 2006). These environments are dynamic and constantly changing and consequently the ability for them to sequester carbon varies as the stand develops.

Chapter 21: Northwest (Mote et al 2014) of Climate Change Impacts in the United States (Melillo Et Al. 2014) predicts an increase in annual temperature of 3.3°F to 9.7°F by 2070 to 2099 with the largest increase in the summer months. They also predict an 11-12% decrease in annual precipitation for 2030 to 2059. These predictions have potential impacts to water resources such as changes in the timing of streamflows related to snowmelt and potential reductions in the total supply of water and competing demands. Increase in summer temperature and potential changes in water availability is predicted to

impacts forest environments through increased wildfire (frequency, duration and intensity), insect and disease outbreaks. It could also lead to long-term forest type transformations as suitable growing conditions change.

Regulatory Framework

The Forest Service does not currently have a national policy or guidance for managing carbon, and the tools for estimating carbon and sequestration are not fully developed. Current direction for addressing climate change issues in project planning and the NEPA process is provided in the document *Climate Change Considerations in Project Level NEPA Analysis* (USDA FS 2009). This document outlines the basic considerations for assessing climate change in relation to project-level planning.

- **Effect of the project on climate change**

  This specifically considers effects to greenhouse gas emissions and carbon cycling. This may include pyrogenic emissions associated with prescribed burning, changes in biogenic emissions through thinning and forest management, avoidance of large pyrogenic emissions associated with wildfire through forest management, and carbon cycle alterations though reforestation and forest management.

- **Effect of the climate change on the project**

  This includes effects of climate change on the seed stock selection for reforestation, potential changes in natural forest regeneration, and effects of decreased snow fall on recreation or stream flows.

Forest Service Strategic Framework for Responding to Climate Change

The USDA Forest Service mission is to sustain the health, diversity and productivity of National Forests and Grasslands to meet the needs of present and future generations. The agency has developed a strategic framework for Responding to Climate Change (USDA FS 2008) because climate change threatens the ability of the Forest Service to fulfill that mission. The framework (Table 205) describes interrelated programs of the agency to help forests, grasslands, and humans mitigate and adapt to global climate change.

Worldwide Greenhouse Gas (GHG) emissions from 2010 were estimated at 49 gigatonnes (=/- 4.5 Gt) with national emissions estimated at 6.9 Gt (US EPA 2015). The primary sources of anthropogenic CO2 are industry, transportation and building (41%), energy production (35%), agriculture (12%) and forestry and other uses 12% (IPCC 2014). Carbon contributions from the forestry sector are generally deforestation and permanent conversion of forest or agriculture to developed areas (IPCC 2000). This project does not all into any of the above categories.

Table 205 Seven goals from *Strategic Framework for Responding to Climate Change* (USFS 2008).

Foundational	**Science**	Advance our understanding of the environmental, economic, and social implications of climate change and related adaptation and mitigation activities on forests and grasslands.
	Education	Advance awareness and understanding regarding the principles and methods for sustaining forests and grasslands, and sustainable resource consumption, in a changing climate.
Structural	**Alliances**	Establish, enhance, and retain strong alliances and partnerships with federal agencies, State and local governments, Tribes, private landowners, non-governmental organizations, and international partners, to provide sustainable forests and grasslands for present and future generations.
	Policy	Integrate climate change, as appropriate, into Forest Service policies, program guidance, and communications and put in place effective mechanisms to coordinate across and within Deputy Areas.
Action	**Sustainable Operations**	Reduce the environmental footprint of Forest Service operations and be a leading example of a green organization.
	Adaptation	Enhance the capacity of forests and grasslands to adapt to environmental stresses of climate change and maintain ecosystem services.
	Mitigation	Promote the management of forests and grasslands to reduce the buildup of greenhouse gases, while sustaining the multiple benefits and services of these ecosystems.

Climate Change Research

The National Climate Change Assessment (Melillo Et Al. 2014) assessed the science of climate change and predicts potential impacts across the United States. Mote et al. (2014) predict some of the potential water challenges for the Pacific Northwest. They note that since 1950 the area-averaged snowpack for the Cascade Range decreased about 20% and spring snowmelt occurred 0-30 days earlier depending on location. They also describe studies showing late winter/early spring streamflows increased from 0-20% and summer flow decreased 0-15% as annual flow. They also note that hydrologic response to climate change will depend on factors such as the dominant form of precipitation in a watershed, elevation, aspect, geology, vegetation and land use.

Evergreen coniferous forests dominate the Pacific Northwest and potential changes in precipitation and temperature are expected to affect these environments. Climate change is expected to alter Pacific Northwest coniferous forests through increasing wildfire risk and insect or disease outbreaks in the near future. Long-term changes could include shifts in forest types and species as environmental conditions change. Much of the potential changes are associated with changes in water availability which can result in drought stressed trees that are less resilient to disturbance agents.

Wildfire activity is expected to increase in duration and frequency as changes in water availability are likely to result in an earlier onset for wildfire activity and the end of fire season depends on season ending precipitation events. Mote et al. (2014) predicts that the median annual area burned in the Pacific Northwest will quadruple by 2080 with a 50% probability that 2.2 million acres would burn in a year. Predictions about fire activity are very general since the potential for any given acre to burn is dependent on a number of factors that vary across the Pacific Northwest.

Insect activity predictions focus on the mountain pine beetle and their impact to drier coniferous forests. Mountain pine beetle activity is increase pine mortality in the Pacific Northwest and the trend is expected to continue. Mountain pine beetle are often limited by elevation and associated temperatures. By the end of the century the upper limit of beetle activity is expected to increase with predicted temperature increases (Mote et al. 2014). The potential interactions between climate change and beetle activity are

uncertain as beetle occurrence changes there are expected landscape changes that may affect the availability of host trees and ultimately the beetle.

Existing Condition

The Melvin Butte Vegetation Management is within the Dry Coniferous Forest biome (Peterson et al 2014). Vegetation in this zone is characterized by ponderosa pine (*Pinus ponderosa*) or Douglas-fir (*Pseudotsuga menziesii*) as dominant species, but can have a significant percentage of true firs and lesser amounts of other conifer species. Typical weather patterns are warm, dry summers with hot daytime temperatures and cool nighttime temperatures. Winters tend to be cold and moist. Most of the annual precipitation is in the form of snow and during spring rainstorms. Rainfall amounts across the zone are highly variable but typically range between 35 cm/year to over 100 cm/year. Snowpack duration varies across this zone and ranges from 1 to 5 months. Snowpack is essential to capturing winter precipitation and converting that to available soil moisture during spring snowmelt.

The combination of cold winters and warm, dry summers results in vegetation that has the highest periods of growth in the spring and early summer when soil moistures are higher and temperatures are lower (Peterson et al. 2014). Limited soil moisture in this vegetation zone creates competition among plant species and can have large impacts on stand development.

Wildfires are a common disturbance agent in central Oregon with substantial activity on the Sisters Ranger District. Over 40% of the Sisters Ranger District has experienced wildfire over the past 12 years. Many of these fires tend to be low or mixed severity, but can be high severity patches. The Melvin Butte Vegetation Management project area is adjacent to the Pole Creek Fire of 2012 and has similar stand characteristics as areas affected by that wildfire. It is reasonable to assume that the project area could display similar fire behavior under environmental conditions experienced during the Pole Creek fire.

Stine et al. (2014) summarized potential changes to the moist mixed conifer forests of eastern Oregon and Washington under a scenario of increased temperature and decreased snowpack. This could include changes to growing season length and timing, timing of bud break (phenology), and seasonal soil moisture availability. Changes on a local scale could be variable as topographic features, such as drainages, can have substantially different environmental conditions than adjacent areas.

Existing Carbon Pools

The Forest Vegetation Simulator (FVS) was used to describe stand conditions and simulate thinning treatments out to 40 years (see the silviculture section of this environmental assessment for more details). The Fire and Fuels Extension (FVS-FFE) for FVS has the ability to estimate carbon pools using stand exam data (Rebain et. al. 2010) but is not an exhaustive accounting of carbon storage for planning purposes. It is used in this section because it is the best available information to quantify carbon storage in the pools most likely to be affected by climate change or project activities. See Table 206: Estimate of Existing Carbon Pools in the Melvin Butte Planning Area using FVS-FFE.

Table 206: Estimate of Existing Carbon Pools in the Melvin Butte Planning Area using FVS-FFE

Carbon Pool	Existing Carbon Storage (Metric Ton)
Above Ground Total Live	264,176
Below Ground Live	62,056
Below Ground Dead	5,934
Standing Dead	20,987
Forest Down Wood	24,021
Forest Floor	20,093
Forest Shrub	2,547
Total	399,815

Effects Analysis

Alternative 1

The effect of the proposed project on climate change

Under this alternative stands would continue to develop and stocking levels would increase. Carbon would continue to be sequestered in currently accessible reservoirs but the rate of sequestration is expected to decrease as stands become overstocked to a point where growth becomes severely restricted from competition. This would lead to stands susceptible to insect and disease outbreaks associated with drought stress that will further reduce the stands ability for carbon fixation.

The effect of climate change on the proposed project

Predicted changes to precipitation and temperature are expected to affect the dry coniferous biome. Potential increased duration and intensity of summer drying can affect disturbance regimes in the biome. A reduced snowpack is expected to melt earlier and with increases in spring and summer temperatures this could result in early drought conditions. Changes to snowpack and summer precipitation would likely result in reduced productivity for the dry coniferous forests at lower elevations.

Using predicted changes to precipitation and temperature combined with current stocking levels the project area would be at increased risk of wildfire. If a large fire occurs in the area the current stand conditions indicate a higher severity fire under similar environmental conditions to the Pole Creek Fire. Any large fire in the area would release a substantial amount of greenhouse gas. While predicting wildfire contributions to greenhouse gas is highly uncertain as the emissions depend on the specific environmental variables when the fire occurs recent fire history on the Sisters Ranger District indicates a potentially substantial amount of greenhouse gas emissions. The fuels report for this project calculated the potential emissions for a wildfire as 6,204 Tons $PM_{2.5}$ and 7,320 Tons $PM_{10.}$

Alternatives 2 and 3 - Direct and Indirect Effects

Since the action alternatives are similar with respect to potential effects associated with climate change they will be analyzed together.

The effect of the proposed project on climate change

Over the short-term (less than five years) implementation of the proposed project on climate change would remove above ground live woody biomass that currently acts as a carbon reservoir. The no treatment areas of the project are identified for habitats that area suitable for northern spotted owl and would continue to fix carbon.

Prescribed burning could potentially occur across the project area and the carbon released by these activities is difficult to calculate as the amount of burning that can occur in any year is dependent on getting suitable weather. The fuels report calculates prescribed burning as releasing 200,323 tons of CO_2. This is based on every potential action burn happening which may not occur since burning depends on the appropriate weather conditions. It is also important that the potential release would occur over many years rather than a predicted large pulse associated with a wildfire.

Several treatments (especially plantation treatments) are expected to release currently suppressed trees so they can accelerate growth and continue capturing carbon over the long-term. Any areas that do not meet minimum stocking standards post-harvest will be replanted and these stands will continue to capture carbon as the seedlings grow.

Removal of above ground woody biomass would be a direct reduction in the ability of forests in the project area to perform carbon sequestration over the short-term. However, over the long-term the forest would regenerate and stands treated to improve tree health will allow currently overstocked stand to maximize growth and capture carbon. Stands without treatment identified will continue to have the highest potential for carbon storage as the soils identified in these stands has favorable properties to develop multi-story complex stands.

The effect of climate change on the proposed project

Potential effects of climate change on the proposed project are difficult to predict. As stated above, the expected changes in temperature and precipitation are expected to affect the drier coniferous forest biome. Stands that are categorized as moist mixed conifer may continue to be exposed to impacts from climate change as the current temperature and precipitation regimes that support them change. Soil moisture availability would continue to result in competition for resources and some stands.

The silvicultural prescriptions are designed to maintain species diversity and reduce stand densities so that in the future, if water is a limiting factor, the reduced stand densities would contribute to overall stand residency under changing and drying conditions. Silvicultural prescriptions also focus on retaining keystone species such as fire resistant tree ponderosa pine which would help stands respond to disturbance factors such as wildfire.

Summary

The Pacific Northwest is predicted to have increases in annual temperatures and changes in water availability associated with climate change. Alternative 1 would allow the project area to continue carbon fixation but would likely place the area at increased risk of wildfire, insects or disease. Alternatives 2 and 3 would remove above ground carbon stores but would reduce the potential for a large pulse input of CO_2 from a wildfire as well as create conditions for increased carbon fixation with increased growth of residual trees.

TRANSPORTATION

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Transportation specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

A roads analysis is an integrated ecological, social, and economic science based approach to transportation planning that addresses existing and future road management options. A completed

science-based roads analysis would inform management decisions about the benefits and risks of constructing new roads; relocating, stabilizing, changing the standards of decommissioning unneeded roads; access issues; and increasing, reducing, or discontinuing road maintenance. See the Melvin Roads Analysis Report for more details.

Regulatory Framework

The goal pursuant to the Deschutes National Forest Plan, page 4-71 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."*

Part of the Standard and Guidelines for meeting the goal is to meet certain road densities as stated on page 4-72, Deschutes National Forest Plan, Section TS-12:

"*Some management areas include open road density guidelines. If not included in the management area direction, the deer summer range guideline of 2.5 miles per square mile, as an average over the entire implementation unit, is assumed. Guideline densities will be used as thresholds for a further evaluation and will not serve as the basis for assessing conformance with the Forest Plan.*

None of the land management allocations within the Melvin Butte Vegetation Management Project area indicates any systematic reduction of road miles or densities except M15 – Old Growth. From Section M15, under the Standard and Guidelines for Transportation M15-14 states:

"Access by road or trail will be limited to the minimum standard and density that meets the objectives of this Management Area. Roads no longer needed will be closed and allowed to revegetate naturally. Helispots and transmission corridors will not be allowed.

Travel Management 36 CFR, Part 212

In September 2015 the Deschutes and the Ochoco National Forests along with the Crooked River National Grasslands completed the process to implement Subpart A: Administration of the Forest Transportation Plan. This process identified the minimum road system needed for safe and efficient travel and for the administration, utilization, and protection of National Forest System lands. To compliment the Forest wide roads analysis a project specific roads analysis was conducted for the Melvin Butte Vegetation Management Project. See the section Other Documents Used in Project Planning for an overview of 36 CFR, Part 212 in this environmental assessment.

Analysis Methods

- Review existing conditions for potential haul routes
- Review the Melvin Butte Vegetation Management Roads Analysis (Walker 2014)
- Review the current Yearly District Road Maintenance Plan
- Calculate miles of road (before and after Roads Analysis recommendations)
- Calculate road density (before and after Roads Analysis recommendations) with the project area

Existing Conditions

The majority of roads within the analysis area have been in existence for decades, and many date back to the early decades of the 20th century. The roads within the analysis area were, by and large, constructed to provide access for timber harvest.

The existing transportation system in the Melvin Butte Vegetation Management Project contains a total of up to 52.51 miles of Forest System roads. All roads within the planning area are forest roads ranging from standard to primitive, wheel tracks to two lane paved Arterial roads. This also includes 3.31miles of existing administratively closed roads.

About 9.2% of the system roads involved consists of Highway Safety Act Roads maintained at a higher standard to accommodate low clearance passenger vehicles. This system has historically been designed and maintained to accommodate the mix of traffic resulting from resource activities and a significant amount of recreation traffic, thus there is a fairly good road system in place which can handle most existing or proposed traffic generating scenarios. Some additional reconstruction or heavy maintenance would be needed if restoration projects concentrate haul volume onto localized segments of these roads.

The remaining 90.8% of the system consists of typically lower standard, high clearance only or closed single lane roads. These roads receive little or no routine maintenance. The roads receive only what is necessary to correct safety problems, when environmental damage is detected, or when they are being used for commercial activity. Traditionally, maintenance associated with commercial use (commercial haul) has been the primary means of maintaining these otherwise low use roads. See Table 207 for a summary of road maintenance levels in the project area.

System Road Maintenance Levels

Level 5 - Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double-lane, paved facilities. Some may be aggregate surfaced and dust abated. The appropriate traffic management strategy is “encourage.”

Level 4 - Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. The most appropriate traffic management strategy is “encourage.” However, the “prohibit” strategy may apply to specific classes of vehicles or users at certain times.

Level 3 - Assigned to roads open and maintained for travel by prudent drivers in a standard passenger cars. User comfort and convenience are low priorities.
Roads in this maintenance level are typically low speed, single lane with turnouts, and spot surfacing. Some roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are either “encourage” or “accept.” “Discourage” or “prohibit” strategies may be employed for certain classes of vehicles or users.

Level 2 - Assigned to roads open for use by high-clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to (1) discourage or prohibit passenger cars or (2) accept or discourage high-clearance vehicles.

Level 1 – Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are “prohibit” and “eliminate.”

Table 207 Current road status in the project area.

MAINTENANCE LEVEL	TOTAL
1 – Basic Custodial Care (Closed Roads)	3.31
2 – Maintained for High Clearance Vehicles	44.39
3 – Maintained Suitable for Passenger Cars, Low User Comfort, Aggregate Surface	0.26
4 – Maintained For Passenger Cars, Moderate Degree of User Comfort	4.55
5 - High Standard Paved Passenger Car Road, High degree of User Comfort	0.0
Undetermined	0.0
TOTALS	52.51

The objectives for road closing and decommissioning are:

Closed Road (Level 1) – A closed road is a road closed at one entrance (spur road) or both ends by means of using natural resources (dead fallen trees, boulders) or by man made resources (gates). A closed road remains a Forest System Road and will have a identification number associated with it. A closed road can be utilized by the Forest Service for emergency purposes such as access to fire situations or administratively for a timber sale.

Decommission Road – A decommissioned road is a road which will be treated and removed from the Forest Transportation system. The identification number shall be removed and the road shall be obliterated, if necessary, to transform the road back to the surrounding natural environment.

The primary reason for the creation of the majority of the existing road system was to provide access for timber harvest. As timber harvest has significantly declined on National Forests over the past several years, the general use of the system roads has also changed.

Today the road system sees some administrative use; however the primary use is public access to multiple summer and winter recreation opportunities on the Forest. The largest recreation area adjacent to the analysis area is the Three Creek area which provides opportunities for camping, fishing, hiking, horseback riding, and snowmobiling. Road 16 is the primary arterial road in the analysis area and serves as the main access to the Three Creek area. Outside of the Three Creek area, other recreation assets including several trailheads that provide access to wilderness trails.

From late spring through fall, firewood collection and mushroom harvesting contribute an increase amount of seasonal traffic to the road system. During fall the road system sees a high amount of traffic associated with deer and elk hunting.

The existing management objectives for roads within the Melvin Butte project area can be defined in two ways: 1) administrative/land management access and 2) recreation access. The bulk of roads are managed primarily for administrative access and are only secondarily to facilitate public usage. Arterials and collectors, regardless of the Maintenance Level, are managed to allow for a mix of commercial and private traffic.

Maintenance Level 2 roads are generally managed to be used primarily by high clearance vehicles. During periods of commercial haul roads are intended to be single user facilities, given the narrow roadbeds and lack of frequent turnouts which preclude any opportunity to safely provide for mixed commercial/public traffic during commercial haul periods. This would occur on most Maintenance Level 2 roads within the project area. There are exceptions to this as some Maintenance Level 2 roads also serve as two lane collector roads in which use would not be restrictive.

Road Restrictions

Commercial Road Rules Deschutes National Forest

Forest Road 16 – Snow 3 – "Snow plowing and vehicle use prohibited from Dec. 1 through April 30". The District Ranger could choose to waive this restriction.

Reconstruction

Prior to implementation of the project, a road maintenance appraisal would be conducted for each unit in the stewardship and/or timber sale. In the maintenance appraisal, the Road Manager would estimate the required maintenance and which transportation routes the contractor shall utilize with each sale unit. This maintenance appraisal does not take into consideration required road reconstruction for the commercial haul routes.

Road 1628000 – a section of curved road in which the curve radius might be too small for chip trucks to maneuver and might need reconstruction to reduce the curve radius and allow passage. A section of the road, north of Forest Road 1628800 might need reconstruction due to water erosion down the center of the road and need to be repaired if the road is utilized for commercial hauling.

Issue Statement

The action alternatives have the potential to plan, 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 System lands.

Measures

1. Total miles of system roads and total miles of open system roads within the project area
2. Miles per square mile of open road density within the project area.

Effects Analysis

Closing and Decommissioning of Forest System Roads

Alternative 1

Under Alternative 1 no recommend road closures and decommissioning would take place. The open roads are not currently maintained but would still remain open to public use. The project area encompasses 5,375 acres (8.40 square miles) along with a current mileage of all Level 2 through 5 open roads of 49.20 miles. This number will not change with Alternative 1 (No Action). This equates to an open road density of 5.86 miles of road per square mile of project area (miles/miles^2). This is above the recommended guideline of 2.5 miles of road per square mile of area (LRMP section TS-12). This will have not any effects on the current transportation system. Currently road maintenance is focused on Maintenance Level 3 roads and above and funding for maintaining Maintenance Level 2 roads are at minimum levels. Alternative 1 will not change the current road maintenance levels.

Alternative 2 and 3 - Direct and Indirect Effects

Alternatives 2 and 3 would decommission and close about 14 miles of Forest system roads. To identify Forest roads to closed and decommissioned the IDT reviewed the Forest level roads analysis and the Popper portion of the Sky Roads Analysis (Popper was the name of a larger vegetation management project that was in the planning phase before the 2012 Pole Creek fire). The interdisciplinary team

determined that the recommendations from the Sky Roads Analysis would apply to the project area with the exception of Forest Roads 1610480, 1610455 1620570, and 1620850. Using this information a project level Roads Analysis was completed (Walker, 2014)

Forest Road 1610480 is an existing open Maintenance Level 2 road located on the east side of the project area. Current recommendations for the project area suggest the decommissioning of Forest Road 1610455 would essentially isolate Forest Road 1610480 with no connection points at either end. It was decided in the roads analysis process to decommission Forest Road 1610480 (Figure 41).

Figure 41 Forest road 1610480.

The 2012 Pole Creek Fire increased overland flow drainage issues to due the lack of vegetation to slow water flow across the landscape. Part of this effect was increased drainage flow paralleling Forest Road 1600700 and eventually flowing onto Forest Road 16. Forest Road 16 is defined as a route suitable for passenger vehicle use. The resulting water flow deposited debris (in the form of sediment and small boulders) onto Forest Road 16, making the route impassible for passenger vehicles. To alleviate this problem, a large culvert was installed at the intersection of Forest Roads 16 and 1600700. It is important to note this road services many campgrounds and trailheads in the Three Creek Lakes area. It was discovered this flow affected some roads within the project area with erosion and scouring to the point the roads were unusable to motorized traffic. After several field visits it was determined this area was in fact an ephemeral stream. It was determined the roads affected by these would be best served by road decommissioning. The recommendations from the Sky Roads Analysis recommended Forest Road 1620570 as Maintenance Level 1 status and Forest Road 1620850 as no change in Maintenance Level (Figure 42). With the erosion damage on both roads it was agreed that both Forest Roads be recommended for decommissioning.

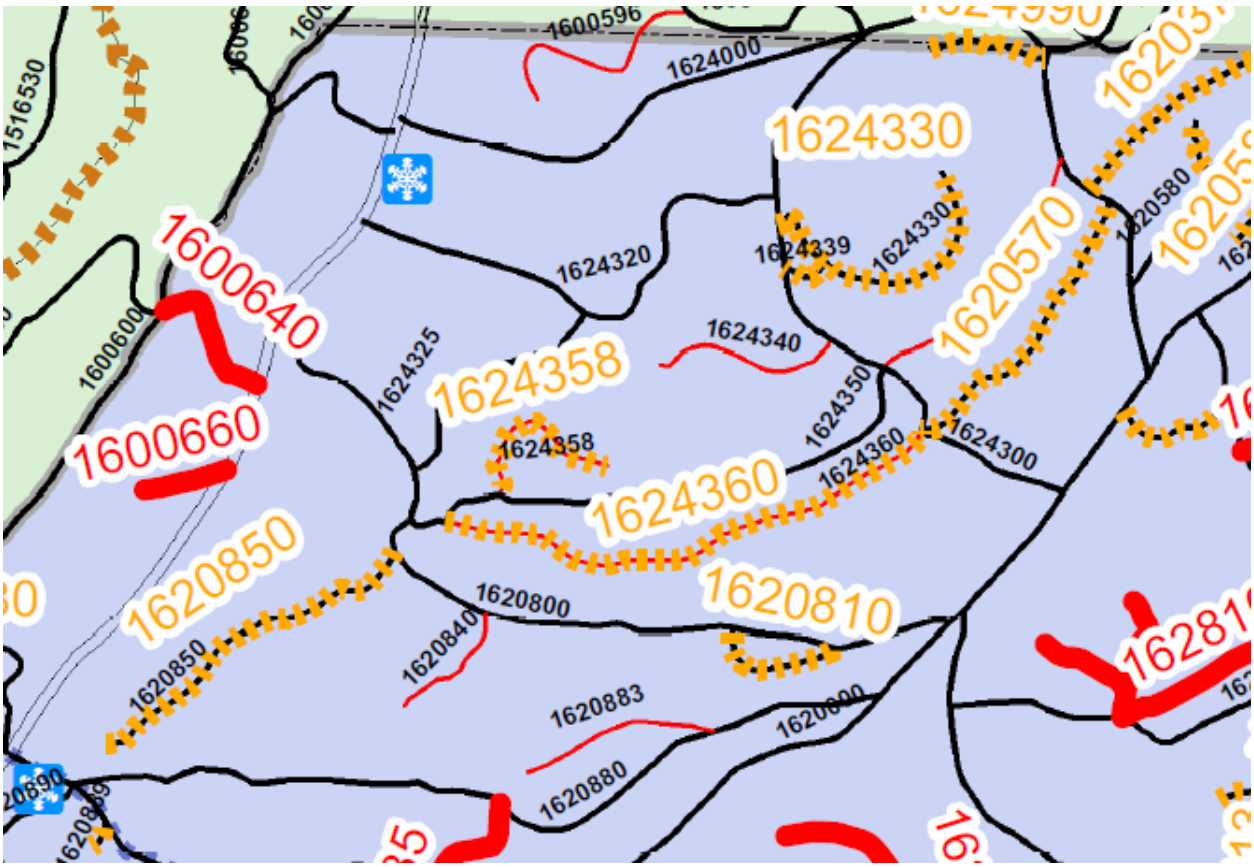


Figure 42 Pole Creek fire affected Forest road 1620850 and 1620570.

Under Alternatives 2 and 3 the total miles of open system roads would be reduced from 49.20 miles to 37.00 miles, with a change of density from 5.86 miles/miles^2 to 4.40 miles/miles^2. During the implementation of closing and decommissioning roads, the Forest Service could close user created and breached closed (Maintenance Level 1) roads when the opportunity arises. This does not mean all user created and breached closed roads would be closed within the project area but when the user created and breached closed roads are located during the field review and process of closing/decommissioning system roads, they too could be closed. The roads will be evaluated on the ground during the process of closing/decommissioning roads. If a road prism has naturally grown in with vegetation (trees, brush, native grasses) a determination would be made between closing/decommissioning the road by mechanically means or leaving the road in its current state.

It should be noted that overall the project reduces about 12 miles of open Forest roads in the project area. This number differs from the 14 miles of road proposed for closure and decommissioning outlined under the action alternatives because some roads currently designated as close (level 1) roads would be designated for road decommissioning. Overall, the project would close and decommission about 14 miles of Forest system roads.

See Figure 43 for the roads analysis recommendations.

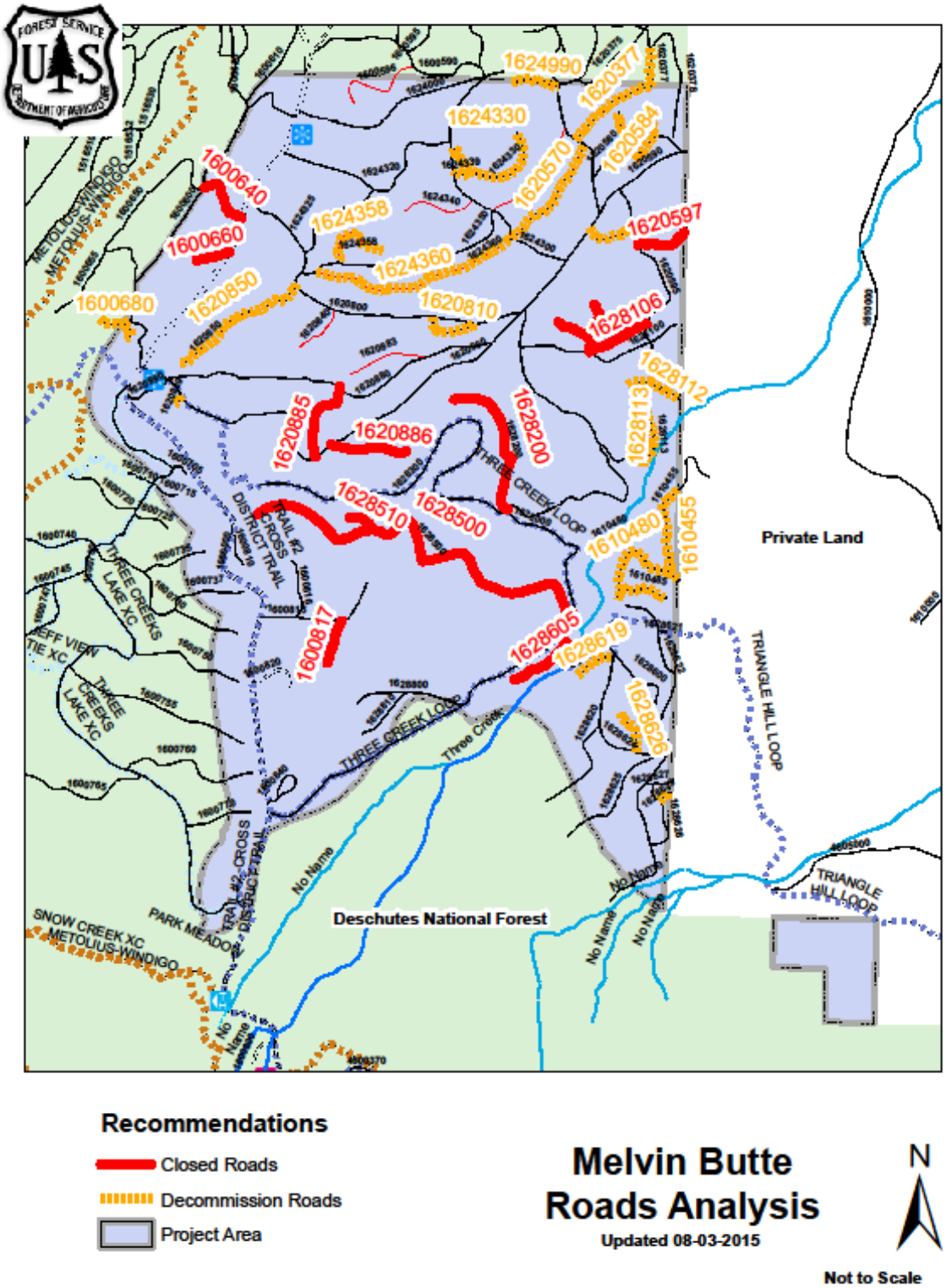


Figure 43 Melvin Butte Vegetation Management Project roads analysis recommendations.

If roads recommended for decommissioning are creating resource damage (i.e. water erosion) appropriate mitigation shall take place to reduce the resource damage. The mitigation techniques would include construction of water bars across the road to dissipate water runoff, construction of lead out ditches to channel the water to the native landscape for dissipation purposes, the removal of culverts (decommissioned roads) to return the natural drainage channel to its natural state, and other best management practices.

As stated with Alternative 1, the current open road density is 5.86 miles/miles^2 of project area. With a reduction in open road mileage from 49.20 miles to 37.00 and using a project area of 8.40 square miles, the road density equates to 4.40 miles/miles^2 of project area, a net decrease of 1.46 miles/miles^2. Table 208 displays route miles, stream crossings and routes in the project area.

Table 208 Route miles, stream crossings and routes in the Melvin Butte Vegetation Management Project area.

Route Miles, Stream Crossings, and Routes in RHCAs	Existing Condition	Alternatives 2 & 3	Amount of Change
Project Acres	5375	5375	0
Project Acres Open to Motorized Cross-Country Travel	0	0	0
Grand Total Motorized Route Miles:	52.51	44.80	-7.71
1. Total Miles of Roads	52.51	44.80	-7.71
a. Miles designated as open yearlong	47.48	36.17	-11.31
b. Miles designated as open seasonally	1.72	0.83	-0.89
c. Miles designated as closed yearlong (ML 1)	3.31	7.80	4.49
2. Total Miles of Motorized Trails	0	0	0
a. Miles of designated roads open year round for use by OHVs	42.66	31.97	-10.69
b. Miles of designated roads open seasonally for use by OHVs	1.72	0.83	-0.89
c. Miles of trail available for use by OHVs <50 in wide	0	0	0
d. Miles of trail available for use by OHVs >50in wide	0	0	0
e. Miles of trail designated for motorcycle use	0	0	0
3. Total Miles of Routes in RHCAs	0.35	0.22	-0.13
a. Total miles of designated OHV routes in RHCA	0	0	0
b. Total miles of designated open roads in RHCA	0.35	0.22	-0.13
c. Total miles of designated closed OHV trails in RHCAs	0	0	0
d. Total miles of designated closed roads in RHCAs (ML 1)	0	0.08	0.08
4. Total Stream Crossings by Designated Route	1	1	0
a. Total number of open OHV trail stream crossings	0	0	0
b. Total number of open road stream crossings	1	1	0
c. Total number of closed OHV trail system crossings	0	0	0
d. Total number of closed road (ML1) stream crossings	0	0	0
5. Total Miles of Designated Routes Available to OHVs	44.38	32.80	-11.58

Temporary Roads

A temporary road is by definition a road for the purposes of implementing management objectives for the surrounding land. Temporary roads are not part of the Forest Transportation network and exist for a limited amount of time. These roads shall be constructed when appropriate during the duration of the

project for access to silvicultural and fuels reduction treatment areas. Once the treatment has been complete the temporary road would be decommissioned and rehabilitated.

Alternative 1 – No Action

Alternative 1 (no action) would not construct any temporary roads.

Alternative 2 - Direct and Indirect Effects

Alternative 2 would construct 0.80 miles of temporary roads to access harvest units. This alternative would use existing roads that are not currently on the transportation system. Maintenance work would include installation or rehabilitation of drainage structures and grading the road for drainage purposes. These actions would have a direct temporary effect on the landscape. After harvest is completed rehabilitation efforts would include removing any existing culverts that are present, scarifying the soil to reduce the compaction effects, and placement of existing debris (rock, downed wood) to prevent access to the road. Figure 44 shows the location of the temporary roads for Alternative 2.

Alternative 3 - Direct and Indirect Effects

Alternative 3 would not construct any temporary roads.

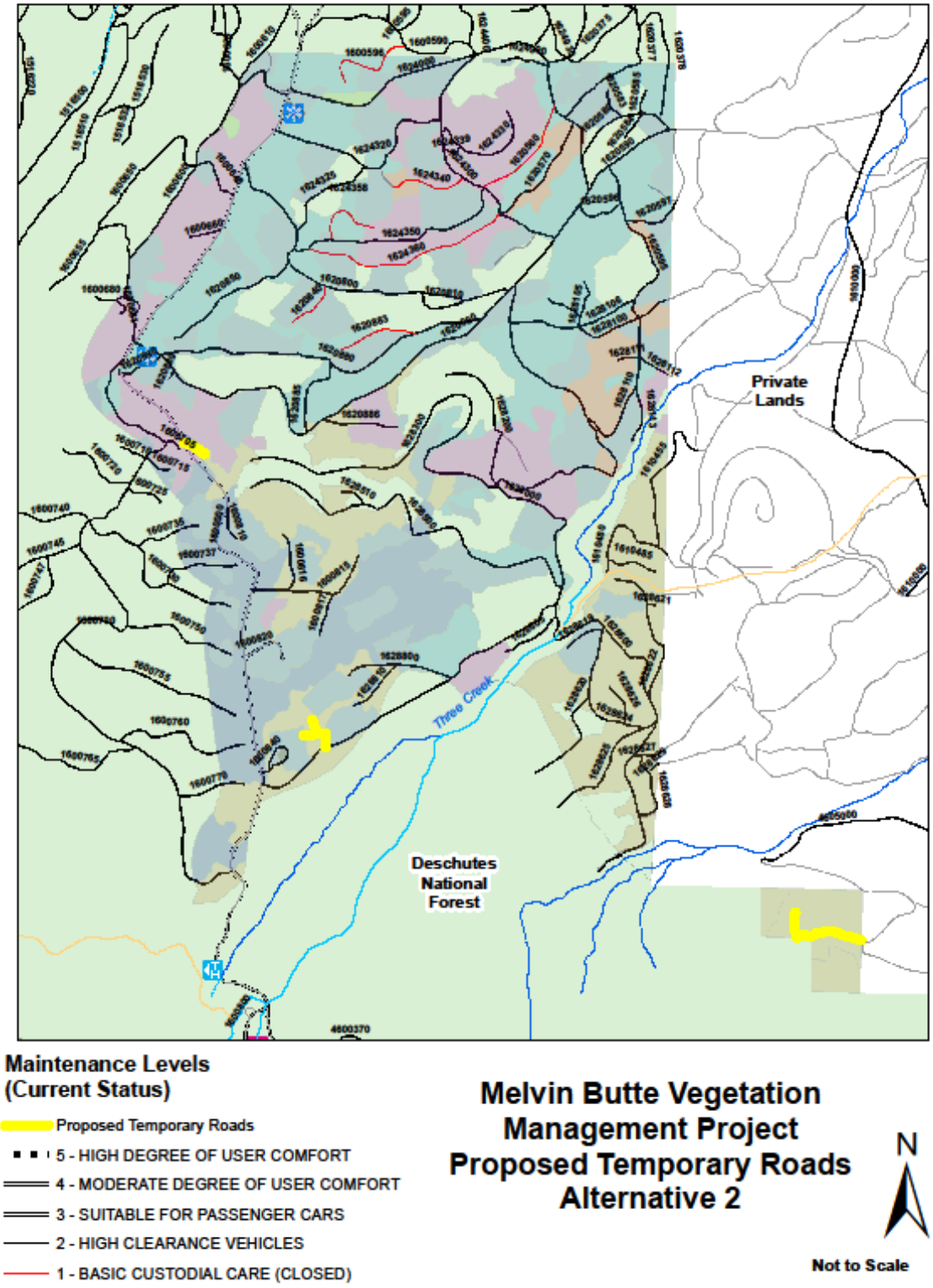


Figure 44 Proposed temporary roads, Alternative 2.

Maintenance

Alternative 1 – No Action

There would be no additional maintenance on roads within the project area.

Alternative 2 and 3 - Direct and Indirect Effects

A short term positive direct effect would be the opportunity to provide maintenance to roads in association with commercial log hauling. Most of the roads proposed for log haul have not been maintained for a number of years. This project would create the opportunity to provide the much needed maintenance for the roads involved.

Road maintenance would include some of the following:

- Blading – Shaping the surface of the road for proper water drainage
- Culvert and other Drainage Facilities – Cleaning out existing relief culverts, ditches, and creation of water bars to improve the water drainage of the roads.
- Hazard Tree Removal – During the term of prescription projects, contractors will have the authority to removal hazard trees deemed unsafe along haul routes.
- Brushing – The contractor would be authorized to trim and remove impeding brush such as low tree limbs, small trees and bushes encroaching into travel lanes of the roads.

Not all Forest System roads would be maintained. At a minimum, 12 miles of system roads would require maintenance. Only roads utilized for commercial haul would be subject to road maintenance.

Cumulative Effects

The cumulative effects are is the project area and the time frame would be the past three years and three years into the future.

Past

In the past three years projects have not occurred that would affect the transportation system, including practices outlined above.

Present

There are currently no projects in project area in which road closures and decommissioning would occur.

The Deschutes and Ochoco National Forest Road Crew plans and has in the past provided maintenance on select roads within the project area. Each year the road crew, District road manager, and resource specialist outline maintenance activities across the District. Maintenance items for fiscal year 2016 are:

- Patching asphalt pot holes along Forest Road 16.
- Watering and blading Forest Road 1620 from Forest Road 16 to Forest Road 1600376 (adjacent to the Melvin Butte Vegetation Management Project)
- Forest Road 1628 erosion repair.
- Forest Road 16 culvert repair
- Forest Road 1620 shoulder repair
- Erosion mitigation of Forest Roads 1624300 and 1620

There are currently no projects in the area within Melvin Butte Vegetation Management Project area in which temporary non system roads would be created.

Future

There is no foreseeable future (3 years) projects in the project area, other than the implementation of the action alternatives, which would affect the transportation system.

Conclusion

The Melvin Butte Vegetation Management Project would have the following effects depending on the alternative;

1. Current road maintenance would remain the same (Alternative 1)
2. Reduce road system mileage (Alternatives 2 and 3)
3. Reduce road densities (Alternatives 2 and 3)
4. Increase road maintenance opportunities (Alternatives 2 and 3)
5. Create temporary roads (Alternative 2)
6. Not create temporary roads (Alternative 1 and 3)
7. Not close or decommission system roads (Alternative 1)

ECONOMICS

This environmental assessment incorporates by reference (as per 40 CFR 152.21) the Economics specialist report and other technical documentation used to support the analysis and conclusions of this environmental assessment. The entire report is in the project record which is located at the Sisters Ranger District office in Sisters, Oregon.

Introduction

Forest Service Handbooks 1909.17 and 2409.18 direct the evaluation of Economic Efficiency for proposed projects. To assess the economic efficiency of Alternatives 2 and 3 harvest volumes (merchantable and unmerchantable) were derived from FVS modeled cut trees. These trees come from inventoried trees on project and representative stands. Specific information on the analysis methodologies, assumptions, and limitations of analysis and other details are contained in the Silviculture report. This section describes the economic outputs from the analysis contained in the Silviculture report. The analysis can be used to compare alternatives, not to give an absolute number for the outputs. Values useful for comparing alternatives include a benefit/cost ratio, discounted benefits, discounted costs, and present net value. Effects on the local economy include estimated number of jobs created or maintained.

Estimated volumes were calculated for each alternative and treatment type associated with an alternative by using FVS stand summary tables. For each action alternative estimated volumes were calculated and the direct revenue and costs identified to measure the value of wood products to determine the estimated value and the economic viability of the project.

While there are other (direct and indirect) economic benefits from the implementation of this project to wildlife (terrestrial, aquatic), recreation, roads, soil, water and vegetation, these values are outside the scope of this timber analysis. Therefore, given the scope of this analysis CCF and MMBF are used as a surrogate to compare the benefits to cost ratio to move towards the desired future condition.

This analysis does not place a value on indirect benefits which may occur such as increased future yields resulting from reduced stocking; reduced risk of stand replacing wildfire; and/or reduced risk of interior forest habitat loss.

Effects Analysis

Alternative 1 – No Action

With this alternative, no commercial forest products would be provided to the economy. There would be no net sale value and no additional jobs would be created or maintained. There would be no benefits to the local economy. Although Alternative 1 would generate no current revenues to returns, there is a cost resulting from the expenditure of funds for project planning. The displayed discounted cost did not discount these costs. Since there are no revenues predicted it is not possible to calculate a benefit/cost ratio.

Alternatives 2 and 3

There are minimal economic factors contributing to differences seen in the benefit/cost ratio and the economic present net value for Alternatives 2 and 3 (Table 209 and Appendix G). These differences include (Alt 2 vs. Alt 3) a slightly higher proportion of late seral (grand/white fir) removal in <4.6% (250 acres) of the project area and select large ponderosa pine tree removal within 160 acres of dwarf mistletoe areas. Select tree ponderosa pine tree removal includes DMR 3+ rated trees that are adjacent to plantation areas and for economic evaluation was estimated to total 160 trees (1 for each acre of Dwarf Mistletoe treatment). As such, these differences resulted in a higher amount of fiber/saw timber proposed for removal under Alternative 2 and a higher cost for pruning under Alternative 3.

The Present Net Value is the value of revenue minus costs. Revenue and costs in the future are discounted to equate to values today using 4% as the discount rate. The discount rate is not the expected rate of inflation but the price of money today discounted to the future. Economics theory suggests that there is a higher value for money today than in the future. The prices of all products in the economy with relation to each other will be relatively the same in the future thus the lack of use of inflation for the calculation. Included in the analysis is an estimate of the value of the logs ($ 140 CCF delivered). This value is affected by the logging cost and hauling costs. For example, if fuel prices rise, the price paid for timber would likely decrease. The value of timber is constantly changing dependent on local, regional and international supplies and demands. In both alternatives the benefit cost ration is very close to 1 indicating timber values breaking even with restorative work. The expression of volume in this report is in CCF or hundred cubic feet. This is used instead of MBF or thousand board feet because of the low amount of fiber to be removed as sawtimber[23].

The present net value (Table 209) is positive for both alternatives. The costs associated with the timber sale in Alternative 2 is lower than in Alternative 3 mostly due to the higher pruning that would take place under Alternative 3 and the reduced volume. The fuels treatments added to the costs decrease the overall benefit cost ratio and decrease the present net value even further for alternatives. This was expected though to treat the fuels without a timber sale would decrease the amount which could be accomplished and would be difficult to accomplish within this decade. Alternative 2 would provide approximately 5 percent less commercial forest products than Alternative 3.

[23] Sawtimber tends to produce a greater economic benefit: cost ratio as compared to non-saw material ("biomass").

The economic efficiency as measured by benefit/cost ratio of Alternative 2 is greater than Alternative 3 by about 6 percent.

Table 209 Summary of economic efficiency analysis.

Economic Measure	Alternative 1 (No Action)	Alternative 2	Alternative 3
Acres of Commercial Harvest	0	2,482 acres	2,411 acres
Volume (Total CCF (hundred cubic feet)) This includes merch and non-merch	0	20,371	19,274
Volume (total hundred cubic feet CCF) *Merch only*	0	*13,240*	*12,565*
Net present value		$212,297	$79,386
Benefit/cost ratio		1.11	1.04
Jobs maintained or created[2]	0	64	60

[1] Assumes 4% discount rate.

[2] Calculated using figures for the Deschutes National Forest from Appendix B-5 of the FY99 Timber Sale Program Annual Report. Excluding firewood from the volume harvested on the Deschutes National Forest, an estimated 9.6 jobs per million board feet were maintained or created.

The current Deschutes National Forest annual average of timber sold is approximately 45 MMBF. In the near future the amount of timber offered for sale is expected to be near this annual average. The Deschutes National Forest is expected to continue offering timber for sale and is expected to continue making contributions to the local economy as a result of timber harvest activities. Timber proposed for harvest with Alternatives 2 would be approximately 15 percent of the Forest's annual average timber sale program. Alternative 3 would be approximately 14 percent of the Forest's annual average timber sale program. This is expected to be sold in the course of more than one year.

The economic effects of the fuels treatments beyond the scope of the timber sold are dependent on the risk and probability of wildfire. There will be continued recreational use of the area and if a wildfire is started in the area or approaches the area from the wilderness to the west there is a low risk of loss of recreation facilities or a loss of recreation activity due to the sense of place. This type of fire has occurred in other areas where control has occurred and little change of recreation use of the area. The economic benefits or losses by a fire in the riparian reserves along the length of Three Creek is difficult to calculate. This value of avoidance is difficult to valuate with probabilities of extensive wildfire risk.

OTHER DISCLOSURES

Civil Rights and Environmental Justice

There have been no issues or concerns raised with adverse effects to Native American Tribes.

There are no known direct, indirect, or cumulative effects on Native Americans, minority groups, women, or civil rights beyond effects disclosed in the Deschutes Land and Resource Management Plan.

Executive Order 12898 on environmental justice requires federal agencies to identify and address any disproportionately high and adverse human health or environmental effects on minority and low income populations. The action alternatives would have no disproportionately high or adverse effects to minority or disadvantaged groups qualifying under the environmental justice order. Scoping and widely circulated

media articles have raised no issues or concerns associated with the principles of environmental justice. The action alternatives do not have a disproportionately high and adverse human health effects, high or adverse environmental effects, substantial environmental hazard or effects to differential patterns of consumption of natural resources. All interested parties will continue to be involved with commenting on the project and the decision making process.

Congressionally Designated Areas

No congressionally designated areas such as Wilderness or Wild and Scenic Rivers would be adversely affected by the proposed activities.

Prime Farm and Forest Lands and Wetlands

The Secretary of Agriculture issued Memorandum 1827 which is intended to protect prime farm lands and range lands. The project area does not contain any prime farmlands, rangelands, or designated wetlands. Prime forestland is not applicable to lands within the National Forest System. National Forest System lands would be managed with consideration of the impacts on adjacent private lands. Prime forestlands on adjacent private lands would benefit indirectly from a decreased risk of impacts from wildfire. There would be no direct, indirect, or cumulative adverse effects to these resources and thus are in compliance with the Farmland Protection Act and Departmental Regulation 9500-3, "Land Use Policy."

Compliance with Other Polices, Plans Jurisdictions

The alternatives are consistent with the goals, objectives and direction contained in the Deschutes National Forest Land and Resource Management Plan except for the described forest plan amendments needed, and the accompanying Final Environmental Impact Statement and Record of Decision dated August 27, 1990 and as provided by the provisions of 36 CFR 219.35 (f) (2005), which address Management Indicator Species. The project is also consistent with the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines*.

Implementation of Alternative 1 (No Action), Alternative 2 (Proposed Acton), or Alternative 3 would be consistent with relevant federal, state and local laws, regulations, and requirements designed for the protection of the environment including the Clean Air and Clean Water Act. Effects meet or exceed state water and air quality standards.

Irretrievable and Irreversible Commitment of Resources

NEPA requires that environmental analysis include identification of "…any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. No significant irreversible or irretrievable commitment of resources would occur under Alternative 2 (Proposed Action) or Alternative 3.

- **Irreversible**: Those resources that have been lost forever, such as the extinction of a species or the removal of mined ore. The proposed activities would result in a commitment of rock for road maintenance.
- **Irretrievable**: Those resources that is 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.

CHAPTER 4 CONSULTATION AND COORDINATION

The Forest Service consulted the following individuals and non-Forest Service persons during the development of this environmental assessment:

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NON-FOREST SERVICE

Deschutes Collaborative Forest Project

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APPENDIX A - SOILS

Alternative 2: Melvin Butte planning area estimates of detrimental soil conditions following mechanical treatments by activity areas.

Appendix A 1 Detrimental soil conditions in the Melvin Butte Project area for Alternative 2

EA Unit Number	Proposed Activity		Unit Acres	Existing Detrimental Soil Conditions		Estimated Detrimental Soil Condition after Treatment	
	Silviculture Rx	Fuels Rx		Acres	Percent of Unit	Acres	Percent of Unit
1	Prescribed Fire	None	3.0	0.1	3	0.1	3
2	Prescribed Fire	None	6.9	.2	3	.2	3
3	Prescribed Fire	None	34.9	1.0	3	1.0	3
4	Prescribed Fire	None	159.6	5.0	3	5.0	3
5	Prescribed Fire	None	4.2	.1	3	.1	3
6	Prescribed Fire	None	136.1	4.1	3	4.1	3
7	Prescribed Fire	None	12.0	0.4	3	0.4	3
8	Prescribed Fire	None	29.8	1.5	5	1.5	5
9	Prescribed Fire	None	54.6	2.7	5	2.7	5
10	Prescribed Fire	None	126.5	3.8	3	3.8	3
12	Prescribed Fire	None	22.3	.7	3	.7	3
13	Prescribed Fire	None	56.5	2.8	5	2.8	5
14	Prescribed Fire	None	111.8	3.4	3	3.4	3
15	Prescribed Fire	None	5.7	0.2	3	0.2	3
17	Prescribed Fire	None	19.5	0.6	3	0.6	3
18	Dwarf Mistletoe 1	MMPB	4.5	0.2	5	0.9	20
19	Dwarf Mistletoe 1	MMPB	8.7	0.4	5	1.7	20
20	Dwarf Mistletoe 2	MMPB	7.1	0.4	5	1.4	20
21	Dwarf Mistletoe 2	MMPB	7.6	0.4	5	1.5	20
22	Dwarf Mistletoe 2	MMPB	9.9	0.5	5	2.0	20
23	Dwarf Mistletoe 2	MMPB	35.8	1.8	5	7.1	20
24	Dwarf Mistletoe 2	MMPB	85.4	4.3	5	17.1	20
25	Thinning	MMPB	2.7	0.1	5	0.5	18
26	Thinning	MMPB	14.0	0.7	5	2.5	18
27	Thinning	MMPB	21.0	1.0	5	3.8	18
28	Thinning	MMPB	44.4	2.2	5	8.0	18
29	Thinning	MMPB	57.5	2.9	5	10.4	18
30	Thinning	MMPB	426.3	21.3	5	76.7	18
31	Thinning	MMPB	10.0	0.5	5	1.8	18
33	Thinning	MMPB	8.4	0.4	5	1.5	18
34	Thinning	MMPB	20.4	1.0	5	3.7	18
35	Thinning	MMPB	15.8	0.8	5	2.8	18

36	Thinning	MMPB	9.1	.5	5	1.6	18
37	Thinning	MMPB	112.4	5.6	5	20.2	18
38	Thinning	MMPB	183.9	9.2	5	33.1	18
39	Thinning	MMPB	103.4	5.2	5	18.6	18
40	Scenic Views Enhance	MMPB	33.4	0.7	2	6.7	20
41	Lodgepole Pine Imp	MMPB	1.8	0.1	2	.4	20
42	Lodgepole Pine Imp	MMPB	8.2	0.2	2	1.6	20
44	Lodgepole Pine Imp	MMPB	208.5	4.2	2	41.7	20
46	Thinning with Group	MMPB	7.6	0.4	5	1.5	20
47	Thinning with Group	MMPB	9.8	0.5	5	2.0	20
48	Scenic Views Enhance	MMPB	19.0	1.0	5	3.8	20
49	Thinning with Group	MMPB	15.6	.8	5	3.1	20
50	Thinning with Group	MMPB	57.6	2.9	5	11.5	20
51	Thinning with Group	MMPB	74.4	3.7	5	14.9	20
52	Thinning with Group	MMPB	156.3	7.8	5	31.3	20
53	Thinning with Group	MMPB	26.9	1.3	5	5.4	20
54	Thinning with Group	MMPB	13.2	0.7	5	2.6	20
56	Thinning with Group	MMPB	86.3	4.3	5	17.3	20
57	Thinning with Group	MMPB	392.3	19.6	5	78.5	20
58	Plantation	MMPB	0.3	0.1	8	0.1	12
59	Plantation	MMPB	1.9	0.2	8	0.2	12
62	Plantation	MMPB	4.3	0.3	8	0.5	12
63	Plantation	MMPB	5.5	0.4	8	0.7	12
64	Plantation	MMPB	7.0	0.6	8	0.8	12
65	Plantation	MMPB	7.0	0.6	8	0.8	12
66	Plantation	MMPB	8.5	0.7	8	1.0	12
67	Plantation	MMPB	9.3	0.7	8	1.1	12
68	Plantation	MMPB	9.4	0.8	8	1.1	12
69	Plantation	MMPB	1.0	0.8	8	1.2	12
70	Plantation	MMPB	14.1	1.1	8	1.7	12
71	Plantation	MMPB	15.0	1.2	8	1.8	12
72	Plantation	MMPB	15.1	1.2	8	1.8	12
73	Plantation	MMPB	16.1	1.3	8	1.9	12
74	Plantation	MMPB	16.7	1.3	8	2.0	12

75	Plantation	MMPB	17.7	1.4	8	2.1	12
76	Plantation	MMPB	18.5	1.5	8	2.2	12
77	Plantation	MMPB	18.8	1.5	8	2.3	12
78	Plantation	MMPB	18.8	1.5	8	2.3	12
79	Plantation	MMPB	19.3	1.5	8	2.3	12
80	Plantation	MMPB	20.9	1.7	8	2.5	12
81	Plantation	MMPB	20.6	1.6	8	2.5	12
82	Plantation	MMPB	21.2	1.7	8	2.5	12
83	Plantation	MMPB	21.5	1.7	8	2.6	12
84	Plantation	MMPB	22.6	1.8	8	2.7	12
85	Plantation	MMPB	21.8	1.7	8	2.6	12
86	Plantation	MMPB	22.7	1.8	8	2.7	12
87	Plantation	MMPB	22.9	1.8	8	2.7	12
88	Plantation	MMPB	24.1	1.9	8	2.9	12
89	Plantation	MMPB	24.6	2.0	8	3.0	12
90	Plantation	MMPB	24.8	2.0	8	3.0	12
91	Plantation	MMPB	24.8	2.0	8	3.0	12
92	Plantation	MMPB	24.8	2.0	8	3.0	12
93	Plantation	MMPB	25.4	2.0	8	3.1	12
94	Plantation	MMPB	25.7	2.1	8	3.1	12
95	Plantation	MMPB	26.3	2.1	8	3.2	12
96	Plantation	MMPB	26.3	2.1	8	3.2	12
97	Plantation	MMPB	27.4	2.2	8	3.3	12
98	Plantation	MMPB	29.8	2.4	8	3.6	12
99	Plantation	MMPB	21.6	1.7	8	2.6	12
100	Plantation	MMPB	31.0	2.5	8	3.7	12
101	Plantation	MMPB	36.0	2.9	8	4.3	12
102	Plantation	MMPB	41.7	3.3	8	5.0	12
103	Plantation	MMPB	40.3	3.2	8	4.8	12
104	Plantation	MMPB	43.4	3.5	8	5.2	12
105	Plantation	MMPB	44.4	3.6	8	5.3	12
106	Plantation	MMPB	46.8	3.7	8	5.6	12
107	Plantation	MMPB	65.8	5.3	8	7.9	12
108	Plantation	MMPB	19.6	1.6	8	2.4	12
109	Plantation	MMPB	22.2	1.8	8	2.7	12
110	Plantation	MMPB	59.0	4.7	8	7.1	12
111	Plantation	MMPB	8.7	0.7	8	1.0	12
113	Thinning	MMPB	26.7	1.3	5	4.8	18
115	Plantation	MMPB	2.2	.2	8	.4	12
116	Thinning	MMPB	42.4	2.1	5	7.6	18
117	Scenic Views Enhance	MMPB	12.0	.6	5	2.4	20
118	Scenic Views Enhance	MMPB	144.0	7.2	5	28.8	20

119	Scenic Views Enhance	MMPB	3.6	.2	5	.7	20
120	Scenic Views Enhance	MMPB	28.7	1.4	5	5.7	20
121	Lodgepole Pine Imp	MMPB	30.6	.6	2	6.1	20

Alternative 3: Melvin Butte planning area estimates of detrimental soil conditions following mechanical treatments by activity areas.

Appendix A 2 Detrimental soil conditions in the Melvin Butte Project area for Alternative 3

EA Unit Number	**Proposed Activity**		**Unit Acres**	**Existing Detrimental Soil Conditions**		**Estimated Detrimental Soil Condition after Treatment**	
	Silviculture Rx	**Fuels Rx**		**Acres**	**Percent of Unit**	**Acres**	**Percent of Unit**
1	Prescribed Fire	None	3.0	0.1	3	0.1	3
2	Prescribed Fire	None	6.9	.2	3	.2	3
3	Prescribed Fire	None	34.9	1.0	3	1.0	3
4	Prescribed Fire	None	159.6	4.8	3	4.8	3
5	Prescribed Fire	None	4.2	.1	3	.1	3
6	Prescribed Fire	None	136.1	4.1	3	4.1	3
7	Prescribed Fire	None	12.0	0.4	3	0.4	3
8	Prescribed Fire	None	29.8	1.5	5	1.5	5
9	Prescribed Fire	None	54.6	2.7	5	2.7	5
10	Prescribed Fire	None	126.5	3.8	3	3.8	3
12	Prescribed Fire	None	23.3	.7	3	.7	3
13	Prescribed Fire	None	81.5	4.1	5	4.1	5
14	Prescribed Fire	None	111.8	3.4	3	3.4	3
15	Prescribed Fire	None	5.7	0.2	3	0.2	3
17	Prescribed Fire	None	19.5	0.6	3	0.6	3
18	Thinning	MMPB	4.5	0.2	5	0.7	15
19	Thinning	MMPB	8.7	0.4	5	1.3	15
20	Thinning	MMPB	7.1	0.4	5	1.1	15
21	Thinning	MMPB	7.6	0.4	5	1.1	15
22	Thinning	MMPB	9.9	0.5	5	1.5	15
23	Thinning	MMPB	35.8	1.9	5	5.6	15
24	Thinning	MMPB	85.4	4.3	5	12.8	15
25	Thinning	MMPB	2.7	0.1	5	0.5	18
26	Thinning	MMPB	14.0	0.7	5	2.5	18
27	Thinning	MMPB	28.2	1.4	5	5.1	18
28	Thinning	MMPB	44.4	2.2	5	8.0	18

29	Thinning	MMP B	57.5	2.9	5	10.4	18
30	Thinning	MMP B	326.3	16.3	5	58.7	18
31	Thinning	MMP B	10.0	0.5	5	1.8	18
33	Thinning	MMP B	8.4	0.4	5	1.5	18
34	Thinning	MMP B	20.4	1.0	5	3.7	18
35	Thinning	MMP B	15.8	0.8	5	2.8	18
36	Thinning	MMP B	9.1	.5	5	1.6	18
37	Thinning	MMP B	112.4	5.6	5	20.2	18
38	Thinning	MMP B	183.9	9.2	5	33.1	18
39	Thinning	MMP B	103.4	5.2	5	18.6	18
40	Scenic Views Enhance	MMP B	33.4	0.7	2	6.7	20
41	Lodgepole Pine Imp	MMP B	1.8	0.1	2	.4	20
42	Lodgepole Pine Imp	MMP B	8.5	0.2	2	1.7	20
44	Lodgepole Pine Imp	MMP B	208.5	4.2	2	41.7	20
46	Thinning without Group	MMP B	7.6	0.4	5	1.4	18
47	Thinning without Group	MMP B	9.8	0.5	5	1.8	18
48	Scenic Views Enhance	MMP B	19.0	1.0	5	3.4	18
49	Thinning without Group	MMP B	15.6	.8	5	2.8	18
50	Thinning without Group	MMP B	57.6	2.9	5	10.4	18
51	Thinning without Group	MMP B	31.0	1.6	5	5.6	18
52	Thinning without Group	MMP B	155.9	7.8	5	28.1	18
53	Thinning without Group	MMP B	13.1	0.7	5	2.4	18
56	Thinning without Group	MMP B	86.3	4.3	5	15.5	18
57	Thinning without Group	MMP B	392.3	19.6	5	70.6	18
58	Plantation	MMP B	0.3	0.1	8	0.1	12
59	Plantation	MMP B	1.9	0.2	8	0.2	12
62	Plantation	MMP B	4.3	0.3	8	0.5	12

63	Plantation	MMP B	5.5	0.4	8	0.7	12
64	Plantation	MMP B	7.0	0.6	8	0.8	12
65	Plantation	MMP B	7.0	0.6	8	0.8	12
66	Plantation	MMP B	8.5	0.7	8	1.0	12
67	Plantation	MMP B	9.3	0.7	8	1.1	12
68	Plantation	MMP B	9.4	0.7	8	1.1	12
69	Plantation	MMP B	10.0	0.8	8	1.2	12
70	Plantation	MMP B	14.1	1.1	8	1.7	12
71	Plantation	MMP B	15.0	1.2	8	1.8	12
72	Plantation	MMP B	15.1	1.2	8	1.8	12
73	Plantation	MMP B	16.1	1.3	8	1.9	12
74	Plantation	MMP B	16.7	1.3	8	2.0	12
75	Plantation	MMP B	17.4	1.4	8	2.1	12
76	Plantation	MMP B	18.5	1.5	8	2.2	12
77	Plantation	MMP B	18.8	1.5	8	2.3	12
78	Plantation	MMP B	18.8	1.5	8	2.3	12
79	Plantation	MMP B	19.3	1.5	8	2.3	12
80	Plantation	MMP B	20.9	1.7	8	2.5	12
81	Plantation	MMP B	20.6	1.7	8	2.5	12
82	Plantation	MMP B	21.2	1.7	8	2.5	12
83	Plantation	MMP B	21.5	1.7	8	2.6	12
84	Plantation	MMP B	22.6	1.8	8	2.7	12
85	Plantation	MMP B	21.8	1.7	8	2.6	12
86	Plantation	MMP B	22.7	1.8	8	2.7	12
87	Plantation	MMP B	22.9	1.8	8	2.7	12
88	Plantation	MMP B	24.1	1.9	8	2.9	12
89	Plantation	MMP B	24.6	2.0	8	3.0	12

90	Plantation	MMP B	24.8	2.0	8	3.0	12
91	Plantation	MMP B	24.8	2.0	8	3.0	12
92	Plantation	MMP B	24.8	2.0	8	3.0	12
93	Plantation	MMP B	25.4	2.0	8	3.1	12
94	Plantation	MMP B	25.7	2.1	8	3.1	12
95	Plantation	MMP B	26.3	2.1	8	3.2	12
96	Plantation	MMP B	26.3	2.1	8	3.2	12
97	Plantation	MMP B	27.4	2.2	8	3.3	12
98	Plantation	MMP B	29.8	2.4	8	3.6	12
99	Plantation	MMP B	21.6	1.7	8	2.6	12
100	Plantation	MMP B	31.0	2.5	8	3.7	12
101	Plantation	MMP B	36.0	2.9	8	4.3	12
102	Plantation	MMP B	41.7	3.3	8	5.0	12
103	Plantation	MMP B	40.1	3.2	8	4.8	12
104	Plantation	MMP B	43.4	3.5	8	5.2	12
105	Plantation	MMP B	44.4	3.6	8	5.3	12
106	Plantation	MMP B	46.8	3.7	8	5.6	12
107	Plantation	MMP B	65.8	5.3	8	7.9	12
108	Plantation	MMP B	19.6	1.6	8	2.4	12
109	Plantation	MMP B	22.2	1.8	8	2.7	12
110	Plantation	MMP B	59.0	4.7	8	7.1	12
111	Plantation	MMP B	8.7	0.7	8	1.0	12
113	Thinning	MMP B	26.7	1.3	5	4.8	18
115	Plantation	MMP B	2.2	.2	8	.3	12
116	Thinning	MMP B	42.4	2.1	5	7.6	18
117	Scenic Views Enhance	MMP B	12.0	.6	5	2.2	18
118	Scenic Views Enhance	MMP B	144.0	7.2	5	25.9	18

119	Scenic Views Enhance	MMP B	3.6	.2	5	.7	18
120	Scenic Views Enhance	MMP B	28.7	1.4	5	5.2	18
121	Lodgepole Pine Imp	MMP B	30.6	.6	2	6.1	20

APPENDIX B - BOTANY

Pre-field review summary of Deschutes Forest Sensitive Plant List for the project area.

Appendix B 1 R6 Sensitive Plant species pre-field review summary for the Melvin Butte Project area.

R6 Sensitive Plant Species Documented or Suspected on the Deschutes National Forest	Range	Habitat	Known occurrence on Sisters RD? 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	Yes/Yes	Low; little suitable habitat
Alpova alexsmithii (fungus) *	Cascades, Central OR to WA	Associated with various Pinaceae sp., incl. Pacific silver fir, lodgepole, Engelmann spruce, and mountain hemlock	Yes/Yes	None; no suitable habitat
Anastrophyllum minutum (liverwort)	Circumboreal	Typically associated with other bryophytes in tight mats on ledges or at the base of cliffs in the mountain hemlock zone	No/No	None; no suitable habitat
Anthelia julacea (liverwort)	Northern hemisphere in boreal and montane regions, found at Diamond Peak/Yoran Lake area of Crescent RD	Found on peaty soil in subalpine/alpine habitats above 5,000 ft. Grows on wet crags, streamsides and areas where snow lies late in the year. In Oregon often associated with low ericaceous shrubs	No/Yes	None; no suitable habitat
Arabis suffrutescens var. horizontalis (vascular plant)	South-Central Oregon	Meadows, woods, summits, ridges, and exposed rock outcrops	No/No	None; no suitable habitat
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	None; no suitable habitat
Astragalus peckii (vascular plant)	South-Central Oregon	Basins, benches, gentle slopes, and meadows.	Yes /Yes	None; no suitable habitat
Barbilophozia lycopodiooides (liverwort) *	Circumboreal, south to Oregon and Idaho	High elevation peaks, peaty soil	No/No	None; no suitable habitat
Botrychium	Central Oregon	Alpine-subalpine ridges,	Yes/Yes	None; no

pumicola (vascular plant)		slopes, and meadows. Lodgepole forests in basins with frost pockets, pumice flats		suitable habitat
Brachydontium olympicum (moss) *	Alaska through Oregon, Cascade Mountains	Subalpine to alpine boulder fields, moraines and cliff faces	No/No	None; no suitable habitat
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	None; no suitable habitat
Carex abrupta (vascular plant) *	Oregon, California, Nevada	Moist meadows and stream banks at moderate to high elevations	No/No	None; no suitable habitat
Carex capitata (vascular plant) *	Circumboreal	Wet meadows, fens and bogs	Yes /Yes	None; no suitable habitat
Carex diandra (vascular plant) *	Circumboreal, south to California	Swamps, sphagnum bogs, lake margins	No/No	None; no suitable habitat
Carex lasiocarpa var. Americana (vascular plant) *	S Cascades of Washington, Idaho, Montana, Utah, irregularly to Oregon	Mid elevation swamps and wet meadows	No/Yes	None; no suitable habitat
Carex livida (vascular plant)	Oregon Washington, California, Idaho	In peatlands, including fens and bogs; wet meadows with still or channeled water	No/No	None; no suitable habitat
Carex retrorsa (vascular plant) *	Nevada, Oregon, Washington, Idaho, to the north and east	Bogs, swamps, wet meadows, stream margins	No/No	None; no suitable habitat
Carex vernacula (vascular plant) *	Washington, Oregon, California, Idaho	Alpine, moist meadows, open slopes	No/No	None; no suitable habitat
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; somel suitable habitat
Cephaloziella spinigera (liverwort)	Widespread around the northern hemisphere in boreal and montane regions	Bogs and fens; boreal and montane. Known from Fremont/Winema National Forest. In moss-dominated communities.	No/no	None; no suitable habitat
Cheilanthes feei (vascular plant) *	Widespread western states, barely in Oregon	Limestone rocky areas	No/No	None; no suitable habitat
Chyloscyphus gimmiparis	Oregon, Alaska, Utah	High elevation montane streams, aquatic	No/No	None; no suitable

(liverwort) *				habitat
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	None; no suitable habitat
Conostomum tetragonum (moss) *	Circumboreal; from BC through California	Subalpine to alpine boulder fields, moraines, and cliff ledges	No/No	None; no suitable habitat
Cyperus acuminatus (vascular plant) *	Western states, west cascades Oregon	Margins wet areas, lake edges	No/Yes	None; no suitable habitat
Cyperus lupulinus ssp.lupulinus (vascular plant) *	Idaho, Eastern Washington, Oregon	Rocky slopes adjacent to streams, low elevation	No/No	None; no suitable habitat
*Dermatocarpon luridum (lichen)	Oregon, Washington	On rocks or bedrock in streams or seeps, usually submerged or inundated for most of the year	No/No	None; no suitable habitat
Elatine brachysperma (vascular plant) *	Washington, Oregon, California, Nevada	Wet to drying muds	No/No	None; no suitable habitat
Encalypta brevipes (moss)	Circumboreal, British Columbia to Oregon. Known from Rogue River/Siskiyou National Forest.	In soil on cliff ledges/ crevices; sites may have frequent fog penetration; apparently restricted to unglaciated regions; +/- Associated with Pacific silver fir, subalpine fir, and mountain hemlock communities	No/No	None; no suitable habitat
Entosthodon fascicularis (moss)	British Columbia, Idaho, Washington, Oregon, California (Arizona, Europe, North Africa.	Grassland, oak savanna, grassy balds and rock outcrops. Individual plants / small patches on seasonally wet, exposed soil in seeps/ intermittent streams.	No/No	None; no suitable habitat
Eucephalus gormanii (vascular plant)	Northern West Cascades	Subalpine to alpine; Rocky ridges, outcrops, or rocky slopes	No/Yes	None; no suitable habitat
Gastroboletus vividus (fungus)	Rogue River N.F., Crater Lake NP, CA	Associated with the roots of Pinaceae sp. such as Shasta red fir and mountain hemlock	No/No	None; no suitable habitat
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	Yes/Yes	None; no suitable habitat

		meadows, commonly with tufted hairgrass		
Haplomitrium hookeri (liverwort)	Widespread but irregularly distributed over temperate and boreal regions, northern and southern hemispheres, Linton Meadows Three Sisters wilderness	On soil in open areas, intermixed with other liverworts and hornworts.	Yes/No	None; no suitable habitat
Harpanthus flotovianus (liverwort)	Widespread in the northern hemisphere in boreal and montane regions. In western North America reaching the southern edge of its range in Oregon	Bogs and fens. On Deschutes, at about 5600' in a smallish, low gradient, persistently groundwater-fed community in the Three Sisters Wilderness Area, south of South Sister	No/Yes	None; no suitable habitat
Helodium blandowii (moss) *	Circumboreal, south through Cascades to Sierra Nevada, and through Rockies to Arizona	Montane fens with calcareous groundwater.	No/Yes	None; no suitable habitat
Heliotropium curassavicum (vascular plant) *	Western United States	Alkaline, saline playas, receding ponds and clay soils	No/No	None; no suitable habitat
Helvella crassitunicata (fungus) *	Cascades, central Oregon to northern WA	On soil, along trails in montane regions with sp. such as Pacific silver fir, grand fir, and mountain hemlock	Yes /No	None; no suitable habitat
Hygrophorus caeruleus (fungus) *	Cascades, central Oregon (Jefferson Co.) to central WA	On soil in association with roots of Pinaceae sp. near melting snowbanks	Yes /Yes	Moderate; little suitable habitat
Jungermannii polaris (liverwort)	Circumboreal and south to California, found at Diamond Peak/Yoran Lake area of Crescent RD. Also found within Waldo Lake at depths up to 330 ft.	Subalpine to alpine habitats above 5,000 ft. Forms small to sometimes extensive mats over peaty soil on damp ledges and crevices of rocks, sometimes along streams and rivulets, sometimes aquatic.	No/Yes	None; no suitable habitat

*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	None; no suitable habitat
Lipocarpha aristulata (vascular plant) *	Washington, Oregon, California, Idaho	Low elevation streamsides, gravel bars	No/No	None; no suitable habitat
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	Yes/Yes	None; no suitable habitat
Lophozia gillmanii (liverwort)	Widespread around the northern hemisphere in boreal and montane regions, in western North America	Cliffs and ledges; boreal and montane. One Oregon site in wet meadow at 6500’	No/No	None; no suitable habitat
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	None; no suitable habitat
Lycopodium complanatum (vascular plant)	Oregon, Idaho, Washington +	Edges of wet meadows; dry forested midslope with >25% canopy cover	No/No	None; no suitable habitat
Marsupella sparsifolia (liverwort)	Polar and alpine regions in Northern Europe and northern North America, South Africa,New Zealand. Rare in the Pacific Northwest, south to Mt. Hood in Oregon and possibly California.	Alpine exposed sites, occasionally flooded sands, sandy soils along streams or acidic soils in late snow areas. Siliceous	No/No	None; no suitable habitat
Muhlenbergia minutissima (vascular plant) *	Western United States	Thin lava soils, associated with Typha, sedges	No/No	None; no suitable habitat
Nardia japonica (liverwort)	In the North Pacific arc from Japan, through Siberia and British Columbia south to Oregon	Subalpine habitats on peaty soil on rock ledges or in rocky meadows	No/No	None; no suitable habitat

Ophioglossum pusillum (vascular plant)	Oregon, Washington, California, Idaho +	Dune deflation plains; marsh edges; vernal ponds and stream terraces in moist meadows	No/No	None; no suitable habitat
Penstemon peckii (vascular plant)	Central Oregon east Cascades	PP openings, open PP forests; mixed conifer openings; recovering fluvial surfaces	Yes/Yes	Moderate; adjacent populations
Pilularia americana (vascular plant)	Oregon, California +	Alkali and other shallow vernal pools, not recently used stock ponds, reservoir shores	No/No	None; no suitable habitat
Pinus albicaulis (vascular plant)	Western US and Canada	Rocky, exposed sites with shallow, well-drained soils. In upper portions of mountain hemlock vegetation series or above, in subalpine parkland.	Yes/Yes	Moderate; adjacent populations
Polytrichum sphaerothecium (moss) *	East Asia-Western North America through Alaska to Oregon; highest Cascade peaks	Subalpine to alpine, forming green to brown sods on igneous rocks in exposed or sheltered sites.	No/No	None; no suitable habitat
Potamogeton diversifolius (vascular plant)	Oregon, Idaho, Nevada, California	Aquatic, pond edges	No/No	None; no suitable habitat
Preissia quadrata (liverwort)	Circumboreal in temperate to boreal regions. In western North America extending south to California	On soil with little organic material, often on cliff ledges or in crevices in rocky areas	Yes/No	None; no suitable habitat
Pseudocalliergon trifarium (moss) *	Circumboreal; British Columbia, Alberta, Montana, Oregon	Montane fens, submerged to emergent or on saturated ground, usually in full sunlight	No/No	None; no suitable habitat
*Ramaria amyloidea (fungus) S&M	Central OR Cascades (Willamette and DES NF); WA Cascades, NW CA	Mycorrhizal with true firs, Douglas fir, and western hemlock in humus or soil.	No/Yes	Moderate; some suitable habitat
*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	Low; little suitable habitat
Rorippa columbiae (vascular plant)	Oregon, California,	Wet to vernally moist sites in meadows, fields, playas,	No/Yes	None; no suitable

	Washington	lakeshores, intermittent stream beds, banks of perennial streams, along irrigation ditches, river bars and deltas, roadsides.		habitat
Rotala ramosior (vascular plant) *	Washington, Oregon, California, Idaho	Low elevation low gradient shores, pond edges, river bars	No/No	None; no suitable habitat
Scheuchzeria palustris var. americana (vascular plant)	Oregon, Washington, California, Idaho +	Open to canopied bogs, fens, and other wetlands where often in shallow water	Yes/Yes	None; no suitable habitat
Schistidium cinclidodonteum (moss)	Washington, Idaho, Oregon, California, Nevada and Europe	In large loose mats on wet or dry rocks / soil in rock crevices, often along intermittent streams. . Ponderosa pine, grand fir, Pacific silver fir, subalpine fir, mountain hemlock and possibly whitebark pine communities.	No/No	None; no suitable habitat
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	None; no suitable habitat
Schofieldia monticola (liverwort)	Oregon, Washington, Russia	Subalpine meadows to alpine areas. On peaty soils under heather or beside small streams.	No/No	None; no suitable habitat
Schoenoplectus 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	None; no suitable habitat
*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	None; no plants or suitable habitat was found during survey
Splachnum ampullaceum (moss) *	Circumboreal; from Alaska through Oregon, and Alberta	Peatlands, wetlands, on old ungulate dung	No/No	None; no suitable habitat
Texosporium sancti-jacobi (lichen) *	Western North America	In Oregon, late seral dry shrub/grassland	No/No	None; no suitable habitat

Tholurna dissimilis (lichen)	Scandinavia, Northwest Territories, Yukon, and British Columbia south into Washington and Oregon. On Black Butte, Sisters District,	- Open Pinus albicaulis stand on moderate slope, with dense understory of shrubs; also open Abies lasiocarpa forest with low stunted trees.	Yes/Yes	None; no suitable habitat
Tomentypnum nitens (moss) *	Circumboreal, Alaska through Oregon	Montane fens at slightly elevated (stumps, logs, hummocks)	Yes/Yes	None; no suitable habitat
Trematodon boasii (moss)	British Columbia through California, Japan, Newfoundland	Subalpine stream, trail and pond edges.	No/No	None; no suitable habitat
Tritomaria exsectiformis (liverwort)	Alaska through Oregon, to Montana, Wyoming and Colorado	Open to shaded coniferous forest along perennial flowing water from springs and seeps	Yes/Yes	None; no suitable habitat
Utricularia minor (vascular plant) *	Western United states north through Canada	Aquatic plant of pools, ponds, bogs, marshes, wet meadows	Yes/Yes	None; no suitable habitat

APPENDIX C – GNN MODELING AND DECAID

GNN MODELING, DECAID ANALYSIS FOR THE WHYCHUS AND DEEP CANYON WATERSHEDS

The purpose of this analysis was to provide an estimate of small (10-20 inches dbh) and large (20 inches dbh and greater) diameter snags in both the Whychus Creek and Deep Canyon watersheds within both green stands as well as post fire habitat that containing stand-replacement, mixed severity, and underburned areas on National Forest lands.

Assumptions/Limitations of Analysis

1. Analysis considered stand-replacement, mixed, and underburned severities.
2. Given the short time since the fire, substantial fall-down of snags was assumed not to have occurred.
3. The minimum size class for the GNN analysis was 10”dbh, therefore plantation in most cases were not include in the analysis due to the fact that the majority of the trees associated with plantations are less than 10”dbh.

All vegetation mortality for this analysis utilized the Burn Intensity GIS layer. Table 210 outlines the cross walk burn intensity, vegetation mortality class, and percent tree mortality.

Table 210 Burn Intensity to Vegetation Mortality for Post Fire areas.

Burn Intensity	Vegetation Mortality Class	Percent Mortality
High	Stand Replacement	100%
Moderate	Stand Replacement	75 to 100%
Low	Mixed Severity	25 to 75%
Underburned / Unburned	Underburned / Unburned	< 25%

Gradient Nearest Neighbor (GNN) Modeling

GNN maps consist of 30 meter pixel (grid) maps with associated data (tree size, density, snag density, canopy cover, percent down wood cover, etc.). The maps used for this analysis were developed by the Landscape Ecology, Modeling, Mapping, and Analysis (LEMMA) team as part of the GNNPAC Pacific States Forest Vegetation Mapping project. This project involves developing detailed maps of existing forest vegetation across all land ownerships in the Pacific Coast States (Oregon, Washington, and parts of California). It is being conducted by the LEMMA team (Pacific Northwest Research Station (PNW) and Oregon State University) at the Corvallis Lab, in close collaboration with the Western Wildlands Environmental Threats Assessment Center, the Interagency Mapping and Assessment Project (IMAP), Northwest Forest Plan Effectiveness Monitoring, the Remote Sensing Applications Center, and Forest Inventory and Analysis at the PNW Research Station.

The process to create the maps involves using gradient imputation (Gradient Nearest Neighbor, or GNN). GNN uses many variables on a gradient along with satellite imagery to assign data from known field plots to pixels with no data that have the same satellite imagery signature (i.e. it “looks” the same to the computer). The species-size GNN model was used in the Whychus and Deep Canyon analysis of Snags. This model uses species composition and stand structure as components for developing maps. Accuracy of the modeling depends on how “like” pixels match up based on numerous variables. Generally speaking, forest types that had more samples like white-fir were more accurate than those with fewer samples like mountain mahogany (Ohman et al. 2008). Information on GNN accuracy, the LEMMA group, IMAP and the GNNPac project is available at the project website: http://www.fsl.orst.edu/lemma/gnnpac.

To determine snags densities from the GNN data, pre-fire stand structure and composition data was used and associated with the vegetation mortality mapping for post fire areas. Once vegetation mortality was applied GNN stand structure and composition data could estimate snag numbers in areas containing both post fire snag numbers and sizes on all acres of stand replacement, mixed severity, underburned stands.

DecAID Analysis

Explanation of the DecAID Advisory Tool and how it was applied to the Melvin Butte project

Snag management guidelines were developed for the Melvin Butte project using a variety of information including scientific literature, standards and guidelines outlined in the Forest Land and Resource Management Plan, the Deschutes NF Wildlife Tree and Log Implementation Strategy, the NWFP, local knowledge of the area, and information contained in the DecAID advisory tool. DecAID is a web-based advisory tool to help managers evaluate effects of forest conditions and existing or proposed management activities on organisms that use snags and down wood. It is a summary, synthesis, and integration of published scientific literature, research data, wildlife databases, forest inventory databases, and expert judgment and experience. DecAID is not a simulation model, it is a compilation of the best available, though imperfect, empirical data on wildlife relationships with dead and decaying wood. "DecAID is not a population viability analysis model. There is more to viability of populations than the dead wood habitat component. DecAID can help managers decide how much, and what sizes, of dead wood to provide for this part of species' habitat needs. It is up to the user to understand the underlying data and determine if the data are appropriate to their local situation and conditions. This is why DecAID was designed to allow the user to drill down into increasingly finer details of the data. The user is urged to carefully read the Summary Narratives which discuss and provide red flags, where appropriate, for the basis of underlying studies" (Mellen et al 2006).

DecAID contains two major data sets which are summarized by wildlife habitat types. The *inventory data* is composed of statistical summaries of forest inventory data on snags and down wood in unharvested forests and entire landscapes across Oregon and Washington. The *wildlife data* is derived from a thorough review of published literature and other available data on wildlife use of snags and down wood, primarily in Oregon and Washington. DecAID provides a statistical synthesis of data showing levels of use by individual wildlife species of snags and down wood. **For this analysis the wildlife data was used.**

DecAID will not be used to analyze snags, but DecAID will be used to evaluate habitat to individual species that utilize snags. **"Forest inventory data are not available for recent post-disturbance habitats** (emphasis added). High snag densities resulting from these disturbances are temporary because snag densities decline rapidly as snags fall in the first decade or so after the disturbance. As a result, stands which have recently sustained a stand-replacing disturbance are not well represented in the inventory data in DecAID, even those from unharvested plots; they are an extremely small proportion of the landscape at any one point in time. Plots occurring in areas experiencing recent fire or other stand replacing disturbance likely are included in the inventory data from one of the other three structural condition classes and are likely plots with high levels of down wood (i.e., the right side of the distribution histograms). It was not possible to separate out plots occurring in these disturbed areas. As a result, inventory data are not available for recent post-fire habitats." (Mellen 2006).

Use of DecAID Wildlife Data

The wildlife data in DecAID is provided in the form of tolerance levels of 30 percent, 50 percent, or 80 percent. A **tolerance interval** is similar to a confidence interval but with a key difference: tolerance intervals are estimates of the percent of all *individuals* in the population that are within some specified

range of values. In the DecAid Advisor tolerance *levels* are used. Levels are one-sided intervals with the lower limit of the interval being zero. Thus, an 80% tolerance level indicates 80% of the individuals in the population have a value for the parameter of interest between 0 and the value for the 80% tolerance level. Or conversely, 20% of the individuals in the population have a value for the parameter of interest greater than the 80% level.

DecAID tolerance levels "may be interpreted as three levels of "assurance": low (30% tolerance level), moderate (50% tolerance level), and high (80% tolerance level)" (Mellen et al. 2006). The higher the tolerance level, the higher the "assurance" that snag habitat is being provided.

Referring to the array of wildlife data collected (for all habitats, not just post-fire habitats) DecAid notes: "The wildlife studies, on which the wildlife portion of DecAID is based, were conducted in a variety of landscapes and site conditions. Typically, the studies (a) did not report how the general study areas and specific study sites were chosen relative to others, and (b) did not describe how the vegetation conditions within the general study areas and specific study sites differed from conditions within a broader area, especially within the wildlife habitat and vegetation condition classes used in DecAID. Thus, there is no way to know to what degree the study areas and sites varied from conditions generally present, and thus no way to gauge the bias in study area and site selection. In turn, this means there is no way to estimate the degree of bias in the wildlife data summarized in DecAID (Mellen et al. 2006)".

DecAID goes on to suggest that this unknown bias can be reduced to acceptable levels by either 1) examining the underlying data and evaluate whether the component studies either pertain to their locations or vegetation conditions of interest, or 2) by determining if the number and breadth of studies may adequately capture the range of conditions within a wildlife habitat and structural condition.

Therefore, it is important to consider how plant communities and conditions at the local site differ from plant communities and conditions in the studies used in DecAID. The primary study used to assess wildlife use of post-fire habitat was Saab and Dudley (1998). These data are from habitat fairly similar to post fire conditions found in the Whychus and Deep Canyon Watershed areas. However, there were more areas of very high snag density in the Saab and Dudley (1998) study than found in Whychus and Deep Canyon Watersheds. For other habitat types, the underlying study information was considered appropriate except where noted in the discussion of effects.

DecAID was used to assist with the analysis of impacts on snag dependent wildlife species. DecAID was used as a:

1. Thorough review of published literature and other available data on wildlife use of decayed wood elements, primarily in Oregon and Washington.
2. Statistical synthesis of data showing levels of use by individual wildlife species of decayed wood elements.
3. Summary of the patterns of use of decayed wood elements by wildlife species in Oregon and Washington (number of species using specific snag or down wood sizes or amounts).
4. Helpful tool for making informed decisions.

DecAID was not used as a:

1. To determine forest stand structure and composition of snags for Whychus and Deep Canyon watersheds.
2. To model snag and down wood recruitment.
3. DecAID was not used to simulate populations or as a viability analysis.
4. Substitute for making professional decisions based on experience.

DecAID Analysis

Using the corporate plant association group (PAG) layer the following PAGS were put into the following DecAID wildlife habitat types (Table 211). The PAG layer was then clipped to the Whychus and Deep Canyon Watersheds and Melvin Butte Project Area.

Table 211 PAGs converted to DecAID Wildlife Habitat Types.

DecAID Wildlife Habitat Type	PAG
Eastside Mixed Conifer**	Mixed Conifer Wet
	Mixed Conifer Dry
	Riparian that occurs within MCW and MCD
Lodgepole	Lodgepole Pine Dry
	Lodgepole Pine Wet
	Riparian that occurs within LPW and LPD
Montane Mixed Conifer Forest	Mountain Hemlock Dry
	White Bark Pine Dry
	Riparian occurring within MHD and WBPD
Ponderosa Pine/Douglas-fir**	Ponderosa Pine Wet
	Ponderosa Pine Dry
	Riparian occurring within PPW and PPD
Non-forest	Alpine Meadow
	Cinder
	Meadow
	Hardwood
	Lava
	Meadow
	Mesic Shrubland
	Rock
	Water

Wildlife data located in DecAID can be utilized by habitat type and structural class. For the Melvin Butte project there are four habitat types: eastside mixed conifer (EMC), lodgepole (LPP), montane mixed conifer (MMC), and ponderosa pine/Douglas-fir (PP). The Melvin Butte project was broken into these four habitat types by utilizing the plant association groups (Table 4). However, the cumulative effects analysis only discussed incremental impact to EMC, LPP, and PP since there are no treatments associated with MMC.

Structural class was broken into two categories. All stand replacement areas were analyzed with the post-fire structural class as outlined by Mellen et al. (2006). All mixed severity, underburned, and unburned areas were analyzed with the small and medium structural class (Table 5).

Stand data for snag numbers (from GNN) were then overlayed to the habitat types and structural classes.

SNAG DEPENDENT SPECIES

DecAID synthesized data from research studies to create cumulative species curves for wildlife use of snags by habitat type and structural condition. From these curves tolerance levels were determined.

Tables 5 through 13 are compilations of synthesized data for wildlife use of snag densities from various studies by habitat type and structural condition located in DecAID.

STAND REPLACEMENT FIRE

There is no available wildlife species use data within DecAID for the lodgepole pine habitat type. The GNN modeling only modeled snags 10 inches and greater, due to majority of the project being within EMC and PP habitat types. Very little of the project occurs within the LPP habitat type. Synthesized data for the post fire montane mixed conifer habitat type only has data for snags 3 inches dbh or greater, so post-fire montane mixed conifer was not evaluated. It is assumed that all post-fire lodgepole and montane mixed conifer habitat types will be providing habitat for species. Table 212 - Table 215 are compilations of synthesized data for wildlife use of snags found within DecAID. There are other species identified in DecAID as using various habitat types and structural classes that were not analyzed, as they are not Management Indicator Species on the Deschutes National Forest.

Table 212 Synthesized data for wildlife use of snag densities from various studies for 10 inch and greater snags in recent post-fire Eastside Mixed Conifer Forest Wildlife Habitat Type

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
Black-backed Woodpecker	56.1	81.1	117.6
Hairy Woodpecker	39.2	63.3	100.0
Lewis' Woodpecker	24.8	43.0	71.0
Mountain Bluebird	38.1	63.2	101.4
Northern Flicker	25.0	48.0	83.1
Western Bluebird	28.8	49.8	81.6
White-headed Woodpecker	0.0	40.0	118.4
Data acquired from DecAID Tables EMC_PF.sp-22			

Table 213 Synthesized data for wildlife use of snag densities rom various studies for 20 inch and greater snags in recent post-fire Eastside Mixed Conifer

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
Cavity Nesting Birds	NA	8.4	NA
Lewis' Woodpecker	0.0	6.2	16.1
Mountain Bluebird	0.0	12.4	38.0
Northern Flicker	2.2	17.4	39.6
Data acquired from DecAID Tables EMC_PF.sp-22			

Table 214 Synthesized data for wildlife use of snag densities from various studies for 10 inch and greater snags in recent post-fire Ponderosa Pine/Douglas fir Forest Wildlife Habitat Type

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
Black-backed Woodpecker	37.4	52.8	76.5
Hairy Woodpecker	39.2	63.3	100.0
Lewis' Woodpecker	24.7	42.7	70.6
Mountain Bluebird	38.1	63.2	101.4

Northern Flicker	25.0	44,9	83.1
Western Bluebird	28.8	49.8	81.6
White-headed Woodpecker	22.2	40.9	68.3
Data acquired from DecAID Tables PPDF_PF.sp-22			

Table 215 Synthesized data for wildlife use of snag densities from various studies for 20 inch and greater snags in recent post-fire Ponderosa Pine/Douglas fir Forest Wildlife Habitat Type

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
Cavity Nesting Bird	NA	8.4	NA
Lewis' Woodpecker	0.0	6.2	16.1
Mountain Bluebird	0.0	12.4	38.0
Northern Flicker	2.2	17.4	39.6
Data acquired from DecAID Tables PPDF_PF.sp-22			

MIXED SEVERITY, UNDERBURNED, AND UNBURNED

Table 216 - Table 222 are compilations of synthesized data for wildlife use of snags found within DecAID.

Table 216 Synthesized data for wildlife use of snag densities from various studies for 10 inch and greater snags in Eastside Mixed Conifer Small and Medium Structure Classes.

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
American Marten	11.8	12.8	14.4
Black-backed Woodpecker	2.5	13.6	29.2
Pileated Woodpecker	14.9	30.1	49.3
Pygmy Nuthatch	1.1	5.6	12.1
White-headed Woodpecker	0.3	1.9	4.3
Williamson's Sapsucker	14.0	28.4	49.7
Data acquired from DecAID Table EMC_S/L.sp-22.			

Table 217 Synthesized data for wildlife use of snag densities from various studies for 20 inch and greater snags in Eastside Mixed Conifer Small and Medium Structure Classes.

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
American Marten	3.7	4.0	4.5
Black-backed	0.0	1.4	5.7

Woodpecker			
Cavity Nesting Birds	NA	2.4	NA
Pileated Woodpecker	3.5	7.8	18.4
Pygmy Nuthatch	0.0	1.6	4.0
White-headed Woodpecker	0.0	1.5	3.8
Williamson's Sapsucker	3.3	8.6	16.6
Data acquired from DecAID Table EMC_S/L.sp-22.			

Table 218 Synthesized data for wildlife use of snag densities from various studies for 10 inch and greater snags in Ponderosa Pine/Douglas Fir Small and Medium Structure Classes.

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
Black-backed Woodpecker	2.5	13.6	29.2
Cavity Nesting Birds	1.2	4.7	10.0
Hairy Woodpecker	0.0	17.0	44.4
Pileated Woodpecker	14.9	30.1	49.3
Pygmy Nuthatch	1.1	5.7	12.1
White-headed Woodpecker	0.0	3.9	11.9
Williamson's Sapsucker	14.0	28.4	49.7
Data acquired from DecAID Table PPDF S/L.sp-22.			

Table 219 Synthesized data for wildlife use of snag densities from various studies for 20 inch and greater snags in Ponderosa Pine/Douglas Fir Small and Medium Structure Classes.

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
Black-backed Woodpecker	0.0	1.4	5.7
Cavity Nesting Birds	0.0	1.0	2.8
Pileated Woodpecker	3.5	7.8	18.4
Pygmy Nuthatch	0.0	1.6	4.0

White-headed Woodpecker	0.5	1.8	3.8
Williamson's Sapsucker	3.0	8.4	16.3
Data acquired from DecAID Table PPDF S/L.sp-22.			

Table 220 Synthesized data for wildlife use of snag densities from various studies for 20 inch and greater snags in Montane Mixed Conifer Small and Medium Structure Classes.

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
American Marten	3.7	4.0	4.5
Data acquired from DecAID Tables MMC_S/L.sp-22.			

Table 221 Synthesized data for wildlife use of snag densities from various studies for 10 inch and greater snags in Lodgepole Small and Medium Structure Classes.

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
American Marten	11.8	12.8	14.4
Data acquired from DecAID Tables LP_S.sp-22.			

Table 222 Synthesized data for wildlife use of snag densities from various studies for 20 inch and greater snags in Lodgepole Small and Medium Structure Classes.

Species	30% t.l. Snag Density (#/acre)	50% t.l. Snag Density (#/acre)	80% t.l. Snag Density (#/acre)
American Marten	3.7	4.0	4.5
Data acquired from DecAID Tables LP_S.sp-22.			

For more detailed information about the wildlife data and associated research see the DecAid Advisor www.fs.fed.us/wildecology/decaid/decaid_background/decaid_home.htm

Whychus Creek and Deep Canyon Watersheds Wildlife Species Analysis

Using data from GNN and data within DecAID, an analysis was conducted to rate habitat quality for individual species. Since the Melvin Butte project does not propose to remove snags and any reduction in snags will be incidental, there is no measurable difference to snag densities at the watershed level by alternative. Thus, the following table displays habitat quality for the watersheds. The following assumptions were used for this analysis.

1. GNN data accurately depicts snags numbers.
2. "It is our fundamental assumption that patterns of species' use and selection of dead wood size and amounts represent behaviors that have adaptive advantage for the species and that serve to bolster individual fitness" (Mellen et al. 2006).

3. Synthesized data for wildlife use of snag densities from Mellen et al. (2006) represent wildlife use within the Whychus and Deep Canyon watersheds.

GNN acres within the Whychus and Deep Canyon watersheds were stratified for each species depending on habitat type and structural composition. Table 223 displays estimated acres by quality of habitat for snag dependent species.

Table 223 Comparison of habitat for species that utilize stand replacement, mixed severity, underburned fire and unburned areas.

Species	0-30% Poor Quality	>30-50% Low Quality	>50-80% Moderate Quality	>80% High Quality	Grand Total
American Marten	266,230	28,008	25,988	123,088	443,314
Black Backed Wood Pecker	429,942	149,257	50,378	28,526	658,103
Cavity Nesting Birds	316,492	46,795	7,988	5,662	376,938
Hairy Woodpecker	232,395	142,230	1,410	903	376,938
Pileated Woodpecker	583,976	45,890	14,162	14,075	658,103
Pygmy Nuthatch	375,737	99,878	75,101	107,388	658,103
White-headed Woodpecker	269,801	147,231	60,970	180,100	658,103
Williamson's Sapsucker	582,173	46,110	15,745	14,075	658,103

APPENDIX D – WILDLIFE MANAGEMENT INDICATOR SPECIES

Management Indicator Species

Management Indicator Species from the Deschutes LRMP Species	Scientific Name
Northern Goshawk	*Accipiter gentiles*
Coopers Hawk	*Accipiter cooperii*
Sharp-shinned Hawk	*Accipiter striatus*
Golden Eagle	*Aquila chrysaetos*
Great Gray Owl	*Strix nebulosa*
Great Blue Heron	*Ardea herodias*
Red-tailed Hawk	*Buteo jamaicensis*
Osprey	*Pandion haliaetus*
Elk	*Cervus elephas*
Mule Deer	*Odocoileus hemionus*
American Marten	*Martes americana*
Western Big-eared Bat (Townsend's)	*Plecotus townsendii*
Woodpeckers (MIS)	
Black-backed Woodpecker	*Picoides arctus*
Hairy Woodpecker	*Picoides villosus*
Lewis' Woodpecker	*Melanerpes lewis*
Northern Flicker	*Colaptes auratus*
Pileated Woodpecker	*Dryocopus pileatus*
Pymy Nuthatch	*Sitta pygmaea*
White-headed Woodpecker	*Picoides albolarvatus*
Waterfowl (MIS)	
Canada Goose	*Branta canadensis*
Wood Duck	*Aix sponsa*

Mallard	*Anas platyrhynchos*
Northern Pintail	*Anas acuta*
Blue-winged Teal	*Anas discors*
Cinnamon Teal	*Anas cyanoptera*
Northern Shoveler	*Anas clypeata*
American Wigeon	*Anas Americana*
Canvasback	*Aythya valisineria*
Redhead	*Aythya Americana*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Green-winged Teal	*Anas carolinensis*
Ring-necked Duck	*Aythya collaris*
Barrow's Goldeneye	*Bucephala islandica*

APPENDIX E – SURVEY AND MANAGE WILDLIFE

DESCHUTES NATIONAL FOREST SURVEY & MANAGE TRACKING FORM

Wildlife Species Survey and Site Management Summary

Project Name: Melvin Butte Project **Prepared By:** Monty Gregg

Project Type: Thinning to improve forest health and reduce fire risk, prescribed fire, road decommissioning.

Date: September 17, 2015

Location: T16S, R09E and T17S, R09E

This is a Survey and Manage (S&M) species checklist and form to track compliance with the 2001 Record of Decision. For each project within the Northwest Forest Plan Area, fill out the Checklist, Tracking Form, Statement of Compliance and Summary of Survey Results. Sign and Date the form at the end of this document.

> This checklist and format are not intended to replace the effects analysis section of you National Environmental Policy Act (NEPA) document. Include the tracking forms as an appendix to the NEPA document, summarize the projects S&M conformance with the 2001 ROD S&Gs in the NEPA document itself. If you have questions or believe your project has a high litigation risk, pleas work with the S&M Contact for your National Forest/BLM District and the appropriate program leads in you FS Regional or BLM State Office to finalize your tracking form for greatest accuracy and defensibility.

The Deschutes National Forest compiled the species listed below (Table Appendix E 1) from the 2001 Record of Decision. This list includes those wildlife species with pre-disturbance survey requirements (Category A or C species), who's known or suspected range includes the Deschutes National Forest.

Table Appendix E 1 identifies Category A, B, C, D, and E species with known sites located within the Project Area.

Appendix E 1 Survey and Manage wildlife species evaluation for the Melvin Butte Project on the Sisters Ranger District, Deschutes National Forest.

Species	Group	S&M Category	Survey Triggers			Survey Results			Site Management
			Project Within Species Range?	Project Contains Suitable Habitat or Old Growth Forest?	Project Habitat Disturbing?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	Describe applied management and what information used to determine this management
Pristiloma arcticum crateris	Mollusk	A[1]	Yes	Yes	No	No[5]	N/A		
Deroceras hesperium	Mollusk	B[2]	Yes	Yes	No	No[6]	N/A		
Strix nebulosa	Vertebrate	C[3]	Yes	No	No	No [4]	N/A		

[1] Pre-disturbance surveys and management of all known sites are required for Category A species.

[2] Equivalent effort surveys required for this mollusk species.
[3] Although the great gray owl is within management Category C (which indicates that only high-priority sites require management) all known sites will require management and be considered high-priority. The Category C designation indicates however, that not all sites need to be discovered through surveys, and allows for a reduced survey effort as identified below.

Pre-disturbance surveys: Pre-disturbance surveys will follow Version 3.0 of the Great Gray Owl Survey Protocol (or future revisions/amendments), except for only 1 year of surveys are required. Pre-disturbance surveys of suitable nesting habitat are required only for proposed activities:

- That fall potential trees within 600 feet of natural openings that are 10 acres or greater and provide suitable conditions for great gray owl nesting (good foraging base); OR
- Where disturbance above ambient levels (or other activities that may impact potential nesting owls) will occur within 300 feet (or up to 1-mile for blasting) of suitable nesting habitat associated with natural openings 10 acres or greater between March 1st and July 31st.

Management Recommendations: Until new Management Recommendations are developed, the following serve as management requirements for this species. Around known (see Protocol definition) and future sites provide:

- A 30 acre management area encompassing the best available nest trees. Within the 30 acre area, management treatments are limited to protection or improvement of nesting habitat.
- A 0.25 mile radius protection zone. Within protection zone,
    - Provide a 300 foot buffer around natural openings greater than 10 acres that have nesting habitat associated with them. Within this 300 foot buffer, treatments are limited to protection or improvement of nesting habitat.
    - Prohibit disturbance from management activities within 300 feet of nesting habitat (1 mile radius for blasting) from March 1st-July 31st, or until fledging, whichever is later, unless surveys of the nesting habitat indicate no presence or no nesting.

[4] Pre-disturbance surveys for Great Gray Owls are not required since there is no suitable nesting habitat within the project area or within proximity of the project area that would be impacted by disturbance. The required habitat characteristics of suitable habitat include: (1) large diameter nest trees, (2) forest for roosting cover, and (3) proximity [within 600 feet] to openings that could be used as foraging areas (Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0, January 12, 2004; and mitigation language in the 2011 Settlement Agreement Species List). The stands in the Melvin Butte project do not have proximity to natural-openings $\geq$10 acres (Name, staff review, 2011) and pre-disturbance surveys are not suggested in suitable nesting habitat adjacent to man-made openings at this time (pg. 14, Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0, January 12, 2004).

[5] Suitable habitat for the Crater Lake tightcoil is "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…" (pg. 43, Survey Protocol for S&M Terrestrial Mollusk Species v3.0, 2003). Within the project, there is no suitable habitat.

[6] Suitable habitat for the evening fieldslug is "perennially wet situations in mature conifer forests, among rushes, mosses and other surface vegetation or under rocks and woody debris…" (pg. 4, *Conservation Assessment for Deroceras hesperium Evening fieldslug*, 2005). Within the project, there is no suitable habitat.

STATEMENT OF COMPLIANCE

The Deschutes National Forest applied the 2011 Settlement Agreement Species List to the Melvin Butte project, completing pre-disturbance surveys, equivalent effort surveys (if old growth habitat is disturbed) and management of known sites (Table A) required by Survey Protocols and Management Recommendations to comply with the *2001 Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines*.

SUMMARY OF SURVEY RESULTS

Project surveys discovered sites for the following Survey and Manage wildlife species:

- _N/A_____

Known sites are present within the project area for these additional species:

- _N/A_____

APPENDIX F – SURVEY AND MANAGE BOTANY

Deschutes National Forest
Survey & Manage Botany Checklist and Tracking Form

Project Name: Melvin Butte Forest Management Project

Describe Project Type: Thinning to improve forest heath and reduce fire risk, prescribed fire, road decommissioning.

Prepared By: Maret Pajutee **Date:** September 22, 2014

District: Sisters

Location: Melvin Butte

This is a Survey and Manage (S&M) species checklist and form to track compliance with the 2001 Record of Decision. For each project within the Northwest Forest Plan Area, fill out Sections A-D (Checklist, Tracking Form, Statement of Compliance and Summary of Survey Results). Sign and date the form at the end of this document.

This checklist and format are not intended to replace the effects analysis section of your National Environmental Policy Act (NEPA) document. Include the tracking forms in your project NEPA. If you include the tracking forms as an appendix to the NEPA document, summarize the project's S&M conformance with the 2001 ROD S&Gs in the NEPA document itself. If you have questions or believe your project has a high litigation risk, please work with the S&M Contact for your National Forest/BLM District and the appropriate program leads in your FS Regional or BLM State Office to finalize your tracking forms for greatest accuracy and defensibility.

A. CHECKLIST – complete this checklist for each project within the NW Forest Plan Area.

☒ **Species List:**

☒ 1. For project decisions, check which box, below, applies:

☒ Surveys were completed using: the December 2003 species list (i.e., 2001 Record of Decision species list. with the Annual Species Reviews).

☒ "Special Consideration" was given for the following species suspected or documented to occur on the Deschutes NF

- ☒ Lichen *Cheanotheca furfuracea*
- ☒ Lichen *Cladonia norvegica*
- ☒ Fungus *Clavariadelphus truncatus*

☒ Surveys were not completed (In a subset of the project area) because the project applied one of the four Pechman Exemptions; therefore the project is exempt from Survey &Manage pre-disturbance surveys and known site management. The following Pechman Exemption was applied:

☒ Thinning forest stands < 80 years old
☐ Culvert replacement/removal
☐ Riparian/stream improvement projects
☒ Hazardous fuel treatments applying prescribed fire for noncommercial projects.

The exemption was applied to plantations less than 80 years old and areas which were slated for fuels reduction, small tree thinning and prescribed fire.

☒ 2. Double check S&M categories and species names for correctness and accuracy.

☒ **Survey Protocols:**

☒ 1. Use survey protocols and any Annual Species Review (ASR) range extensions/contractions to determine if the project is in the species range, has suitable habitat, is a "habitat-disturbing activity" and, hence, needs pre-disturbance surveys.

☒ 2. Identify and list the survey protocols used. Note the survey protocol name in the preceding bullets to Table A.

Fungi- USFS, 2012. Survey & Manage Category B Fungi Equivalent-Effort Survey Protocol, Version 1.0, February 2012

☒ 3. Confirm survey results are entered into the appropriate Agency database.

☒ 4. Confirm forms are in the project record. The survey forms are evidence that surveys were conducted within protocol parameters and demonstrate survey findings.

☒ **Survey Requirements:**

☒ 1. Include the following species in Table A:

a. Category A and C flora species **known or suspected** to occur within the National Forest/BLM District (pre-disturbance surveys).

☒ 2. For habitat-disturbing projects within old-growth forests (2001 ROD S&Gs, pp. 79-80), list the following species in Table A:

☒ Include Category B bryophyte and lichen species **known or suspected** to occur within the National Forest/BLM District (if your project has a Decision in FY06 or later and strategic surveys are not completed for the province that encompasses the project area, then equivalent effort surveys are required in old-growth habitat to be disturbed; 2001 ROD S&G, p. 9). Do not list the 8 lichen and bryophyte species where strategic surveys are considered complete. See IM-2006-38 for further information about these species and about Equivalent Effort surveys.

☒ Include Category B fungi species **known or suspected** to occur within the National Forest/BLM District if your project has a Decision in FY11 or later (if your project has a Decision in FY06 or later and strategic surveys are not completed for the province that encompasses the project area, then equivalent effort surveys are required in old-growth habitat to be disturbed; 2001 ROD S&G, p. 9).

☒ 3. Although you are listing all species with pre-disturbance and equivalent effort survey requirements that are **known or suspected** within your National Forest/BLM District, Table A should reflect how the species information is applied to the [PROJECT] specifically. For instance, some of the species may be known or suspected within your National forest/BLM District, but the project may not be within the range of the species, and therefore the species is not known or suspected within the specific project.

☒ 4. Review consistency of responses in consecutive columns of Table A for a given species. If a project is not within the range of the species, you can't have suitable habitat in

the project (i.e. doesn't make sense to put "No" in the first column for "within range of the species" and then have "Yes" in second column for "project contains suitable habitat").

☒ **Known Site Management:**

☒ 1. Include in Table A any species with **known sites that** occur **within the project area**.

☐ Indicate what site management the unit implemented and what information the National Forest/BLM District utilized in determining appropriate site management (management recommendations, conservation assessments, species fact sheets, Appendix J-2, etc.). Be specific when describing exact management applied; for example, "placed a 100 ft. no-activity area around the site (source citation)."

☒ 2. For Category D and E species, only the "Sites Known or Found" and "Site Management" sections of Table A need to be filled out (all other fields should be N/A).

☐ Indicate what site management the unit implemented and what information the National Forest/BLM District utilized in determining appropriate site management (management recommendations, conservation assessments, species fact sheets, Appendix J-2, etc.). Be specific when describing exact management applied; for example, "placed a 100 ft. no-activity area around the site (source citation)."

☒ 3. For species not requiring site management (non-high priority sites, occasional site of a rare species not needed for persistence, Category F species), indicate that site management is not required and why.

(Note: While a "yes/no/NA" answer is sufficient in the column titled "Site Management" for Table A, provide the more detailed information identified above in 1-3 in either a footnote to Table A or the Statement of Compliance-Summary of Survey Results section at the end of the form.)

☒ **Information Regarding Unique Circumstances:**

Use the footnotes section of Table A for information that describes unique circumstances in your National Forest/BLM District or for further clarification. Don't use them to restate something that is already clear from the table. For example, it may be helpful to more completely explain that the range of the species bi-sects the National Forest/BLM District and the specific project is outside the range.

☒ **Final Statement of Compliance:**

Include a summary in the Statement of Compliance to include identification of:

☒ 1. Species list applied 2003

☒ 2. Species surveyed: See Table A

☒ 3. Species found or with known sites in the project area NONE

☒ 4. Information demonstrating application of management recommendations

Survey Protocols Used:

Equivalent effort FUNGI- USFS, 2012. Survey & Manage Category B Fungi Equivalent-Effort Survey Protocol, Version 1.0, February 2012. http://www.blm.gov/or/plans/surveyandmanage/files/sp-fu-catB-equiv-effort-2012.pdf

Cladonia norvegica- Supplemental Guidance for Pre-Disturbance Surveys Under the Northwest Forest Plan Survey and Manage Standard and Guidelines *Cladonia norvegica*, USDA Forest Service Regions 5 and 6, USDI Bureau of Land Management, Oregon and California, September 2012. http://www.blm.gov/or/plans/surveyandmanage/files/sp-li-cladonia-norvegica-enc.pdf

- Identify the management recommendation or other information utilized.

- Clearly describe on-the-ground application of known site management. What management/protective measures were specifically applied to provide for the persistence of the species at the known site.

Botany Species Survey and Site Management Summary

C. <u>TRACKING FORM</u> – Use this form to track compliance with surveys and known site management.

D.

The Deschutes National Forest compiled the species listed below (**Table A**) from the 2001 Record of Decision. This list includes those vascular and non-vascular plant species with pre-disturbance survey requirements (Category A or C species), whose known or suspected range includes the Deschutes National Forest according to the references listed in **Appendix B.**

IF YOUR PROJECT IS A HABITAT-DISTURBING ACTIVITY IN OLD GROWTH, KEEP THIS SECTION: This list also includes species with Equivalent Effort pre-disturbance survey requirements, including Category B lichen and bryophytes and Category B fungi species whose known or suspected range includes the Deschutes National Forest according to the references listed in **Appendix A**.

All other survey and manage species that are on the 2011 Settlement Agreement list but are not included in Table A, are not known or suspected to occur on the Deschutes NF either because the Forest is outside the known or expected range of the species or the Forest does not contain suitable habitat for the species.

Equivalent effort surveys are not required for this project for Category B lichen, bryophyte and fungi species because:

___ Old growth habitat does not occur with the project area

_X_ Old growth habitat occurs but the project will not cause a significant negative impact on species' habitat, life cycle, microclimate, or life support requirement.

***Explanation*: The old growth to be affected in the project area falls under the Pechman Exemption for fuel reduction. Thinning small trees under 8" dbh and prescribed fire would be used.**

Table A identifies Category A, B, C, D, and E species with known sites located within the Project Area. The references listed in **Appendix A** were used to determine appropriate known site management.

Survey & Manage plant species evaluation for the Melvin Butte Project. Species highlighted in yellow need Special Consideration.

Appendix F 1 Survey & Manage plant speices evaluation for the Melvin Butte Project on the Sisters Ranger District, Deschutes National Forest.

Species	Group	S&M Category	Survey Triggers			Survey Results			Site Management
			Project Within Species Range?	Project Contains Suitable Habitat or Old Growth Forest?	Project Habitat Disturbing?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	Describe applied management and what information used to determine this management
Schistostega pennata	Bryophyte	A[1]	yes	yes	yes	yes	8/07	no	
Leptogium cyanescens	Lichen	A	yes	yes	yes	yes	8/07	no	
Rhizomnium nudum	Bryophyte	B[3]	yes	yes	yes	yes	8/07	no	
Tritomaria exsectiformis	Bryophyte	B[2]	yes	yes	yes	yes	8/07	no	
Calicium abietinum	Lichen	B[3]	yes	no	yes	yes	8/07	no	
Chaenotheca Chrysocephala	Lichen	B[3]	yes	no	yes	yes	8/07	no	
Chaenotheca ferruginea	Lichen	B[3]	yes	no	yes	yes	8/07	no	
Cladonia norvegica	Lichen	B[8]	yes	no	yes	yes	8/07	no	
Dermatocarpon luridum (now called D. meiophyllizum)	Lichen	B[2]	yes	no	yes	yes	8/07	no	
Tholurna dissimilis	Lichen	B[2]	yes	no	yes	yes	8/07	no	

Species	Group	S&M Category	Survey Triggers			Survey Results			Site Management
			Project Within Species Range?	Project Contains Suitable Habitat or Old Growth Forest?	Project Habitat Disturbing?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	Describe applied management and what information used to determine this management
Albatrellus caeruleoporus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Albatrellus ellisii	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Alpova alexsmithii	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Arcangeliella crassa	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Arcangeliella lactarioides	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Boletus pulcherrimus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Choiromyces alveolatus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Chroogomphus loculatus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Clavariadelphus ligula	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Clavariadelphus occidentalis	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Clavariadelphus sachalinensis	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Clavariadelphus truncatus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Cortinarius magnivelatus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	

Species	Group	S&M Category	Survey Triggers			Survey Results			Site Management
			Project Within Species Range?	Project Contains Suitable Habitat or Old Growth Forest?	Project Habitat Disturbing?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	Describe applied management and what information used to determine this management
Cortinarius olympianus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Cortinarius verrucisporus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Cortinarius wiebeae	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Cudonia monticola	Fungus Litter saprobe	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Elaphomyces anthracinus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Elaphomyces subviscidus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Fayodia bishpaerigera	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Fevansia aurantiaca (= Alpova aurantiaca)	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Gastroboletus ruber	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Gastroboletus subalpinus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Gastroboletus turbinatus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Gastroboletus vividus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	

Species	Group	S&M Category	Survey Triggers			Survey Results			Site Management
			Project Within Species Range?	Project Contains Suitable Habitat or Old Growth Forest?	Project Habitat Disturbing?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	Describe applied management and what information used to determine this management
Gautieria magnicellaris	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Gomphus bonarii	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Gomphus clavatus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Gymnomyces abietis	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Gymnomyces nondistincta	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Gyromitra californica	Fungus Wood/litter saprobel	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Helvella crassitunicata	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Hydnotrya inordata	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Hygrophorus caeruleus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Leucogaster citrinus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Polyozellus multiplex	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Ramaria amyloidea	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Ramaria aurantiisiccescens	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	

Species	Group	S&M Category	Survey Triggers			Survey Results			Site Management
			Project Within Species Range?	Project Contains Suitable Habitat or Old Growth Forest?	Project Habitat Disturbing?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	Describe applied management and what information used to determine this management
Ramaria botrytis var. aurantiiramosa	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Ramaria coulterae	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Ramaria largentii	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Ramaria maculatipes	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Ramaria rubrievanescens	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Ramaria thiersii	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Rhizopogon abietis	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Rhizopogon atroviolaceus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Rhizopogon evadens var. subalpinus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Rhizopogon exiguous	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Rhizopogon flavofibrillosus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Sarcodon fuscoindicus	Fungus Mycorrhizal	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	

Species	Group	S&M Category	Survey Triggers			Survey Results			Site Management
			Project Within Species Range?	Project Contains Suitable Habitat or Old Growth Forest?	Project Habitat Disturbing?	Surveys Required?	Survey Date (month/year)	Sites Known or Found?	Describe applied management and what information used to determine this management
Spathularia flavida	Fungus Litter saprobe	B[2]	yes	yes	yes	yes	6/11, 10/11, 5/12, 10/12	no	
Cypripedium montanum	Vascular	C[4]	yes	yes	yes	yes	8/07		
Chalciporus piperatus	Fungus Mycorrhizal	D[5]	yes	N/A	N/A	No[2]	N/A		
Mycena overholtsii	Fungus Wood saprobel	D[5]	yes	N/A	N/A	No[2]	N/A		
Phaeocollybia attenuata	Fungus Mycorrhizal	D[5]	yes	N/A	N/A	No[2]	N/A		
Ramaria rubripermanens	Fungus Mycorrhizal s	D[5]	yes	N/A	N/A	No[2]	N/A		
Rhizopogon truncatus	Fungus Mycorrhizal	D[5]	yes	N/A	N/A	No[2]	N/A		
Sparassis crispa	Fungus Wood saprobe	D[5]	yes	N/A	N/A	No[2]	N/A		
Tremiscus helvelloides	Fungus Litter saprobe	D[5]	yes	N/A	N/A	No[2]	N/A		
Chaenotheca subroscida	Lichen	E[6]	yes	N/A	N/A	No[6]	N/A		
Chaenothecopsis pusilla	Lichen	E[6]	yes	N/A	N/A	No[6]	N/A		

Species	Group	S&M Category	Survey Triggers			Survey Results			Site Management
			Project Within Species Range?	**Project Contains Suitable Habitat or Old Growth Forest?**	**Project Habitat Disturbing?**	**Surveys Required?**	**Survey Date (month/year)**	**Sites Known or Found?**	**Describe applied management and what information used to determine this management**
Leptogium teretiusculum	Lichen	E[6]	yes	N/A	N/A	No[6]	N/A		
Chaenotheca furfuracea	Lichen	F[7]	yes	N/A	N/A	No[7]	N/A		*Not required to manage known sites but if apply site management, describe:*
Collema nigrescens	Lichen	F[7]	yes	N/A	N/A	No[7]	N/A		*Not required to manage known sites but if apply site management, describe:*
Collybia bakerensis	Fungus Litter saprobe	F[7]	yes	N/A	N/A	No[7]	N/A		*Not required to manage known sites but if apply site management, describe:*
Gomphus clavatus	Fungus Mycorrhizal	F[7]	yes	N/A	N/A	No[7]	N/A		*Not required to manage known sites but if apply site management, describe:*

[1] Pre-disturbance surveys and management of all known sites are required for Category A species
[2] Equivalent effort surveys required if old growth habitat disturbed and manage all known sites (Category B species)
[3] Strategic surveys completed; therefore equivalent effort surveys are **not** required (memo titled, *Category B Lichens and Bryophytes where Strategic Surveys are Considered Complete*, March 24, 2006).
[4] Pre-disturbance surveys and management of high priority sites are required for Category C species
[5] Pre-disturbance surveys are not required for Category D species, but required to manage high priority sites
[6] Pre-disturbance surveys are not required for Category E species, but required to manage all known sites
[7] Pre-disturbance surveys and management of known sites are not required for Category F species
[8] Special Consideration given to this species per Letter of Direction dated May 13, 2014

APPENDIX G – ECONOMICS

Alternative 2 net present value analysis

Net present Value Analysis				**Net present Value**	**$ 212,297.32**								
Alternative 2				**Benefit cost ratio**	**1.11**								
				Revenues									
				Delivered log price									
Project area acres	5375			**$ 140.00**	**Market Discount Rate**	4%							
				Pulp/chip per ton									
				$ 30.00									
										Total		Discounted	
Year	time	Activity	unit	No of units	Acres (multiplier)	Total No. units	Cost per unit	Revenue per unit		cost	revenue	Cost	Revenue
2015	0	Planning	5375 acres	5375	NA	1	$ 300,000.00			$ 300,000.00	$ -	$ 300,000.00	
2015	0	Sale prep/admin	CCF	20371	1	20371	$ 20.00			$ 407,420.00	$ -	$ 407,420.00	
2015	0	Road Maintenance	CCF	20371	1	20371	$ 6.00			$ 122,226.00	$ -	$ 122,226.00	
2015	0	Removal of 4-7"material	CCF	7131.0	1	7131.00		$ 30.00		$ -	$ 213,930.00	$ -	$ 213,930.00
2015	0	Saw logs	CCF	13240	1	13240.00		$ 140.00		$ -	$ 1,853,600.00	$ -	$ 1,853,600.00
2015	0	PCT (whipping) <4"dbh	acre	3786	1	3786.00	$ 100.00			$ 378,600.00	$ -	$ 378,600.00	$ -
Sub-totals										$ 1,208,246.00	$ 2,067,530.00	$ 1,208,246.00	$ 2,067,530.00
2016	1	mowing/mastication	Acres	1218	1	1218	$ 100.00			$ 121,800.00		$ 117,115.38	
2016	1	Burn landing piles	landings	150	1	150	$ 30.00			$ 4,500.00		$ 4,326.92	
2016	1	Pruning	Acres	1166	1	1166	$ 100.00			$ 116,600.00		$ 112,115.38	
Sub-totals										$ 242,900.00	$ -	$ 233,557.69	$ -
2017	2	Pruning	acres	1166	1	1166	$ 100.00			$ 116,600.00		$ 107,803.25	
2017	2	under burn	acres	1218	1	1218	$ 100.00			$ 121,800.00		$ 112,610.95	
Sub-totals										$ 238,400.00	$ -	$ 220,414.20	$ -
2018	3	Planting (KV)	acres	250	1	250	$ 400.00			$ 100,000.00		$ 88,899.64	
2018	3	under burn	acres	1218	1	1218	$ 100.00			$ 121,800.00		$ 108,279.76	
Sub-totals										$ 100,000.00	$ -	$ 88,899.64	$ -
2019	4	Underburn	acres	1218	1	1218	$ 100.00			$ 121,800.00		$ 104,115.15	
										$ 121,800.00	$ -	$ 104,115.15	$ -
Grand totals										$ 1,911,346.00	$ 2,067,530.00	$ 1,855,232.68	$ 2,067,530.00
												Cost	Revenue
											Per acre	$ 345.16	$ 384.66

Alternative 3 net present value analysis

Net present Value Analysis				**Net present Value**	**$ 79,386.45**							
Alternative 3				**Benefit cost ratio**	**1.04**							
				Revenues								
				Delivered log price								
Project area acres	5375			**$ 140.00**	**Market Discount Rate**	4%						
				Pulp/chip per ton								
				$ 30.00								
									Total		Discounted	
Year	time	Activity	unit	No of units	Acres (multiplier)	Total No. units	Cost per unit	Revenue per unit	cost	revenue	Cost	Revenue
2015	0	Planning	5375 acres	5375	NA	1	$ 300,000.00		$ 300,000.00	$ -	$ 300,000.00	
2015	0	Sale prep/admin	CCF	19274	1	19274	$ 20.00		$ 385,480.00	$ -	$ 385,480.00	
2015	0	Road Maintenance	CCF	19274	1	19274	$ 6.00		$ 115,644.00	$ -	$ 115,644.00	
2015	0	Removal of 4-7"material	CCF	6709.0	1	6709.00		$ 30.00	$ -	$ 201,270.00	$ -	$ 201,270.00
2015	0	Saw logs	CCF	12565	1	12565.00		$ 140.00	$ -	$ 1,759,100.00	$ -	$ 1,759,100.00
2015	0	PCT (whipping) <4"dbh	acre	3786	1	3786.00	$ 100.00		$ 378,600.00	$ -	$ 378,600.00	$ -
Sub-totals									$ 1,179,724.00	$ 1,960,370.00	$ 1,179,724.00	$ 1,960,370.00
2016	1	mowing/mastication	Acres	1218	1	1218	$ 100.00		$ 121,800.00		$ 117,115.38	
2016	1	Burn landing piles	landings	150	1	150	$ 30.00		$ 4,500.00		$ 4,326.92	
2016	1	Pruning	Acres	1351	1	1351	$ 100.00		$ 135,100.00		$ 129,903.85	
Sub-totals									$ 261,400.00	$ -	$ 251,346.15	$ -
2017	2	Pruning	acres	1351	1	1351	$ 100.00		$ 135,100.00		$ 124,907.54	
2017	2	under burn	acres	1218	1	1218	$ 100.00		$ 121,800.00		$ 112,610.95	
Sub-totals									$ 256,900.00	$ -	$ 237,518.49	$ -
2018	3	under burn	acres	1218	1	1218	$ 100.00		$ 121,800.00		$ 108,279.76	
Sub-totals									$ 121,800.00	$ -	$ 108,279.76	$ -
2019	4	Underburn	acres	1218	1	1218	$ 100.00		$ 121,800.00		$ 104,115.15	
									$ 121,800.00	$ -	$ 104,115.15	$ -
Grand totals									$ 1,941,624.00	$ 1,960,370.00	$ 1,880,983.55	$ 1,960,370.00
											Cost	Revenue
										Per acre	$ 349.95	$ 364.72

APPENDIX H – POTENTIAL WILDERNESS AREA CLASSIFICATION

Appendix H 1 Evaluation of potential wilderness area polygons based on FSH 1909.12 Chapter 71 Inventory Criteria.

ParentPolyID	PolyID	Analysis_Acres	PWAreaAnalyzed	PWA	PWAComment	Regulation1	Regulation2a	Regulation2b	Regulation2c	Regulation 3
1	1	7.3	Yes	no	firewood cutting	no	no	no	no	no
2	2	18.9	Yes	no	firewood cutting	no	no	no	no	no
3	3	4.7	Yes	no	firewood cutting	no	no	no	no	no
4	4	71.9	Yes	no	firewood cutting	no	no	no	no	no
5	5	42.4	Yes	no	firewood cutting	no	no	no	no	no
6	6	44.6	Yes	no	firewood cutting	no	no	no	no	no
7	7	3.7	Yes	no	firewood cutting	no	no	no	no	no
8	8	21.3	Yes	no	firewood cutting	no	no	no	no	no
9	9	4.1	Yes	no	firewood cutting	no	no	no	no	no
10	10	11.5	Yes	no	firewood cutting	no	no	no	no	no
11	11	60.8	Yes	no	firewood cutting	no	no	no	no	no
12	12	4.9	Yes	no	firewood cutting	no	no	no	no	no
13	13	1.4	Yes	no	firewood cutting	no	no	no	no	no
14	14	8.6	Yes	no	firewood cutting	no	no	no	no	no
16	16	7.3	Yes	no	firewood cutting	no	no	no	no	no
17	17	2.1	Yes	no	firewood cutting	no	no	no	no	no
18	18	1.1	Yes	no	firewood cutting	no	no	no	no	no
19	19	1.8	Yes	no	firewood cutting	no	no	no	no	no
20	20	116.7	Yes	no	firewood cutting	no	no	no	no	no
21	21	20.4	Yes	no	firewood cutting	no	no	no	no	no
22	22	8.0	Yes	no	firewood cutting	no	no	no	no	no
23	23	95.1	Yes	no	firewood cutting	no	no	no	no	no
24	24	48.1	Yes	no	firewood cutting	no	no	no	no	no
25	25	5.8	Yes	no	sanitation-salvage	no	no	no	no	no
26	26	1.2	Yes	no	sanitation-salvage	no	no	no	no	no

ParentPolyID	PolyID	Analysis_Acres	PWAreaAnalyzed	PWA	PWAComment	Regulation1	Regulation2a	Regulation2b	Regulation2c	Regulation 3
27	27	23.6	Yes	no	firewood cutting	no	no	no	no	no
28	28	1.6	Yes	yes	ADJ. WILDERNESS	no	no	no	yes	yes
29	29	13.3	Yes	no	sanitation-salvage	no	no	no	no	no
30	30	23.6	Yes	no	firewood cutting	no	no	no	no	no
31	31	3.2	Yes	no	sanitation-salvage	no	no	no	no	no
32	32	15.4	Yes	no	sanitation-salvage	no	no	no	no	no
33	33	2.2	Yes	no	sanitation-salvage	no	no	no	no	no
34	34	2.1	Yes	no	sanitation-salvage	no	no	no	no	no
35	35	60.6	Yes	no	sanitation-salvage	no	no	no	no	no
36	36	24.2	Yes	no	sanitation-salvage	no	no	no	no	no
37	37	10.2	Yes	no	sanitation-salvage	no	no	no	no	no
38	38	3.3	Yes	no	sanitation-salvage	no	no	no	no	no
39	39	4.4	Yes	no	sanitation-salvage	no	no	no	no	no
40	40	8.7	Yes	no	sanitation-salvage	no	no	no	no	no
41	41	1.2	Yes	no	sanitation-salvage	no	no	no	no	no
42	42	27.1	Yes	no	sanitation-salvage	no	no	no	no	no
43	43	8.1	Yes	no	sanitation-salvage	no	no	no	no	no
44	44	4.3	Yes	no	sanitation-salvage	no	no	no	no	no
45	45	1.3	Yes	no	sanitation-salvage	no	no	no	no	no
46	46	14.3	Yes	no	sanitation-salvage	no	no	no	no	no
47	47	2.0	Yes	no	sanitation-salvage	no	no	no	no	no
48	48	24.6	Yes	no	sanitation-salvage	no	no	no	no	no
49	49	12.9	Yes	no	sanitation-salvage	no	no	no	no	no
50	50	1.6	Yes	no	sanitation-salvage	no	no	no	no	no
51	51	40.8	Yes	no	sanitation-salvage	no	no	no	no	no
52	52	11.9	Yes	no	sanitation-salvage	no	no	no	no	no
53	53	10.7	Yes	no	sanitation-salvage	no	no	no	no	no

ParentPolyID	PolyID	Analysis_Acres	PWAreaAnalyzed	PWA	PWAComment	Regulation1	Regulation2a	Regulation2b	Regulation2c	Regulation 3
54	54	14.6	Yes	no	sanitation-salvage	no	no	no	no	no
55	55	15.9	Yes	no	sanitation-salvage	no	no	no	no	no
56	56	12.0	Yes	no	sanitation-salvage	no	no	no	no	no
57	57	14.1	Yes	no	sanitation-salvage	no	no	no	no	no
58	58	7.0	Yes	no	sanitation-salvage	no	no	no	no	no
59	59	5.4	Yes	no	sanitation-salvage	no	no	no	no	no
60	60	28.1	Yes	no	sanitation-salvage	no	no	no	no	no
61	61	1.9	Yes	no	sanitation-salvage	no	no	no	no	no
62	62	5.4	Yes	no	sanitation-salvage	no	no	no	no	no
63	63	6.7	Yes	no	sanitation-salvage	no	no	no	no	no
64	64	2.1	Yes	no	sanitation-salvage	no	no	no	no	no
65	65	2.0	Yes	no	sanitation-salvage	no	no	no	no	no
66	66	13.9	Yes	no	sanitation-salvage	no	no	no	no	no
67	67	6.1	Yes	no	sanitation-salvage	no	no	no	no	no
68	68	5.1	Yes	no	sanitation-salvage	no	no	no	no	no
69	69	7.5	Yes	no	sanitation-salvage	no	no	no	no	no
70	70	21.9	Yes	no	sanitation-salvage	no	no	no	no	no
71	71	68.5	Yes	no	sanitation-salvage	no	no	no	no	no
72	72	1.1	Yes	no	sanitation-salvage	no	no	no	no	no
73	73	22.5	Yes	no	sanitation-salvage	no	no	no	no	no
74	74	2.7	Yes	no	sanitation-salvage	no	no	no	no	no
75	75	64.1	Yes	no	sanitation-salvage	no	no	no	no	no
76	76	1.7	Yes	no	sanitation-salvage	no	no	no	no	no
77	77	2.7	Yes	no	sanitation-salvage	no	no	no	no	no
78	78	14.3	Yes	no	sanitation-salvage	no	no	no	no	no
79	79	12.1	Yes	no	sanitation-salvage	no	no	no	no	no
80	80	17.0	Yes	no	sanitation-salvage	no	no	no	no	no

ParentPolyID	PolyID	Analysis_Acres	PWAreaAnalyzed	PWA	PWAComment	Regulation1	Regulation2a	Regulation2b	Regulation2c	Regulation 3
81	81	1.3	Yes	no	sanitation-salvage	no	no	no	no	no
82	82	15.6	Yes	no	sanitation-salvage	no	no	no	no	no
83	83	4.2	Yes	no	sanitation-salvage	no	no	no	no	no
84	84	1.5	Yes	no	sanitation-salvage	no	no	no	no	no
85	85	4.2	Yes	no	sanitation-salvage	no	no	no	no	no
86	86	9.8	Yes	no	sanitation-salvage	no	no	no	no	no
87	87	55.3	Yes	no	sanitation-salvage	no	no	no	no	no
88	88	6.4	Yes	no	sanitation-salvage	no	no	no	no	no
89	89	3.8	Yes	no	sanitation-salvage	no	no	no	no	no
90	90	81.2	Yes	no	sanitation-salvage	no	no	no	no	no
91	91	2.4	Yes	no	sanitation-salvage	no	no	no	no	no
92	92	35.8	Yes	no	sanitation-salvage	no	no	no	no	no
93	93	18.5	Yes	no	sanitation-salvage	no	no	no	no	no
94	94	77.9	Yes	no	sanitation-salvage	no	no	no	no	no
95	95	4.0	Yes	no	sanitation-salvage	no	no	no	no	no
96	96	3.1	Yes	no	sanitation-salvage	no	no	no	no	no
97	97	5.6	Yes	no	sanitation-salvage	no	no	no	no	no
98	98	11.6	Yes	no	sanitation-salvage	no	no	no	no	no
99	99	3.2	Yes	no	sanitation-salvage	no	no	no	no	no
100	100	4.9	Yes	no	sanitation-salvage	no	no	no	no	no
101	101	19.8	Yes	no	sanitation-salvage	no	no	no	no	no
102	102	1.6	Yes	no	sanitation-salvage	no	no	no	no	no
103	103	26.0	Yes	no	sanitation-salvage	no	no	no	no	no
104	104	6.6	Yes	no	sanitation-salvage	no	no	no	no	no
105	105	18.3	Yes	no	sanitation-salvage	no	no	no	no	no
106	106	12.6	Yes	no	sanitation-salvage	no	no	no	no	no
107	107	9.2	Yes	no	sanitation-salvage	no	no	no	no	no
108	108	19.0	Yes	no	sanitation-salvage	no	no	no	no	no
109	109	20.0	Yes	no	sanitation-salvage	no	no	no	no	no

ParentPolyID	PolyID	Analysis_Acres	PWAreaAnalyzed	PWA	PWAComment	Regulation1	Regulation2a	Regulation2b	Regulation2c	Regulation 3
110	110	17.8	Yes	no	sanitation-salvage	no	no	no	no	no
111	111	14.6	Yes	no	sanitation-salvage	no	no	no	no	no
112	112	1.0	Yes	no	sanitation-salvage	no	no	no	no	no
113	113	3.3	Yes	no	sanitation-salvage	no	no	no	no	no
114	114	1.1	Yes	no	sanitation-salvage	no	no	no	no	no
115	115	6.1	Yes	no	sanitation-salvage	no	no	no	no	no
116	116	2.5	Yes	no	sanitation-salvage	no	no	no	no	no
117	117	2.2	Yes	no	sanitation-salvage	no	no	no	no	no
118	118	19.8	Yes	no	sanitation-salvage	no	no	no	no	no
119	119	2.1	Yes	no	sanitation-salvage	no	no	no	no	no
121	121	66.1	Yes	no	sanitation-salvage	no	no	no	no	no
122	122	6.6	Yes	no	sanitation-salvage	no	no	no	no	no
123	123	1.1	Yes	no	sanitation-salvage	no	no	no	no	no
15	15	57.4	Yes	no	sanitation-salvage	no	no	no	no	no
120	120	1605.1	Yes	yes	ADJ. WILDNERNESS	no	yes	no	yes	yes
120	124	14.8	Yes	yes	ADJ. WILDNERNESS	no	no	no	yes	yes
120	125	0.0	Yes	yes	ADJ. WILDNERNESS	no	no	no	yes	yes
120	126	0.0	Yes	yes	ADJ. WILDNERNESS	no	no	no	yes	yes
120	127	0.0	Yes	yes	ADJ. WILDNERNESS	no	no	no	yes	yes
120	128	0.8	Yes	yes	ADJ. WILDNERNESS	no	no	no	yes	yes
120	129	37.3	Yes	yes	ADJ. WILDNERNESS	no	no	no	yes	yes
120	130	307.0	Yes	yes	ADJ. WILDNERNESS	no	yes	no	yes	yes
120	131	924.1	Yes	yes	ADJ. WILDNERNESS	no	yes	no	yes	yes
120	130	260.0	Yes	yes	ADJ.	no	yes	no	yes	yes

					WILDNERNESS					
120	129	11.9	Yes	yes	ADJ. WILDNERNESS	no	no	no	yes	yes

Note: ADJ. WILDERNESS = The polygon is adjacent to an existing Wilderness area.

APPENDIX I - RESPONSE TO COMMENTS ON DRAFT ENVIRONMENTAL ASSESSMENT

Final Melvin Butte Vegetation Management Project Environmental Assessment

Content Analysis Process

The following is a response to public comments received by the Sisters Ranger District regarding the draft environmental analysis (EA) for the Melvin Butte Vegetation Management project. The EA was made available for a 30-day comment period, under the provisions of the National Environmental Policy Act (40 CFR 1500-1508) and the Predecisional Administrative Review Process Notice, and Comment (36 CFR 218). A legal notice on the availability to comment was published in *The Bulletin*, the newspaper of record, on January 8, 2016.

Content analysis is a method for analyzing public comment. This process strives to identify all substantive comments represented by the public. Ninety comments were identified (See Table 1). 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. Comments on the draft environmental assessment are taken verbatim from the comment letters listed below. Responses are referenced to the final environmental assessment.

Table 1: Organizations and individuals who commented on the draft Melvin Butte Environmental Assessment

Letter	Date	Name	Organization	Response Type	No. of Comments
1	2/2/2016	Tom Partin	AFRC	e-mail	9
2	2/3/2016	Chris Richard	INTERFOR	e-mail	3
3	2/8/16	Doug Heiken	Oregon Wild	e-mail	19
4	2/8/16	Paula Hood	Blue Mountain Biodiversity Project	e-mail and hard copy	54
5	2/8/2016	Jason Brush	Quicksilver Contracting	e-mail	5

***Comment**: The project area is in the Northwest Forest Plan. Therefore, no diameter limits should be implemented to treat the stands. In order to fireproof the stands and protect the dominant old ponderosa pine, trees over 21" will need to be removed. A diameter limit was considered by the planning team, but we support your recommendation of no diameter limits. (1.1)*

Response: There is no blanket use of an upper diameter limit associated with the Matrix land allocation found in the project area. However, diameter limits are associated with stand level silvicultural prescriptions based on the unique conditions of a stand, stand level objectives, and in order to meet the larger project's purpose and need (final EA, pages 139-189). In some stands, for example, white fir

greater than 21 inches diameter at breast height (dbh) may be removed to reduce ladder fuels overstory competition with old growth ponderosa pine.

Comment: *AFRC supports treatments in mixed conifer forests in addition to younger stands of pure ponderosa pine. If the project area is going to receive the necessary forest health treatments to reduce the heavy fuel loading, protect residual dominant trees, and protect the remaining stands from insects and disease, all tree species will need to be thinned out. This means going into the cool moist forest types (mixed conifer) as well as the drier pure pine sites. As evidenced in the Pole Creek fire, much of the heavy stand replacing burns occurred in the mixed conifer stands, which now points to the need for treatments. (1.2)*

Response: Proposed treatments cover the ponderosa pine to moist mixed conifer forest types (final EA pages 19-21).

Comment: *Winter logging and logging over slopes of 30% should have some flexibility. The low snow packs that have occurred during several of the past winters should not be a deterrent to treating the stands. AFRC suggests mitigating measures be included in the contract to allow ground based skidding should snow or freezing conditions not be present. Further, limiting ground based harvest to slopes of 30% or less greatly reduces the options for using economical ground-based systems. Many of the new feller bunchers used today do quite well on slopes over 30% with minimal impacts to soil and the residual stands. AFRC suggests treating more acres on slopes over 30% to advance forest health and prevent large wildfires. (1.3)*

Response: Ground-based logging systems would be used to harvest trees under both action alternatives (final EA, pages 40 and 48). Only slopes less than 30% slope are included in timber harvest. Minor inclusions of slopes greater than 30% slope could exist within the interior of units. These area could either be long-lined to remove cut trees (no equipment would be allowed) or left as uncut areas (final EA, page 40).

Snow conditions could permit logging during winter conditions if certain criteria such as frozen ground and the depth of snow are adequate to avoid or minimize unacceptable rutting or soil displacement (final EA, page 57; Resource Protection Measure BMP Veg-7: Winter Logging). Such conditions could lengthen the logging operating season.

Comment: *AFRC supports the use of thinning with group openings to better treat the areas that are infected with mistletoe and in areas where the residual stands are not healthy. This will allow for the planting of mistletoe-free healthy trees that will quickly grow into an older age class component. Using this harvest tool will also increase early seral forage species needed for deer and elk in the area. (1.4)*

Response: A Thinning with Group Openings Treatment to maintain and restore fire climax ponderosa pine stands is proposed for Alternative 2 (proposed action). Group openings would be from 1-3 acres in size. About 839 acres would be treated using this treatment method (final EA, page 39). In response to public comments the treatment method was changed to exclude group openings in Alternative 3 (final EA, page 47).

Comment: *AFRC supports the use of the two site-specific Forest Plan Amendments suggested in Alternative 2. This will allow for treatments in the view sheds and slash treatments over a longer period of time. The short-term negative impacts of these actions will be greatly outweighed by the long-term benefits to the landscape. (1.5)*

Response: Site-specific Forest Plan amendments would allow for more effective and efficient fuels treatments in the Timber/Mixed Conifer Foreground areas, help meet the desired future condition for lands in a designated Wildland Urban Interface (WUI), in addition to providing safe ingress of the public and ingress of fire suppression resources in the event of a wildfire, as well as meeting the long-term management goals for the Scenic Views land allocation (final EA, page 28). The amendments would be short-term and be in effect for approximately a five year period after timber harvest and burning of logging residues are completed. The effects analysis by resource area associated with the implementation of the Forest Plan amendments are outlined in the environmental assessment (final EA pages, 22-32).

Comment: *AFRC supports doing forest health work immediately adjacent to the private lands found in the area and in the community wildfire protection plan. Alternative 3 drops some of these lands from treatments, which we do not support. AFRC believes it is imperative to treat as many acres as possible for wildfire mitigation during this entry into the project area. (1.6)*

Response: Alternative 2 (proposed action) and Alternative 3 reduce fuels in the Wildland Urban Interface adjacent to Forest Road 16 and along the shared boundary with the Cascades Timberlands property (final EA, page 18 - 19). Adjacent to the Cascade Forest Timberlands property fuel treatments would occur in a 600 foot buffer as measured from the property boundary and include thinning from below, mastication and/or mowing, and prescribed burning (no wildlife clumps would be placed in the 600 foot buffer) (final EA, page 19). There is, however, a small disjunct portion of the project area (units 51, 53, and 54) located about 0.5 miles from unit 57 (final EA, page 37, Figure 4 and page 44, Figure 5). The lands separating these units from the main project area is the Bearwallows Inventoried Roadless Area (IRA). There would be no harvest or fuels treatments in the Inventoried Roadless Area (final EA, page 423 - 427).

Comment: *In areas of pine mistletoe, it may be necessary to remove some of the dominant ponderosa pine to limit the spread of dwarf mistletoe. This could improve the long-term health of the stands and provide a better economic project with the removal of some of these more valuable trees. AFRC supports and encourages the harvest of these trees when needed. (1.7)*

Response: A Ponderosa Pine infected with Dwarf Mistletoe Treatment is proposed for Alternative 2 (proposed action; named “Dwarf Mistletoe”). About 160 acres are the focus of this treatment type. The goal is to maintain and restore ponderosa pine stands relatively free of mistletoe while recognizing the role that mistletoe plays in ecosystem function (final EA, page 38).

Comment: *AFRC supports the use and construction of temporary roads to help access the treatment areas as found in Alternative 2. Well-placed temporary roads often cause fewer impacts accessing with longer skidding distances. Further, once treatments are completed, a close analysis of what roads are needed in the area for fire protection and other forest health treatments should be completed before final road decommissioning or administrative closures are put into effect. The ability to access and respond to a fire quickly is often the deciding factor on how large the fire becomes, hence keeping good access is important. (1.8)*

Response: Alternative 2 would construct about 0.80 miles of temporary road to conduct logging operations (final EA, page 40); no temporary roads would be constructed under Alternative 3 (final EA, page 46). A Roads Analysis was conducted as part of project planning (final EA, page 442; see project record) and is referenced to the Deschutes National Forest Travel Analysis Report completed in September 2015. The roads analysis was conducted in a interdisciplinary setting and included consideration of access needs for fuels management and ingress of fire suppression resources in the event of a wildfire. The roads analysis recommended roads for decommissioning and closure. The action

alternatives would decommission about 8 miles of Forest Roads and close about 6 miles of Forest Roads (final EA, page 22 and 48).

Comment: *AFRC supports your use of an EA to analyze the project. From our perspective there are no unique factors or impacts to this area during the operations that would dictate the need for an Environmental Impact Statement. (1.9)*

Response: The effects analysis conducted to analyze the action alternatives did not indicate any significant impacts to resources of concern; this conclusion allowed the use of an environmental assessment to document the impacts of the action alternatives (final EA, pages 73-77).

Comment: *[…] Interfor supports Alternative 2 because it treats the greatest amount of acres, increases forest resilience to fire and insects, as well as brings the forest closer to {the} Historic Range of Variability; it only makes sense that you should implement the alternative that treats the greatest amount of acres after having spent the resources to analyze the project area. (2.1)*

Response: Thank you for your support.

Comment: *Alternative 1 is unacceptable due to the extreme fire danger posed to the south of Sisters. This no action alternative does nothing in terms of protecting the timber resource and wildlife habitat. In fact, it's limiting the timber supply and economic community benefit. This alternative will most likely end up costing the taxpayers millions in fire suppression. (2.1)*

Response: Alternative 1 (No Action) serves as a comparative baseline to analyze the action alternatives and is described in the final environmental assessment (final EA, page 37).

Comment: *Alternative 3 treats less acreage and removes less fuel from the project area. The […] project lies within the Northwest Forest Plan. This means there are no Eastside Screen required to be implemented on this project. Diameter and age limits restrict the ability to manage stands according to historic basal areas, they require such species such as grand fir, Douglas fir, and ponderosa pine be left on the landscape in far greater quantities that have occurred in the past. This decreases the growing space for shade intolerant species, therefor reducing resiliency to fire and insects. (2.3)*

Response: The East-side Screens (Regional Forester's Forest Plan Amendment #2) do not apply to the project area. The entire project area is managed under the Deschutes National Forest Land and Resource Management Plan as amended by Northwest Forest Plan (final EA, page 7; Figure 3, page 8). About 5,208 acres fall in the Matrix land allocation (final EA, page 7). There is no blanket use of an upper diameter limit associated with the Matrix land allocation. However, diameter limits are associated with stand level silvicultural prescriptions based on the unique conditions of a stand and stand level objectives (final EA, pages 139- 189). In some stands trees greater than 21 inches diameter at breast height (dbh), such as white fir, may be cut to reduce overstory and site resource competition with residual old growth ponderosa pine.

Comment: *Several of the other prescriptions could be improved with modifications that better balance ecological trade-offs. More and larger retention areas and lighter thinning that retains more medium and large trees would allow the FS to meet its objectives but would also conserve spotted owl habitat functions in this critical habitat unit, would mimic natural disturbance processes and provide habitat for species that use dead wood, and store carbon in the face of global climate change. (3.1)*

Response: A Wildlife Habitat Retention Strategy was utilized as a design element in project development (final EA pages 18). The strategy used a combination of soil type groupings and future habitat needs to identify areas with the greatest potential to develop into mature multi-storied mixed conifer forest or areas likely to become single story mature ponderosa pine. As a result of this strategy about 745 acres in the project area would be retained as no treatments areas (final EA, page 18; Table 3). Additionally about 30 acres of prescribed burning would be used for wildlife retention, bringing the total number of acres to about 775 acres in the project area. These acres are placed strategically across the project area (final EA page 37; Figure 4 and page 44; Figure 5).

Silvicultural prescriptions are based on current stand conditions and treatment (e.g. thinning) and is guided by the desired future condition for a particular stand. Under the proposed action plantations would be treated based on variable density thinning (final EA, page 38). Thinning treatments to maintain fire climax ponderosa pine have two treatments options 1) in late old structure stands thin from below, moving stands towards single story late old structure and 2) second growth ponderosa pine stands using variable density thinning (final EA, page 39). These treatment types are scattered across the project area, and in addition to prescribed burning, would provide landscape heterogeneity. Existing stands would continue to prove carbon storage.

Comment: *The collaborative has urged the FS to limit the size of forest openings. Our understanding is that forest openings or clearings will be limited to two acres in size, but only for certain forest types or prescription types. We encourage the FS to use this 2-acre limit for all prescriptions and forest types. This is consistent with where the collaborative has found common ground for mixed conifer forests. The FS should consider leaving a small clump of couple of live and dead trees within each opening. Retaining some legacy structure would better mimic natural processes. (3.2)*

Response: The March 26, 2014 public scoping letter had originally proposed 1-5 acre openings for the Thinning with Group Openings treatment type and up to five acre openings in the Lodgepole Pine Improvement Treatment type (public scoping letter, Melvin Butte project record). Subsequent discussions with the Deschutes Landscape Collaborative changed the opening size for the Thinning with Group Opening Treatment to 1- 3 acres in size and up to 3 acres in size in the Lodgepole Pine Improvement Treatment (final EA, pages 37 - 38). Actual opening size would vary based on stand conditions. The intent of group openings is to create growing conditions/ locations for pine recovery (where it had once been). Field verification of opening locations would include areas where pine abundance is lacking but could be expected (stand level indicators). Stand level prescription elements call for the retention of legacy structures such as old pine trees in the event they are discovered in any location. All snags (dead trees) would be retained unless they are an OSHA safety consideration during unit timber harvest.

Comment: *A small area of uninventoired roadless area is proposed for commercial treatment – two acres in unit 31, and about 8 acres in unit 56. We urge the FS to drop these treatments (or allocate these small areas to the untreated 10-20% of the associated units) in order to conserve the wild and unmanaged character of these stands. We do not object to relatively small-scale non-commercial treatments in uninventoried roadless areas, hopefully without the need for heavy equipment.(3.3)*

Response: A Citizen Unroaded Areas analysis was conducted for the project (final EA, pages 433 - 436). The action alternatives would impact about 46 acres of the Oregon Wild Unroaded Area inventory. Harvest units that would be affected include units 4, 31, 40, 48, and 56. Unit 4 would be Burn Only. The other units would be thinned from below based on the harvest prescription (final EA, page 434, Table 203). No timber harvest or prescribed burning would occur under the no action alternative.

Comment: *This project is described as a restoration project, but it has significant non-restorative effects on wildlife. The EA does not clearly disclose the trade-offs associated with commercial logging as a method of restoration. The EA says 88% of the project area is too dense. The action alternatives propose to reduce stand density across a large fraction of the project area. A natural disturbance in this setting would recruit a large amount of snags and dead wood. This project will export a vast majority of the mortality causes by this logging disturbance. This is inconsistent with the natural cycle of growth and mortality in forests. Many wildlife evolved to utilize snags and dead wood for a variety of life functions. Removing 1200 log trucks worth of wood will adversely impact those wildlife.(3.4)*

Response: The project is designed to maintain and restore forest resiliency and forest health in stands that that provide habitat for interior forest wildlife species and pose a potential hazard of large scale wildfires in the Melvin Butte area (final EA, page 13). The Historic Range of Variability (HRV) provides a reference condition framework for historical estimates of forest size-classes and seral stages, and tree species that may be present at any given point in time in the past 300 years (final EA pages 14-16). The existing condition describes tree density in terms of likelihood and risk and that 88% of the project area is in this condition.

Findings for the project area include: 1) the greatest departure occurs in ponderosa pine, where large diameter pine stands were once distributed across a larger portion of the landscape in both the ponderosa pine and mixed conifer plant association groups. About 90% of the project area was dominated by ponderosa pine across most plant associations. Currently more than 75% of the project area is dominated by trees less than 20 inches diameter at breast height. Much of this acreage occurs as small blocks of plantations (about 22% of the project area (final EA page 15); and 2) species composition across the project area is outside of the HRV. There has been an overall increase in advanced grand/white fir persistence and abundance as the expense of ponderosa pine regeneration compared to the reference condition. The densities of grand/white fir regeneration and subsequent development of shade intolerant trees as ladder fuels put the existing overstory old ponderosa pine trees at risk to high intensity wild fires and the potential loss of these cap-stone species reduces the resiliency of the landscape to respond to disturbance over time (final EA, pages 15; also see the Forest Vegetation section of the environment assessment).

The project proposes to create conditions that move the project area towards HRV over the long term. These conditions include 1) maintain and improve long-term habitat for interior forest species; 2) reduce fire risk for large scale replacement events: 3) improve potential for large pine tree development; and 4) maintain and enhance stand densities that favor resistance and resiliency to future unknown disturbances. Actions proposed in the project area would move forest vegetation towards the desired future condition (final EA page 16). The project also meets Northwest Forest Plan standard and guideline C-44 “provide for retention of old-growth fragments in watersheds where little remains” (final EA pages 183-187).

See the Rationale for the Purpose and Need for Action in the environmental assessment for more detail (final EA pages 14-16).

A Comparison of the Alternatives table summarizes the effects to wildlife and other resources of concern. Effects to wildlife range from no effect, no impact, may affect but not likely to adversely affect, to may impact but not lead to a trend towards federal listing (final EA, pages 73 - 77).

The project meets Northwest Forest Plan standards and guidelines for snags and down wood habitat and the *Deschutes National Forest Wildlife Tree and Log Strategy* (final EA page 335 - 336).

The project would also meet a need to provide wood products to the local and regional economy as a byproduct of landscape restoration treatments (final EA page 14 and pages 453 - 455).

Comment: *The FS should consider treating similar forest types in different ways. Such as thinning some of the plantations heavily, some lightly, some left untreated. The mixed conifer thinning treatments should also be highly variable. It is not necessary or desirable to put space around every tree. It would be good to retain a couple of small groups of 2-5 trees on each acre (along with the more traditional thinning).(3.5)*

Response: We agree with this statement. Inducing variability where it may be lacking or accentuating where it is already present is the essence of all thinning operations. This applies to plantations as well as other treatment types. As such, distance among trees would be variable including groups of trees and areas that are part of the overall retention strategy.

Comment: *The FS should adopt a lighter touch in order to conserve spotted owl critical habitat function. The Forest Service should manage critical habitat to support as much spotted owl function as possible. (3.6)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The Melvin Butte project is associated with approximately 3,731 acres of the spotted owl Critical Habitat subunit ECN 8 or 4% of the Subunit (EA page 206; Table 76). The 2013 Final Rule for Spotted Owl Critical Habitat identified Special Management Considerations for the East Cascades. These management considerations identified the essential physical or biological features of dynamic, disturbance-prone forests that should be managed to promote spotted owl conservation, respond to climate change, and restore dry forest ecological structure, composition, and processes, including wildfire and other disturbances. The management considerations emphasized the following: 1. conserve older stands that contain the conditions to support spotted owl occupancy or high value owl habitat; 2. emphasize vegetation management treatments outside spotted owl territories or highly suitable habitat; 3. design and implement restoration treatments at the landscape level; 4. retain and restore key structural components, including large and old trees, large snags, and downed logs; 5. retain and restore heterogeneity within stands; 6. retain and restore heterogeneity among stands; 7. manage roads to address fire risk; and 8. consider vegetation management objectives when managing wildfires where appropriate. These considerations were incorporated into the design of the Melvin Butte Vegetation Management Project.

In addition, the 2011 Spotted Owl Revised Recovery Plan emphasize the conservation of spotted owl sites and high value spotted owl habitat (page I-2). Interim Guidance recommends site conservation priorities for reproductive status (page III-44): Known sites with reproductive pairs; Known sites with pairs; Known sites with resident singles; and Historic sites with reproductive pairs, pairs, and resident singles, respectively. Further recommendations include avoiding activities would reduce nesting, roosting, and foraging habitat within provincial home ranges (1.2 mile radius) of reproductive pairs (III-45).

Management considerations for critical habitat and conservation priorities identified in the revised recovery plan were utilized to design and develop the action alternatives for the project (final EA pages 211-215). Spotted owl surveys and field reconnaissance determined that no suitable spotted owl nesting, roosting, and foraging habitat occur within the project area. Spotted owl surveys were completed to protocol from 2009 to 2011; no responses were detected within the Melvin Butte project area and no nest sites exist within the project area (final EA page 204).

Approximately 2,343 acres of spotted owl dispersal habitat is associated with the Critical Habitat subunit. A field review of dispersal habitat was conducted and stands containing the highest functioning dispersal

habitat, with the highest site potential for maintaining habitat were retained as no-treatment areas to provide dispersal habitat connectivity. Stands that were identified as dispersal habitat but minimally met criteria due to lack of canopy cover, were identified for silvicultural treatment. Treatments were designed to meet the eastside forest management considerations; within multi-storied stands the largest and oldest trees would be retained. These treatments would thin small trees from below primarily to reduce ladder fuels. No snags are proposed to be felled unless they pose an OSHA safety hazard to logging operations. Some dispersal habitat exists in 40 to 60 year old second growth ponderosa pine plantations; no old growth or large tree structure is associated with these stands. Plantations would be thinned in a mosaic fashion to retain patches and clumps of trees providing utility for spotted owl dispersal; however, the entire canopy cover of the stand would be reduced below minimum dispersal standards. Finally, roads are proposed for closure to manage fire risk.

The project is consistent with the 2013 Critical Habitat Rule and the 2011 Revised Recovery Plan (final EA page 217). A Level 1 Review was initiated on August 8, 2013 with the U. S. Fish and Wildlife to discuss the project effects to spotted owl designated Critical Habitat. A rationale for determination of effects to spotted owl primary constituent habitat elements in designated critical habitat was discussed at that time. A Biological Assessment was submitted on February 15, 2015 and a Letter of Concurrence was received from the U.S. Fish and Wildlife Service on March 5, 2015. (EA page 9)

Alternatives 2 and 3 may affect but are not likely to adversely affect designated northern spotted owl critical habitat or dispersal habitat from thinning (final EA page 205 and 207). Treatments such as thinning would greatly increase stand resiliency to insects, disease, and wildfire through density reduction (final EA, page 204-207). About 33% of the dispersal habitat would be retained in the project area post treatment (final EA, page 214; Table 84).

Comment: *This project will downgrade 1601 acres of northern spotted owl dispersal habitat. That is 2/3 of the CHU dispersal habitat in the project area! The FS should do more to avoid this loss of function in the CHU. When managing for dispersal habitat, the FS should manage for high quality dispersal habitat, with plenty of opportunities to escape predators, roost, and forage. The FS should therefore retain all large trees, retain dense patches well-distributed, and retain abundant dead wood (and abundant green tree recruitment pool). (3.7)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The project meets the interim guidance and recommendations of the Revised Recovery Plan for the norther spotted owl (final EA, page 217). There is about 2,796 acres of norther spotted owl dispersal habitat in the project area (final EA, page 206). The action alternatives would treat about 1,882 acres of dispersal habitat. The project may affect but is not likely to adversely affect dispersal habitat from thinning stands from below and reducing canopy cover to levels that no longer meet the dispersal definitions in the programmatic biological assessment. Also see response 3.6.

Comment: *We are concerned that logging will do more harm than good in terms of conserving spotted owls and their critical habitat. Owls prefer dense forests. Logging for fuel reduction and "resiliency" will reduce stand density and owl habitat suitability.(3.8*)

Response: See responses 3.6 and 3.7.

Comment: The EA analysis of effects to spotted owl critical habitat are confusing. There are a lot of words but where does it say how much logging is proposed in CHU? Page 198 says 2,971 acres of "veg management" will occur in CHU. How much of that is commercial logging? (3.9)

Response: The reference given for page 198 could not be located in the final environmental assessment. See responses 3.6 and 3.7.

Comment: *It seems highly implausible that losing 2/3 of the dispersal habitat in this landscape does not adversely modify this CHU. The NEPA document must therefore disclose primary constituent elements of critical habitat, the current condition of the affected CHU, and how this CHU may fit into recovery and conservation efforts for listed species. The NEPA analysis for this project fails to make these disclosures and inappropriately aims to avoid jeopardy rather than contribute to recovery. (3.10)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

A complete analysis of Critical Habitat subunit ECN-8 was conducted to disclose the existing condition of spotted owl occupancy and habitat within the subunit. The analysis includes recent impacts to habitat, barred owl detection, NRF habitat, and finally dispersal habitat and connectivity. Only 4% of the Melvin Butte project is associated with designated northern spotted owl Critical Habitat ECN 8 subunit. Both short-term and long-term spotted owl habitat objectives associate with the proposed action were developed to be consistent with the 2013 Critical Habitat Rule and the 2011 Revised Recovery Plan. (EA pages 199-217)

The short-term objective is to treat stands that do not meet or minimally meet the dispersal habitat criteria while retaining and providing connectivity throughout the project area to the rest of the Critical Habitat Subunit ECN 8. The long-term objective is to develop habitat resiliency to insects, disease, and wildfire. The project is consistent with the 2013 Critical Habitat Rule and with the 2011 Revised Recovery Plan. (EA page 217) A Level 1 Review was initiated with the U. S. Fish and Wildlife on August 8, 2013 to discuss the project effects to northern spotted owl designated critical habitat within both the Melvin Butte project and the effects to the function of critical habitat subunit ECN 8. A rationale for determination of effects to northern spotted owl primary constituent habitat elements in designated critical habitat was discussed at that time. A Biological Assessment was submitted on February 15, 2015 and a Letter of Concurrence was received from the U.S. Fish and Wildlife Service on March 5, 2015. (final EA pages 9 and 201)

The final environmental analysis contains a detailed discussion of the northern spotted owl as it pertains to the project area: Existing Condition (final EA, pages 200-201); Consultation History (final EA, page 201); 2011 Revised Recovery Plan (final EA, page 201); 2013 Designated Critical Habitat (final EA, pages 201-202); Physical and Biological Features (final EA, page 202); Primary Constituent Elements (final EA, page 202-203); Critical Habitat on the Deschutes National Forest (final EA, page 203-204); Status of the Spotted Owl including barred owl Detections in Subunit ECN 8 (final EA, pages 196199); NRF Habitat within Critical Habitat and the Project Area (final EA, pages 204-206); Dispersal Habitat and Connectivity (final EA, pages 208-210); Alternative 1 (final EA pages 203-204); Alternative 2 and 3 (final EA, pages 204-207); Physical and Biological Features/Primary Constituent Elements of Critical habitat (final EA, pages 205-207); and Cumulative Effects (final EA, pages 207-210).

Comment: *This project places a 600 foot buffer on the public/private border where the ecological function of public forests will be compromised in order to benefit private industry. This imposes both an*

economic and an ecological cost on the public. We do not feel the public is getting a good deal here. (3.11)

Response: A Wildland Fire Urban Interface and Fuels Reduction Strategy was developed for the project (final EA, page 18-19). One strategy element would reduce ladder fuels along the western boundary of the Cascades Timberlands property. This treatment would prevent fires moving from National Forest System lands onto private property. Treatments along the property edge would consist of thinning from below, mastication, and/or mowing, and prescribed burning. An additional design feature (#3) is that no wildlife clumps would be placed in a 600 foot wide buffer from the property boundary; wildlife clumps would be retained beyond the 600 foot wide buffer. Wildlife habitat, including snags (dead trees) would be maintained in this buffer zone unless they are an OSHA safety hazard in conducing logging operations.

Comment: *Neither the Environmental Assessment nor the "Draft Report Melvin Climate Change" posted on the project website provide a credible scientific analysis of the effects of this project on global climate change. The EA fails to quantify the differences in carbon storage between the action and no action alternatives. Once the carbon storage consequences are quantified then the FS can calculate the social cost of carbon dioxide emissions associated with the different alternatives. The EA and Draft Report emphasize the amount of CO2 emissions expected under the no action alternative as a result of wildfire. The analysis fails to disclose that (1) carbon storage would be highest under the no action alternative; (2) emissions from fire would be expected to be similar under both the action and no-action alternatives, and (3) the probability of fire emissions are not high, while the probability of logging related emissions are very high under all of the action alternatives.(3.12)*

Response: The Climate Change report was updated to quantify existing carbon pools in the planning area using the Forest Service Forest Vegetation Simulator (FVS) program (final EA page 439) and with this addition shows that the no action alternative does provide the most carbon storage; however, it also states that there is an increased risk of wildfire and insect and disease prevalence in the planning area associated with predicted climate changes in central Oregon. Emissions from fire were taken out of the final climate change report because better information became available with the FVS estimates and fire emissions can vary considerably depending on weather conditions when the fire occurs.

Comment: *We do not support logging to enhance scenic views in the Pole Creek fire area. First, The FS should not assume that fires are not scenic. The public is learning to appreciate the aesthetic and ecological values of burned forests. Second, the clumpy feathered edge look with occur naturally as the snag fall and the forest regenerates. Third, the FS will be removing valuable habitat structures from an area that needs them.(3.13)*

Response: The action alternatives propose a Scenic View Enhancement Treatment. The goal is to meet direction for the Scenic Views land management area. The area does not currently meet the long-terms goals for the Scenic Views management allocation (final EA page 418-420). About 240 acres would be treated west of Forest Road 16 in areas impacted by the 2012 Pole Creek fire. In order to meet the long term goals for Scenic Views green trees and scattered clusters of fire killed trees would remain in order to slowly transition the area to become scenic again in the future. (final EA pages 39-40 and 47)

Activities such as feathering the edges around dead and green trees and planting trees in open areas would restore scenic quality by eventually changing the appearance of this area of the forest from burned to green over the long-term (final EA, page 419-420). The effects to snags and snag habitat are discussed in the wildlife section of the environmental assessment.

Comment: *If these white fir stands have large tree structure and are currently providing important habitat values the Forest Service should consider leaving these areas unmanaged or lightly thinned. Conversion back to Ponderosa pine can be accomplished after wildfire visits these areas in the future. (3.14)*

Response: Within the "Thinning with Group Openings" treatment retention of leave trees would include white fir. The group opening portion of this treatment would be used up to 30% (1-3 acre opening sizes) of a given unit (see also response to comment 3.2). The remainder of these areas would be generally thinned from below consisting of all species that are present (white fir, ponderosa pine, lodgepole pine). In other areas with a large white fir tree component (ex. "Ponderosa pine with Dwarf Mistletoe") large white fir are being used to screen ponderosa pine dwarf mistletoe (where effective as a barrier to do so) to adjacent areas and thus select large white fir trees would be retained adding heterogeneity to the landscape. In other areas with just a "thinning treatment" large white fir are retained as a minor component and in accordance with topographical cues (microsites) among the historically dominate ponderosa pine**.** See response 3.10 and the retention strategy (final EA page 18 and Table 3).

Comment: *We support the gappy/patchy/clumpy prescription but we urge that large trees be retained. The FS should work around the existing large tree structure. All old trees >150 years should be retained regardless of size. Large "young" white fir should be removed only if they are in direct competition with large trees of preferred species like Ponderosa pine or Douglas fir. A park-like condition should not be prescribed over large areas, especially in mixed conifer forests. The FS should leave generous unthinned patches within and between units. The unthinned skips should include representation of a variety of stand conditions.(3.15)*

Response: Silviculture prescriptions describe the accentuation and/or creation of an irregular pattern of trees. This includes "gappy/patchy/clumpy" prescriptions and the "retention" strategy. This retention strategy crosses the variety of biophysical environments and consists of areas with dense and large tree structures (see Final EA page 18).

Comment: *Mistletoe treatments will be less controversial if they are consistent with the collaborative recommendations. Commercial removal of mistletoe trees will be very controversial as these trees are some of the best habitat trees for nesting species. (3.16)*

Response: Prescription elements are directly referenced to the proposed action for "Ponderosa pine infected with Dwarf Mistletoe Treatment" (Final EA page 38). The effects analysis (final EA pages 167, 170-171, and 174) describes the outcomes of the specific 160 acre "ponderosa pine infected with dwarf mistletoe treatment" areas. In brief, dwarf mistletoe would not be eliminated from the project area. The dwarf mistletoe treatment was developed after discussions with the Deschutes Skyline Forest Collaborative.

Comment*: We urge the FS to retain all large trees, even if they are infected with mistletoe. First, mistletoe itself provides habitat and food for wildlife. Second, mistletoe infected trees are ecologically valuable as live trees. Third, they are ecologically valuable as snags. None of these large trees are excess of ecological needs. Existing LRMP standards for snags are outdated "minimums" not descriptions of optimal habitat. Fourth, these treatments will not be effective. Stand with mistletoe remain infected after treatments like this. The only answer is stand replacing fire that kills all of the host trees over large areas, and this project is actually trying to prevent that from happening, so the FS really should be learning to live with mistletoe, and appreciate the ecological contribution of this native species, instead of fighting an ineffective battle against it.(3.17)*

Response: We agree large mistletoe-infected ponderosa pine trees are an important ecological component. A spatially explicit approach with ground surveillance (tree-level) and dwarf mistletoe mapping was conducted (final EA pages 164-166; Figure 18). The environmental assessment describes the effects of the proposed action where it applies (the "Dwarf Mistletoe Treatment" 160 acres) and other areas with dwarf mistletoe outside of these specific 160 acres (final EA pages 177-178). Under the No Action alternative current levels of dwarf would increase substantially. Infected plantations would be completely or nearly enveloped with dwarf mistletoe by 2045 (final EA pages 174-175). See also response 3.16.

Comment: *We are concerned that creating opening in lodgepole will stimulate dense lodgepole regeneration and create hazardous fuel conditions. The preferred treatment in lodgepole is either no action (most consistent with the natural range of variability), or thinning that leaves significant lodgepole canopy to help suppress regen.(3.18)*

Response: Lodgepole pine, a shade intolerant conifer, is typically managed using even-aged management systems such as regeneration harvest (clear cutting), shelterwood, seed tree, or some type of group opening. Lodgepole pine in the project area would be treated using an improvement cutting treatment (thinning or group openings up to 3 acres in size) (final EA, pages 37-38 and 46). Lodgepole pine in the Wildland Urban Interface (WUI) would be thinned over time to provide a fuel break along Forest Road 16 and to maintain stand resiliency (final EA, page 38).

Comment: *We have noticed a disturbing pattern of projects being designed that include both logging and prescribed fire. Once the project is finalized the logging proceeds but only a small portion of the prescribed fire occurs. When evaluating projects we look at the projects as a whole and determine our support based on the sum of all the parts. When one critical piece is consistently short changed it calls the entire project into question. We recognize that there are some elements that are outside the control of the Forest Service (short fire-safe windows, and state smoke management issues), however we are increasingly concerned by this pattern and practice. (3.19)*

Response: The district typically conducts prescribed burning on about 800-1,200 acre per year based on funding, burn window, smoke management issues, completed NEPA analysis, and available manpower.

Comment: *The purpose and need is overly narrowly construed. Proposed action fails to meet/contradicts the Purpose and Need for the project. The implied desired future conditions in the purpose and need are more in line with economical forestry goals for timber harvest than they are with ecological health and integrity. These narrowly construed and unnatural outcomes do not allow for serious consideration of more ecologically beneficial alternatives, much less their selection. (4.1)*

Response: See response 3.4.

Comment: *The Melvin Butte EA states that "[t]he high fire hazard would be lowered from about 45% to around 7% across the project area." However, the project EA fails to adequately consider scientific controversy surrounding managing areas with historically mixed-severity fire regimes for ecologically inappropriate lower-fire severity. A large body of scientific studies suggests that mixed-conifer and higher elevation forests, such as those within the project area, naturally support mixed-intensity fire regimes that include large patches of high severity fires and have long return intervals. As such, managing for a different fire regime over such a large percentage of the project area will have negative repercussions to the ecology and species within the project area that the USFS failed to consider. (4.2*)

Response: It is important to note fire hazard and fire regime are different concepts (Final EA pages 143, 160-164, 350, and 353-356).

The environmental assessment recognizes a wider range (versus lower elevation pine type) of fire severities within the more mesic forest types (final EA page 160; also see the desired future condition of mixed conifer final EA page 169). Analysis of vegetation conditions in the project area indicates the likelihood of creating similar severities in the event of a wildfire. The fire type would be similar to the adjacent 2012 Pole Creek (final EA page163-164). The watershed has experienced a large percentage of its land base burned with recent fires (2012 Pole Creek Fire: 26,120 acres) which has caused significant changes in forest structure in the past 15 years (final EA pages 143-144, 154-155: Table 34). The desired future condition for forest vegetation is specifically listed on page 162 of the final environmental assessment and includes but not limited to the reduction risk for stand replacement fire on >10% of project area. The proposed project level activities reduces risk of stand replacement (on project level) to below this level while retaining dense unthinned stands/patches which can support active crown fire (high/mixed severity) on stand/patch level (see final EA page 168;Table 50; 141-14 (Alternative 2) and pages 174-175 (Alternative 3). In addition, the predicted fire type (among either action alternative) is expected to vary among plant associations reflecting the mixed severity fire regime of the more mesic forest types.

Additional factors were also taken into consideration:

- Historic records show no existence of large fire (100+ acres) occurrence within the Melvin Butte project area, east adjacent to the Melvin Butte project area, nor to the south since the 1900's (final EA, page 358; Figure 22).
- 69% of the Melvin Butte project area falls within Fire Regime III with a reference fire return interval of 35 to 100 years, mixed severity fire in predominately mixed conifer stand types (final EA, page 353; Table 185).
- When designing treatments for this area, consideration was given to how fire historically travels across the landscape (draft EA, page 352 Figure 20). The overall intent is to maximize treatment effectiveness through the type of treatment and its strategic placement with emphasis towards addressing values at risk such as wildlife and viable ecosystem habitats (final EA, page 363-366).

The above fire management considerations meet the purpose and need for action by reducing hazard levels from 45% to 7% (final EA, pages 379-382 Table 191). In addition, the level of treatment reduces the potential for sustained crown fire as well as adhering to community needs as stated in the 2014 Greater Sisters Community Wildfire Protection Plan (final EA, pages 345-346).

Comment: *[…] the Melvin Butte project is almost completely surrounded by forest with extremely reduced forest density. The Melvin Butte project area is one of the last remaining areas of forest density in the area (high density forests are required by many species, especially special-status species). There is no need to log in the Melvin Butte area to reduce fire hazards for nearby human habitations, since forests with reduced fuels (due to fires and logging) surround the area. There have been logging and fires that have reduced density between Melvin Butte and the Sisters, as well as closer to the lake, and near towns.*

Using fire risk reduction and forest density reduction as a rationale for logging in one of the last remaining areas of forest density is ecologically inappropriate, and will not provide for the viability of species that depend on forest density or on post-fire habitats. In addition, post-fire areas within the Melvin Butte area should not be logged. They should be left to recover naturally, and to provide the unique, important, and (compared to historic levels) extremely rare post-fire habitats. (4.3)

Response: Between 2002 and 2013 approximately 40% of the Sisters Ranger District has been affected by wildfire, including loss of nesting, roosting and foraging habitat for the northern spotted owl. For example, prior to the 2003 B&B fire the districted hosted over 24 northern spotted owl nest cores. Multiple fires eliminated 18 nest cores. Currently the district has three functioning nest cores (final EA, page 1). The project area has some of the last remaining mixed conifer stands in that portion of the district. Much of the high quality mixed conifer habitat available for wildlife in the area has been lost (final EA, page 2).

The existing condition, both at a landscape and project level, and including the departure of the area from the Historic Range of Variability (HRV), provide the rationale to managed stands in the Melvin Butte area to maintain and restore stand resiliency and lower fire hazard (final EA, page 2 and pages 14-16).

In addition, no management actions would take place under No Action alternative (final EA page 37).

Comment: *The Melvin Butte project area encompasses some of the last remaining areas of structural complexity in the area. What percent of the area larger landscape area on the east side of North and South Sisters provides high-quality dense forest habitat for density-dependent species? (4.4)*

Response: Habitat for all species was assessed at the project level and watershed or multi watershed level. Suitable habitat is displayed within the existing condition for each species at the project level, watershed level, and at the Forest Level (final EA pages 189-342). The Deschutes Land and Resource Management Plan provides standards and guidelines for Management Indicator Species which include species that require dense forest habitats. These standards and guidelines provide direction to describe how project specific impacts effect the overall available habitat at the Forest level for each specific Management Indicator Species (final EA pages 189-342). In addition, the Conservation Strategy for the East-Slope of the Cascade Mountains in Oregon and Washington provide biological objectives for focal species and focal species habitat, some of which are associated with dense forest habitats. This project is consistent with the biological objectives associated with landbirds that are associated with the project area (final EA pages 275-282).

Comment: *The Melvin Butte EA contains an inadequate range of alternatives. The Melvin Butte EA failed to analyze a full range of alternatives. The EA should have analyzed alternatives that included options more protective of the ecology, and with fewer negative impacts to the natural and undeveloped character of the area. Alternatives should include options with no logging; no road building; non-commercial logging only; small diameter thinning only; no new road construction; no re-opening of roads; no logging in mixed-conifer habitat; no logging in Northern spotted owl habitat; and no commercial logging in Potential Wilderness Areas. (4.5)*

Response: The environmental assessment includes three alternatives, including the no action alternative (final EA, 37-53). Alternative 3 was developed based on key issues identified during public scoping: 1) do not construct any temporary roads; 2) do not include group openings in the mixed conifer plant association; and 3) do not remove large diameter ponderosa pine trees with dwarf mistletoe (final EA, pages 46-53).

Three comments were received during public scoping that suggested alternatives to the proposed action but were not analyzed in detail. These include 1) do not treat stands in the mixed conifer plant association; 2) do not remove trees greater than 9, 12, or 15 inches diameter at breast height (dbh); and 3) only treat second growth ponderosa pine. These proposed alternatives would 1.1) not meet the intent of increasing stand resiliency to insects, disease or wildfire, or maintain existing old growth ponderosa pine in the mixed conifer plant association; 2.1) would apply an arbitrarily apply a diameter limit which would

limit the ability to address site specific conditions and silviculture needs of individual stands; and 3.1) decrease the size of the project area by about 80%. Reducing the size of the project area would forego fuels reduction treatments in the Wildland Urban Interface and the potential fire risk would be similar to the No Action Alternative. A fourth alternative was also considred by the planning team: consider an action alternative that did not contain site-specific Forest Plan amendments. The planning team determined this alternative didn't provide 1) the necessary operationally flexibility to treat logging residues (slash) in Foreground Retention areas; a period longer than one year (current direction) is necessary for fuels to cure (dry out) and that slash burning must often be staggered over time contingent on such factors as weather and smoke dispersal requirements and 2) prescribed burning blocks greater than five acres in size (current direction is less than five acres) are necessary to facilitate fuels reduction in a designated Wildland Urban Interface (WUI) and help blend fire suppression activities associated with the 2012 Pole Creek fire with the surrounding landscape (final EA, pages 53-55).

Comment: *[An] EIS needed. An EIS should have been prepared for the Melvin Butte project. We are concerned that the project will have significant negative effects on species such as Northern spotted owls, American marten, Black-backed woodpeckers, Williamson's sapsucker, Townsend's big-eared bats, Pacific fisher, Western bumblebee, Johnson's hairstreak, Lynx, and other native species. The Melvin Butte EA does not provide a reasoned decision for their conclusion that logging will not cause significant negative impacts including long-term downward population trends of these and other native species due to direct, indirect, and cumulative effects from this project. (4.6)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The environmental analysis, including direct, indirect and cumulative effects for resources of concern, did not identify any significant effects to the natural or social environment (final EA, pages 73-77). Therefore, an environmental impact statement (EIS) was not prepared.

- Northern spotted owls: See Responses 3.6; 3.7; 3.8; 3.9; 3.10; 4.9; 4.13; 4.29; 4.30; and 4.45.
- American marten: See Response 4.22.
- Black-backed woodpeckers: See Responses 4.20 and 4.25.
- Williamson's sapsucker: See Response 4.21
- Pacific fisher: See Response 4.15.
- Western bumblebee: See Response 4.16.
- Johnson's hairstreak: See Response 4.17.
- Lynx: There is no Lynx habitat located on the Deschutes National Forest.

Comment: *The Melvin Butte EA failed to adequately analyze direct, indirect, and cumulative effects. The Melvin Butte EA contains an insufficient effects analysis. The EA failed to quantify potential impacts to listed and sensitive species such as Oregon spotted frogs, Northern spotted owls, Pacific fisher, Redband trout, and sensitive botanical species, and failed to analyze the actual effects to each species' viability in the Melvin Butte project area. The scale of the effects analysis was inappropriate for a number of species and issues, including but not limited to Black-backed woodpeckers, road densities, and cumulative impacts.*

Direct and indirect affects include impacts from mortality or direct habitat loss during the project, as well as future lack of high intensity fire and deviation from natural regimes and processes due to this project, particularly in mixed-conifer forests and in riparian areas. Examples of species that may be negatively affected by this project include American marten; Peregrine falcon; Northern goshawk; accipiter hawks;

Black-backed woodpeckers; American wolverine; Bald eagle; Pileated woodpeckers; PCEs; Bufflehead; Northern Waterthrush; Fringed Myotis Bat; Townsends Big-eared bat; Johnson's hairstreak; Cascades Axetail slug; Crater Lake tightcoil; Western bumblebee; Oregon megomphix; Great gray owl; Oregon spotted frog; and other amphibians. (4.7)

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

- *Northern spotted owl*: See Responses 3.6; 3.7; 3.8; 3.9; 3.10; 4.9; 4.13; 4.29; 4.30; and 4.45.
- *Pacific fisher*: See Response 4.15.
- *Redband trout*: There would be no impact to redband trout populations (final EA pages 129-132).
- *Sensitive botanical species*: There are no known sensitive plant populations or habitat in the project area (final EA pages 386-389). The project is consistent with the January 2001 *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation measures Standards and Guidelines*. The project utilized the December 2003 species list (final EA page 390).
- *American marten:* See Response 4.22.
- *American peregrine falcon*: There are no high escarpments, cliffs, or tall buildings in the project area. There would be no impact to the American peregrine falcon (final EA page 221).
- *Northern goshawk*: See response 4.18.
- *Accipiter Hawks (Cooper's hawk and sharp shinned hawk)*: There will less than a 1% reduction of suitable habitat across the Forest; the overall direct, indirect, and cumulative effects would result in a small negative trend of habitat (i.e. increase in disturbance). The loss of habitat (i.e. increase in disturbance) will be insignificant at the Forest scale. The project is consistent with the Forest Plan, and thus continued viability of the accipiter hawks is expected on the Deschutes National Forest (final EA pages 257-261).
- *Black-backed woodpeckers*: Because this project impacts less than 1% of suitable habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat (increase in disturbance). The loss of habitat (increase in disturbance) would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan and thus continued viability of black-backed woodpecker is expected on the Deschutes National Forest.(final EA Page 299-305)
- *North American wolverine*: There would be no direct or indirect effects to the wolverine or its habitat. Alternatives 2 and 3 would not lead to a trend towards Federal listing (final EA pages 231 – 232).
- *Bald eagle*: The closest know nest site is six miles from the project area. There would be no impact to the bald eagle (final EA page 231).
- *Pileated woodpeckers*: Although the Melvin Butte project would treat about 63% of the suitable reproductive habitat for the pileated wood pecker; treatment would not target habitat components such as large trees and snags. Reproductive habitat would be degraded as a result of thinning stands from below. Canopy closures and structural complexities of the stands would be degraded, reducing the suitability of reproductive habitat. Approximately 45% of the reproductive habitat would be retained in its current state. Of the 207 acres of reproductive habitat that exists, 149 acres of habitat would be retained across the project area. The project is associated with 3% of the total suitable habitat across the Forest; the overall direct, indirect, and cumulative effects would result in a small negative trend on habitat (i.e. increase in disturbance). The changes to habitat would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan and thus continued viability of the pileated woodpecker is expected to occur on the Deschutes National Forest (final EA pages 288-295).

- *PCEs [Primary Constituent Elements]*: Primary Constituent Elements are discussed on pages 202 and 203 of the environmental assessment as they relate to northern spotted owl critical habitat. The project may affect but is not likely to adversely effect 2013 designated northern spotted owl critical habitat (draft EA page 215).
- *Bufflehead:* There is no suitable habitat (lakes or ponds) in the project area. There would be no impact to the bufflehead (final EA page 221).
- *Northern waterthrush*: There would be no treatments in Riparian Reserves. There would be no impact to the northern waterthrush (final EA page 221).
- *Fringed Myotis bat*: The project does not propose to remove large snags within the mixed conifer and ponderosa pine habitat types except those posing hard to operations under OSHA guidelines and those incidentally lost to prescribed fire. Implementation of the project would not have measurable impacts to Fringed Myotis bat habitat (final EA pages 225-230). The project may impact individuals or habitat for the Fringed Myotis bat (final EA page 230).
- *Townsend's Big-eared bat*: The project does not contain caves or cave like structures/rock outcrops that provide roosting habitat that would promote bat dispersal. The project may impact individuals or habitat for the Townsend's big-eared bat (final EA page 220).
- *Johnson's hairstreak*: Alternative 2 would result in the specific reduction of mistletoe trees on about 160 acres. On average, about 97% of the project area is not proposed for any treatment providing mistletoe habitat for this species. This retention, plus leaving about 906 acres in untreated stands and not removing all mistletoe trees (but only those trees with the highest rating) would maintain the presence of mistletoe, and Johnson's hairstreak habitat, widely distributed across the entire project area. Alternative 3 removes less mistletoe than Alternative 2, therefore would retain more trees with mistletoe and would have a lower potential to remove Johnson's hairstreak habitat (final EA pages 244-245). The project may impact the Johnson's hairstreak (final EA page 225).
- *Cascade Axetail slug*: This species is not found in the project area (Lauri Turner, Forest Wildlife Biologist, personal communication). .
- *Crater Lake tightcoil*: There would be no treatment in Riparian Reserves. There would be no impact to the Crater Lake tightcoil (final EA page 220).
- *Western bumblebee*: Approximately 20% of the project area (including harvest and fuels activities and depending upon the alternative chosen) would remain unchanged, and a majority of the Deep Canyon watersheds would be retained in Inventoried Roadless Areas and Wilderness areas. It is assumed species presence would still be maintained with either of the action alternatives. Based on these assumptions, the Melvin Butte project may impact individuals or habitat, but would not likely contribute to a trend toward federal listing for the western bumblebee. (EA pages 222-225;, Table 87).
- *Oregon megomphix*. This species is not found in the project area (Lauri Turner, Forest Wildlife Biologist, personal communication).
- *Great gray owl*: There is no habitat in the project area; therefore, no further analysis is needed (final EA pages 261-262).
- *Oregon Spotted frog*: No habitat occurs in the project area or on the Sisters Ranger District (final EA, page 217-218).

Comment: *There was no analysis in the Melvin Butte EA of potential effects from the USFS's converting to a larger-than-historic percentage of low-intensity burn area to species or ecological processes at the larger landscape scale. The effects of fuels reduction and forest density reduction on forest species that are reliant on denser forest and high and mixed fire regimes were not adequately considered, and were particularly lacking at relevant spatial and temporal scales.(4.8)*

Response: It is important to note fire hazard and fire regime are different concepts (final EA pages 143, 160-164, 350, 353-356). Mixed and high severity fires (high vegetation mortality percentages) are still expected under 90th percentile weather parameters (final EA pages 326-328 Table 36) within the project area. Also see Response 4.2.

Comment: *We are particularly concerned about the lack of adequate analysis regarding species with a determination in the EA of "affect but not likely to adversely effect". In general, we are concerned that potential post-fire habitats did not receive adequate analysis regarding potential effects from this project. Ecological features and processes that may also be negatively affected include future snag and dead wood recruitment and Big Game hiding cover. (4.9)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

We assume this comment is directed primarily towards the northern spotted owl. The environmental assessment contains an analysis of project effects to the northern spotted owl (final EA, pages 199-217). Alternatives 2 and 3 do not impact nesting, roosting and foraging, habitat (NRF); no NRF habitat is found in the project area. The action alternatives would reduce about 1,882 acres of dispersal habitat, retaining about 914 acres of the largest blocks of dispersal habitat; therefore the project may affect but is not likely to adversely affect northern spotted owl connectivity (final EA page 217). The project may affect but is not likely to adversely affect critical habitat in 2013 designated critical habitat by reducing about 1,601 acres of dispersal habitat, retaining about 752 acres of the largest block of dispersal habitat. The project is consistent with the 2011 Revised Recovery Plan. The project is consistent with the Deschutes National Forest LRMP standards and guidelines. A Level 1 review of the project was also conducted with the U. S. Fish and Wildlife Service and a Letter of Concurrence was issued on March 5, 2015 (final EA page 217).

Post-fire habitats for bats is described on pages 226-227 of the environmental assessment. For a discussion of Snags and Down Wood see pages 313-336 of the environmental assessment. With ongoing forest management projects within the Whychus and Deep Canyon watersheds by comparing the snags per acre by habitat types across both watersheds, there will be less than a 1% reduction in overall snag habitat. Implementation of the Melvin Butte project would not incrementally contribute to a change in viability of species associated with down wood habitat on the Deschutes National Forest (final EA, page 312; Table 177).

Treatments associated with the project would retain about 42% of the hiding cover within the summer range associated with the Dep Canyon watershed (final EA page 272-273).

Comment: *The Melvin Butte EA states that the project "may affect" Northern spotted owls due to the reduction/degradation of dispersal habitat within the project, but would "not likely adversely affect" spotted owls. The USFS does not provide a logical rationale as to why these reductions/degradations to dispersal habitat would not create barriers to movement, or why dispersal habitat degradation and destruction would not adversely affect spotted owls in this project. (4.10)*

Response: See response 4.9.

Comment: *In addition, the degradation of dispersal habitat will negatively affect recruitment of nesting, roasting, and foraging habitat, as thinning will remove complex forest canopy structure that would grow into forest structure needed by spotted owls for these activities. (4.11)*

Response: *See response 4.9.*

Comment: *Seasonal restrictions should apply to any potential disturbances that may affect spotted owls. (4.12)*

Response: Seasonal buffer restrictions for nesting raptors, including the norther spotted owl would be applied, if required, as a mitigation measure (final EA page 60; Table 11). See response 4.9.

Comment: *We are also concerned about indirect and cumulative impacts to spotted owl critical habitat due to the degradation of dispersal habitat in this and other nearby projects. Degradation to dispersal habitat creates movement barriers, affects connectivity and movement across spotted owl range, and prevents recruitment of dispersal habitat to higher value spotted owl habitat across their range, and will result from actions in this project as well as from other projects. (4.13)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

An analyses was completed to display the existing condition of Critical Habitat Subunit ECN 8 and the effects of the Melvin Butte project to critical habitat. In addition, the Ursus project would also remove dispersal habitat within the Deep Canyon watershed. (final EA pages 215-217) The Ursus project is not associated with the designated spotted owl critical habitat. The Melvin Butte and Ursus projects do not propose to treat NRF habitat and neither project contains occupied northern spotted owl habitat. Although both project reduce the overall amount of suitable dispersal habitat within the watershed, both project provide dispersal habitat to maintain habitat connectivity through the watershed. The Ursus project may affect but is not likely to adversely effect the spotted owl due to the reduction of spotted owl habitat within the project area. (EA pages 216-217).

Comment: […] *the Melvin Butte EA fails to consider best available science that shows that risk from fire, even high severity fires, to spotted owls is likely overstated, and also that spotted owl occupancy after fires might be much larger than previously assumed.(4.14)*

Response: FlamMap, a fire behavior mapping and analysis program that computes conditional fire behavior characteristics (flame length, crown fire potential, burn probability, etc.) over an entire landscape, was used with LANDFIRE to determine fire hazard across the Melvin Butte project area (final EA page *). FlamMap is a state-of-the-art tool used by many researchers in the Intermountain West (Finney (2006), Stratton (2004), Gerke and Stewart (2006), Stratton (2009), and Ager et al. (2010) (see references section of final EA).

FlamMap uses eight distinct raster (i.e. “grid”) data files (aspect, slope, elevation, fuel model, canopy height, canopy base height, crown bulk density, and crown class) and specific weather and fuel moisture conditions as inputs. (EA page 325) Fire behavior outputs are considered “potential” because they are conditional on a fire actually occurring (Finney 2006). Stand density treatments lower the fire hazard from a high of around 45% under the no action alternative to a low of around 7% under the action alternatives. Lowering the fire hazard has multiple benefits including fuel reduction in a designated Wildland Urban Interface while protecting the project area, to the extent possible, from stand replacement fire. The project area has some of the last remaining unburned mixed conifer forest and future northern spotted habitat in the portion of the Ranger District (final EA page 2).

About 640 acres of the 2012 Pole Creek fire are located in the project area. These acres were not associated with pre-fire northern spotted owl nesting, roosting, or foraging habitat. About 25,140 acres of

the 2012 Pole Creek fire are currently undergoing natural succession (4% of the total fire area was fire salvaged during the 2013 Pole Creek Fire Timber Salvage Project) and could be used for current and future northern owl spotted occupancy if they choose and can do so.

Surveys for the northern spotted owl were conducted within and adjacent to the Melvin Butte project from 2009 to 2011. (EA page 208) No known or historic spotted owl sites occur within the project area. No suitable nesting, roosting, or foraging habitat occurs within the project area. (EA pages 204) The project does not propose any post fire treatment within previously suitable northern spotted habitat. (EA pages 211-217). The project is consistent with the 2013 Critical Habitat Rule and with the 2011 Revised Recovery Plan. (EA page 217) A Level 1 Review was initiated with the U. S. Fish and Wildlife on August 8, 2013 to discuss the project effects to spotted owl designated critical habitat within both the Melvin Butte project and the effects to the function of critical habitat subunit ECN8. A rationale for determination of effects to spotted owl primary constituent habitat elements in designated critical habitat was discussed at that time. A Biological Assessment was submitted on February 15, 2015 and a Letter of Concurrence was received from the U.S. Fish and Wildlife Service on March 5, 2015. (EA page 206)

A number of scientific papers related to post-fire habitat for the northern spotted owl were supplied as part of the comments on the draft environmental assessment. These papers are summarized with responses in Appendix J of the final environmental assessment.

Comment: *It is not clear why the USFS determined that there was no fisher habitat available within the Melvin Butte Project area. We are concerned that Pacific fishers and their habitat will be negatively affected by the Melvin Butte project, and that the Melvin Butte EA failed to adequately analyze the direct, indirect, and cumulative impacts from this project on Pacific fishers. (4.15)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

Suitable habitat for the Pacific Fisher was determined based on the habitat components and human disturbance identified in the habitat summary (final EA pages 230-231). The mixed conifer zone of the project area does not contain the structurally complex Douglas-fir forest or montane mixed conifer that is highly associated with fisher denning and resting habitat (EA page 144 and 204). The Ursus project is associated with montane mix conifer containing mountain hemlock, white fir, and lodgepole pine. The Melvin Butte project occurs at lower elevations and as a result the mixed conifer zone is drier, and therefore made up of ponderosa pine, white-fir, and lodgepole pine. Due to the lack of habitat types that provide the structural complexities needed for denning habitat, and due to the disturbance associate with the intensive winter recreation associated the project area, the Melvin Butte project does not provide fisher denning habitat (final EA page 231). .

Comment: *Despite the acknowledgement of cumulative impacts to Western Bumblebees due to the Ursus and Melvin Butte projects within the Ursus EA, the Melvin Butte EA fails to acknowledge or justify these cumulative impacts, and says instead that there will be no impacts to Western Bumblebee from the Melvin Butte project due to a lack of habitat within the project area. Please explain the discrepancy between the Ursus project disclosing these potential cumulative impacts regarding the Melvin Butte sale, while the Melvin Butte EA does not disclose them. We are very concerned that the Melvin Butte EA failed to disclose or analyze cumulative impacts to Western bumblebees from this and other projects. (4.16)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The Melvin Butte cumulative effects analysis identifies there would be additive impacts from the Ursus Hazardous Fuels Reduction Project located on the Bend Ft. Rock Ranger District. The Ursus project is approximately 5,900 acres in size and is associated with approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to address fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project would impact about 68% to 69% of the forest habitat that has the potential to provide western bumble bee habitat. Thinning and fuels reduction efforts under both project proposals would impact potential bumblebee habitat through reduction in flowering shrubs and possible collapsing of rodent burrows due to equipment used during logging operations. (final EA page 224)

The Melvin Butte project identifies that there is the potential to destroy nest/hibernation burrows and reduce the amount of food source available to western bumble bee by crushing plants during harvest treatments and mastication of fuels. However, 20% of the project area (including harvest and fuels activities and depending upon the alternative chosen) would remain unchanged, plus a majority of the Deep Canyon watershed would be retained in Inventoried Roadless Areas and Wilderness areas. It is assumed species presence would still be maintained under the action alternatives. Based on these assumptions, the Melvin Butte project may impact individuals or habitat, but would not likely contribute to a trend toward federal listing for the western bumblebee. (final EA pages 223-225)

Comment: *Despite the acknowledgement of cumulative impacts to Johnson's hairstreak butterfly due to the Ursus and Melvin Butte projects within the Ursus EA, the Melvin Butte EA fails to acknowledge these cumulative impacts, and says instead that there will be no impacts to Johnson's hairstreak from the Melvin Butte project due to a lack of habitat within the project area. Please explain the discrepancy between the Ursus project disclosing these potential cumulative impacts regarding the Melvin Butte sale, while the Melvin Butte EA does not disclose them. We are very concerned that the Melvin Butte EA failed to disclose or analyze cumulative impacts to Johnson's hairstreak. (4.17)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

Within the Melvin Butte cumulative effects analysis the Ursus project has the potential to impact Johnson hairstreak habitat. On average 31%-32% of the Ursus project area (depending upon the alternative chosen) would remain unchanged, including a majority of the Tumalo Creek and Deep Canyon watersheds, in addition to Inventoried Roadless Areas and Wilderness areas. These areas would continue to provide the presence of mistletoe and therefore Johnson hairstreak habitat. It is assumed that species presence would be maintained under either of the action alternatives. (final EA page 245)

The Melvin Butte project has the potential to impact Johnson hairstreak due to the treatment of mistletoe infected trees on 160 acres. The action alternatives propose to remove trees with the highest mistletoe ratings to reduce the rate of spread. Although both action alternatives would remove mistletoe infected trees, Alternative 3 would retain a higher density since it would not intensively treat those areas that are the most heavily infected. On average about 97% of the stands containing mistletoe would still retain adequate levels of mistletoe post treatment. The majority of the Deep Canyon watersheds would remain untreated in addition to Inventoried Roadless Areas and Wilderness areas providing the presence of mistletoe throughout the watershed. It is assumed species presence would still be maintained with either of the action alternatives. Based on these assumptions, the Melvin Butte Project may impact individuals or habitat, but would not likely contribute to a trend toward federal listing for the Johnson's hairstreak. (final EA pages 244-245)

Comment: *Despite the acknowledgement of cumulative impacts to Northern goshawk due to the Ursus and Melvin Butte projects within the Ursus EA, the Melvin Butte EA downplays impacts to Northern goshawk from the Melvin Butte project by focusing on the Forest-wide scale, and by ignoring the potential to affect multiple territories (as mentioned by the Ursus EA and quoted above). The Forest-wide scale is inappropriate for analyzing potential impacts from this project. In addition, if the USFS desires to analyze impacts at a larger scale, then projects throughout the entire forest as well as neighboring private lands need to be analyzed and quantified. (4.18)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The Melvin Butte project propose to thin between approximately 1,882-1,976 acres of goshawk reproductive habitat. Overstory structural diversity would be retained, but understory complexity would be reduced through thinning, mowing, and burning. Although prey habitat would be reduced in the short-term, residual habitat would continue to provide foraging opportunities for the goshawk. Long-term benefits of treatments would reduce stress to overstory conifers and promote tree longevity. Treatments would promote the development of future old growth in the stands to provide long-term nesting habitat. Overall, reproductive habitat would be degraded in the short-term as a result of treatments (final EA pages 249-251).

The Ursus Hazardous Fuels Reduction project is approximately 5,900 acres in size and is associated with approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to address fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project would impact up to 1,839 acres of habitat, approximately 6% of the available habitat in the watershed and 0.6% of the available habitat on the Deschutes National Forest. The Deschutes Land and Resource Management Plan provides direction for habitat management of the northern goshawk at the Forest level. Reproductive habitat for the northern goshawk was quantified based on the existing forest conditions across the Deschutes National Forest. The Melvin Butte project is consistent with the Deschutes Land and Resource Management Plan (final EA pages 251-253).

Surveys were conducted from 2009 to 2014; one active goshawk territory was identified. A 30+ acre nest core was identified around the nest tree and would be excluded from treatment. A 400 acres of post fledging area was also identified adjacent to the nest core. (EA pages 248).

Comment: *The cumulative impacts from the Ursus, Melvin Butte, Drink, and other projects will have significant negative impacts to Big game, including population trends.*

Given that deer and elk populations are far below target and continuing to decline due, at least in part, to the lack of quality hiding cover-- there is little reason to believe that the further loss of hiding cover from the Melvin Butte project in combination with other projects will not have significant negative impacts on Big Game population trends. The Melvin Butte EA failed to adequately disclose or analyze cumulative impacts from this and other sales, and inappropriately downplayed the impacts from this project by switching to a Forest-wide scale.

The Melvin Butte attempts to downplay impacts to Big Game by noting that the project will decommission roads. While we support road decommissioning, the loss of hiding cover will still include significant negative impacts to Big Game. (4.19)

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The Melvin Butte project would remove between approximately 2,421-2,480 acres of deer hiding cover in the Melvin Butte project area (final EA page 271). Although treatment would improve foraging habitat in the short-term, deer may avoid these areas due to lack of hiding cover. The Deschutes Land and Resource Management Plan provides direction to manage mule deer hiding cover for summer range at the sub-watershed level. Minimally 30% of the subwatershed would remain as hiding cover as directed by Forest Plan. The project would maintain hiding cover and contribute to the overall available hiding cover for the Deep Canyon sub-watershed. In addition, the project proposes road closure which would increase habitat effectiveness within the project area. Overall, as a result of the Melvin Butte project, 42% of Deep Canyon sub watershed would remain as deer hiding cover. This project is consistent with the Deschutes Land and Resource Management Plan. (EA page 273) The Oregon Department of Fish and Wildlife is a member of the Deschutes Collaborative and supports the treatments associated with the Melvin Butte project.

Comment: *We are very concerned that the Melvin Butte EA failed to disclose or analyze cumulative impacts to Black-backed woodpeckers.*

The Forest-wide scale is inappropriate for analyzing potential cumulative impacts from this project. (4.20)

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

There is about 1,542 acres of black-backed woodpecker habitat in the project area (final EA page 305; Table 130). Alternative 2 would treat about 972 acres of reproductive habitat and Alterntive 3 would treat about 967 acres of reproductive habtitat, leaving about 570 acres and 575 acres, respectively. In total of suitable habitat, about 35% would be retained in untreated stands (final EA page 303).

The Urus Hazardous Fuels Reduction Project is about 5,900 acres in size and is associated with about 3,434 acres of the Deep Canyon Watershed. The project would impact up to about 2,311 acres of suitable black-backed woodpecker habitat. Project design avoids areas containing high densities of snags and limits the removal of snags > 20 inches dbh and under Alternative 3 limits the removal of white-fir snags > 22 inches dbh. The Ursus project would retain six snahs per acres across all treatment units. The project would impact less than 3%-4% of existing habitat in the Deep Creek, Tumalo Creek, Deschutes River-Charleston Creek, and McKenzie Canyon-Deschutes River watershed (final EA page 304).

Cumulatively, with other ongoing forest management projects within the Deep Canyon and Whychus watersheds, the Melvin Butte project would impact less than 0.2% of the suitable habitat across the Forest; the over all direct, indirect and cumulative effects would result in a small negative trend of habitat. The loss of habitat would be insignificant at the Forest level. The project is consistent with the Forest Plan and thus continued viability of the black-backed wood pecker is expected on the Deschutes National Forest (final EA page 305; Table 130).

Comment: *Despite the acknowledgement of habitat loss due to the Ursus and Melvin Butte projects within the Ursus EA, the Melvin Butte EA fails to adequately disclose or analyze these cumulative impacts. Please explain the discrepancy between the Ursus project disclosing these potential cumulative impacts regarding the Melvin Butte sale, while the Melvin Butte EA does not disclose them. We are very*

concerned that the Melvin Butte EA failed to disclose or analyze cumulative impacts to Williamson's sapsuckers. (4.21)

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

Between approximately 766-825 acres of Williamson's sapsucker habitat is associated with treatments under the action alternatives. These acres are primarily multi-storied stands dominated by large trees. In areas identified for thinning tree canopy cover and stand densities would be reduced to lessen the risk of a large-scale disturbance event (insects, disease, or fire). Approximately 65% of the identified Williamson's sapsucker habitat is associated with vegetation treatments and have the potential to degrade habitat by reducing the structural diversity of green trees associated with reproductive habitat.

Approximately 3% of the reproductive habitat associated with Deep Canyon and Whychus Watersheds has the potential to be degraded from treatments identified with the Melvin Butte Project (final EA page 293). The Ursus Hazardous Fuels Reduction project is approximately 5,900 acres in size and is associated with approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to address fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project contains approximately 812 acres of suitable Williamson's sapsucker habitat. The project design avoids areas containing high densities of snags and limits the removal of snags $\geq$20inches dbh and under Alternative 3 would limit the removal of white-fir snags $\geq$22 inches dbh. In addition, the project will retain six snags per acre across all treatment units. The projects would impact far less than 1% of the existing habitat on the Deschutes National Forest. The project is consistent with the Biological Objectives for Williamson's Sapsucker identified within the Land Bird Conservation Strategy (final EA page 294).

***Comment**: The cumulative impacts from the Melvin Butte project, especially in combination with other projects, will cause a significant loss of habitat as well as a negative population trend. Despite the acknowledgement of habitat loss and negative population trends due to the Ursus and Melvin Butte projects within the Ursus EA, the Melvin Butte EA fails to adequately disclose or analyze these cumulative impacts. Please explain the discrepancy between the Ursus project disclosing these potential cumulative impacts regarding the Melvin Butte sale, while the Melvin Butte EA does not disclose them. We are very concerned that the Melvin Butte EA failed to disclose or analyze cumulative impacts to American marten. (4.22)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

About 968 acres of reproductive habitat for the American marten is located in the project area (final EA page 307). As a of result treatments overstory structural diversity would be reduced in mixed conifer stands by thinning from below and understory complexities would be reduced through fuels treatments to treat slash generated by thinning activities. Fuels treatments associated with harvest treatments may impact the American marten and its prey species. Although prey habitat would be reduced in the short-term, some residual habitat would remain providing foraging opportunities for the American marten. Long-term benefits of treatments would be a reduction of stress to the overstory conifers by promoting the longevity of the residual large tree structure. Treatments would also promote the development of future old growth in stands that would be thinned from below, providing habitat over the long-term (final EA pages 308-311) .

Overall, approximately 649 acres of American marten reproductive habitat are associated with treatments identified under Alternative 2 and approximately 707 acres under Alternative 3 totaling 70% of the existing reproductive habitat in the project area. The majority of these treatments would occur in the wet mixed conifer plant association group. Thinning and burning could reduce snag and down wood structural complexities that contribute to American marten reproductive habitat. Thinning would also reduce the overall canopy closure associated with these areas as a result of treatments to reduce the potential for crown fires. Although burning would recruit snags and down wood, slash treatment associated with these stands would decrease overall down wood level in the stands minimally meeting Forest Plan objectives final EA page 310).

American marten reproductive habitat would be reduced within the project area; however, a full stocked overstory would remain after treatment. Although these stands may not meet the need for marten denning habitat, these areas would still provide avenues for dispersal. In addition, the Ursus Hazardous Fuels Reduction project is approximately 5,900 acres in size and is associated with approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project addresses fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The project would impact up to approximately 3,707 acres of overstory habitat suitable marten. The project design avoids areas containing high densities of snags and limits the removal of snags $\geq$20inches dbh and under Alternative 3 limits removal on white-fir snag >22 inches dbh. In addition, the project would retain six snags per acre across all treatment units. Implementation of the Ursus project would contribute to a small downward trend in local marten populations due to the reduction in canopy closures, snags and logs in mixed conifer and lodgepole pine habitat types. This contribution is small because of the location of the project adjacent to high quality habitats in Inventoried Roadless Areas (American marten observations have occurred in these areas) and downed log densities would increase as snags fall (final Ea pages 311-312).

The Deschutes Land and Resource Management Plan provides direction for habitat management of the American marten at the Forest level. Reproductive habitat for the American marten was quantified based on the existing forest conditions across the Deschutes National Forest. Habitat was quantified at the project level, watershed level, and Forest level. A cumulative effects analysis was completed to determine the projects impacts in conjunction with ongoing and reasonably foreseeable future projects. In addition, a habitat quality assessment was completed for the American Marten for the Whychus and Deep Canyon watersheds. Cumulatively, because this project impacts 0.6% of suitable American marten habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat. The project is consistent with the Deschutes Land and Resource Management Plan (final EA page 313). The project does not change the overall quality of habitat at the watershed level for the American marten based on the dead wood requirement for this species. The Melvin Butte project impacts less than 1% of suitable American marten habitat across the Forest final EA page 313).

Comment: *The cumulative impacts from the Melvin Butte project, especially in combination with other projects, will cause a significant loss of habitat and may cause a negative population trend. Despite the acknowledgement of habitat loss and negative population trends due to the Ursus and Melvin Butte projects within the Ursus EA, the Melvin Butte EA fails to adequately disclose or analyze these cumulative impacts. We are very concerned that the Melvin Butte EA failed to disclose or analyze cumulative impacts to Flammulated owls. (4.23)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The flammulated owl is discussed under the section Mixed Conifer, Large Trees and Snags-Pileated Woodpecker, Brown Creeper, Hermit Thrush, Flammulated Owl and Williamson's Sapsucker (final EA pages 288-295). The Williamson's sapsucker and the pileated woodpecker are used as surrogates for the brown creeper, hermit thrush, and flammulated owl (final EA page 289).

Cumulatively the project is associated with a 0.6% of the total suitable Williamson's sapsucker habitat and 0.5% of the total suitable Pileated woodpecker across the forest, the overall direct, indirect, and cumulative effects of the project would result in a small negative trend of habitat. The changes would be insignificant at the Forest scale. The project is consistent with the biological objectives for the flammulated owl, brown creeper, and hermit thrush (final EA page 294).

Comment: *The cumulative impacts from the Melvin Butte project, especially in combination with other projects, will cause a significant loss of habitat and may cause a negative population trend. Despite the acknowledgement of habitat loss and negative population trends due to the Ursus and Melvin Butte projects within the Ursus EA, the Melvin Butte EA fails to adequately disclose or analyze these cumulative impacts. We are very concerned that the Melvin Butte EA failed to disclose or analyze cumulative impacts to Brown creepers and Hermit thrushes. (4.24)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

Although treatments would thin stands that are currently suitable reproductive habitat for the brown creeper and hermit thrush, the Melvin Butte project does not propose to remove large trees and large snags that are associated with reproductive habitat within the watersheds or on the Deschutes National Forest. The Melvin Butte project has the potential to reduce habitat quality for these species by thinning green trees, reducing the structural complexity of stands associated with reproductive habitat. The project has the potential to degrade 3% of the overall habitat associated with the Deep Canyon and Whychus watersheds through the thinning of green trees.

Although the Melvin Butte project would treat approximately between 63%-65% of suitable habitat within the project area, treatment would not target habitat components such as large trees and snags within the project area. The Ursus Hazardous Fuels Reduction project is approximately 5,900 acres in size and is associated with approximately 3,434 acres of the Deep Canyon Watershed. The Ursus project proposes to break up the fuel continuity across the project area, removing dead and dying trees associated with insects and disease outbreaks in the eastside mixed conifer, montane mixed conifer, and lodgepole pine habitat types. The Ursus project would reduce habitat on approximately 15% of the brown creep habitat and 3% of the hermit thrush habitat associated with the Deep Canyon watershed.

The Melvin Butte project is consistent with the Biological Objectives for hermit thrush and brown creeper identified within the Land Bird Conservation Strategy. (final EA page 294)

Comment: *The Melvin Butte EA states: "…dead and dying trees in the medium size classes (averaging approximately 12 - 14 inches dbh) will be removed to reduce fuel concentrations, potentially removing some foraging opportunities. Although they are not large snags these medium sized snags do provide some limited nesting opportunities." The EA does not adequately analyze what effects this removal of medium sized snags and dying trees will have on Black-backed woodpeckers, forest structure, snag recruitment, or species viability (4.25)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

Because this project impacts less than 1% of suitable black-backed woodpecker habitat across the Forest, the overall direct, indirect and cumulative effects would result in a small negative trend of habitat (increase in disturbance). The loss of habitat (increase in disturbance) would be insignificant at the Forest scale. The Melvin Butte project is consistent with the Forest Plan and thus continued viability of black-backed woodpecker is expected on the Deschutes National Forest. (final EA page 305)

Comment: *The Melvin Butte EA did not adequately analyze direct, indirect, or cumulative impacts on recreation. What are the cumulative impacts to recreational values and scenic integrity from the Melvin Butte sale combined with these [West Tumbull. Pole Creek Fire Salvage, Drink, fire salvage in the Cascade Timberlands Forest] and other projects? (4.26)*

Response: The direct, indirect, and cumulative effects of the project on the recreation resource are discussed in the environmental assessment (final EA pages 408-411).

The direct and indirect effects to Forest visitors would occur due to the presence of machinery, creation of noise due to logging operations, creation of road dust due to log haul, possible traffic delays, and visual evidence such as marked trees and skid trails (final EA page 411).

The relevant ongoing actions in the cumulative effects discussion include activities taking place in the Ursus project taking place on the Bend Fort Rock Ranger District. The Ursus project may displace snowmobile users and other winter users from snowmobile trail #8 and Triangle Hill #88 during activities. Depending on the Melvin Butte and Ursus implementation operations timeframe, temporary snowmobile trail closures within the same region may occur (final EA page 410).

The Forest Plan standards and guidelines would be met through the project Resource Protection Measures (final EA pages 61-63).

Tables 14, 15, and 16 [in the EA] are merely a listing of past, present, and future foreseeable actions that have the potential to overlap the project area. Because a project appears in [these] tables it does not necessarily mean it has an additive effect because it may not be applicable for all resources. If there is a past, present, or foreseeable action, it is disclosed in the individual resource area in the environmental consequences section of [the] environmental assessment (final EA, pages 73-75)

Comment*: The EA failed to disclose or acknowledge legitimate scientific controversy regarding Bark beetles and the USFS's perceived need for logging in relation to beetles.(4.27)*

Response: A review of Six et al 2014 was conducted in order to assess its utility in relationship to the Melvin Butte proposed action. The paper is a review of science vis-à-vis timber harvest treatments in areas of ongoing mountain pine beetle outbreaks (Six et al. 2014). There are no current (years 2015/2016) outbreaks of mountain pine beetle in the project area or within the watershed. The final environmental assessment identifies the existing condition and context of the mountain pine bark beetle (final EA pages 164, 167, 177, and 181(Eglitis et al. 2015)). The final environmental assessment mentions a past outbreak (circa 2000's) in order to describe the effects from past outbreaks in the surrounding area. The thinning that is planned within the project area would be conducted as a preventative measure and in terms of increased "resistance" and increased "resilience" for future unknown disturbances (includes resilience to potential bark beetle) (final EA page 14-16; effects analyses pages 172-183) (Comment on Six et al. 2014 by Fettig et al. 2014). The environmental assessment identifies the most significant insect in the project

area as the western pine beetle affecting small groups of ponderosa pine (Final EA page 159 and FHP review of Melvin EA (Eglitis et al. 2015)). It is the aforementioned reasons this publication was not cited as relevant to the project.

Comment: *In addition, studies suggesting that logging in forests affected by Bark-beetles is misguided and ineffective should be taken into account by the USFS in relation to their assumption that logging is necessary to promote or protect large tree structure to for Northern spotted owls. These studies show that this assumption may be inaccurate, and therefore not a sound ecological justification for logging to protect large tree structure for spotted owls.(4.28)*

Response: The previous research (Six et al. 2014) refers to outbreak areas primarily within lodgepole stands. The proposed action consists of treatments within lodgepole stands; however, it is designed as a lodgepole improvement or scenic views enhancement due to a past (not current) outbreaks and impacts recent fires in order to meet the Foreground management area and/or Wildland Urban Interface objectives (final EA pages 37-40). This action does not have the intent or purpose of mitigating and or responding to a current insect outbreak. Also see response 4.27.

Comment: *Northern spotted owls often nest on mistletoe brooms. Attempts to control mistletoe in the Melvin Butte project may in fact harm habitat and habitat recruitment for Northern spotted owls. Flying squirrels, the preferred prey of Northern spotted owls, also rely on mistletoe brooms. Degrading and destroying mistletoe-created habitats may directly, indirectly, and cumulatively harm both spotted owls and their prey. Other listed and at-risk species may also depend on mistletoe brooms, but this aspect of forest ecology was severely downplayed in the Melvin Butte EA. We request a more scientifically accurate analysis that includes best available current science. (4.29)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

No spotted owl nesting, roosting, and foraging habitat occurs in the project area (final EA pages 211 and 217). The project does not attempt to control mistletoe rather it treats approximately 160 acres where infestation is the most severe. The remainder of the project areas contains occurrences of mistletoe which would continue to persist providing habitat for mistletoe dependent species as such. (final EA pages 164-167, 177,181-182)

Comment: *The Melvin Butte EA failed to disclose or acknowledge legitimate scientific controversy regarding perceived risks to spotted owls and other TES species and their habitats from wildfire. The USFS also failed to disclose or acknowledge legitimate scientific controversy regarding the USFS's perceived need for logging and potential associated risks to preserve spotted owl and other TES species and their habitats due to logging. (4.30)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The project area is not highly associated with post fire habitat for the northern spotted owl. About 240 acres of post fire habitats would be treated along Forest Road 16 to meet Forest Plan objectives for Scenic View land allocation. No pre-fire northern spotted owl habitat occurs within the Scenic Views land allocation. The project proposes to thin green stands, specifically conducting stand density reduction and ladder fuel removal to increase stand resiliency. A complete analysis was conducted for the spotted owl; no nesting, roosting, or foraging habitat occurs within the project area. The project area contains spotted

owl dispersal habitat; a connectivity strategy was developed for the project area. The project is consistent with the 2011 USFWS Revised Recovery Plan for the Northern Spotted Owl (final EA page 217). A Level 1 review with the U. S. Fish and Wildlife was initiated on August 8, 2013 to discuss project effects to spotted owl designated critical habitat. A rationale for a determination of effects to spotted owl primary constituent habitat elements in designated Critical Habitat was discussed at the time. A Biological Assessment was submitted on February 15, 2015 and a Letter of Concurrence was received from the U.S. Fish and Wildlife Service on March 5, 2015 (final EA page 201).

A number of scientific references regarding the management of post-fire northern spotted owl habitat were supplied during the 30-day day comment period on the draft environmental assessment. Our responses are in included in Appendix J of this final environmental assessment.

Comment: *The Melvin Butte EA failed to disclose or acknowledge legitimate scientific controversy regarding perceived risks from wildfire, or the numerous ecological benefits of wildfire. The Melvin Butte EA failed to disclose or acknowledge legitimate scientific controversy regarding fire regimes, historic range of variability of high-intensity fires and forest densities.(4.31)*

Response: Values at risk are described in the final environmental assessment (final EA pages 363-366). The watershed has experienced a large proportion of fire in the recent past. We feel the severity proportions that occurred and the temporal relationship among fires in the watershed is part of the purpose and need for the project. Continued large stand replacement fires (greater than that described in the Desired Future Condition) would not meet the purpose and need of the project.

Comment: *The Melvin Butte EA failed to consider scientific controversy surrounding fire suppression strategies, including thinning. Altering forest density in mixed-conifer forests may negatively affect wildlife and ecological functions. Artificially manipulating mixed-conifer forests through logging and other fuels reduction activities and managing for lower fire risk may create unnatural and ecologically deleterious conditions. (4.32)*

Response: A number of scientific references regarding fire suppression strategies were supplied during the 30-day day comment period on the draft environmental assessment. Our responses are in included in Appendix J of this final environmental assessment.

See Response 4.5**.**

Comment: *Post-fire logging is extremely ecologically damaging. While the Melvin Butte project says it is not proposing "salvage" logging, the project does proposed to log in post-fire habitats, some of which have overlapping cumulative impacts with past management. Logging will degrade and destroy the sensitive and unique post-fire areas. While the Melvin Butte EA is not calling logging in post-burn areas "salvage" logging—the effects of logging in this unique post-fire habitat will similarly degrade these areas. (4.33)*

Response: In 2012 the Pole Creek fire burned approximately 26,120 acres at varying fire intensities affecting overstory tree mortality (24% underburned: 6,269 acres; 36% mixed mortality: 9,403 acres; and 40% stand replacement: 10,448 acres). The 2013 Pole Creek Fire Timber Salvage Project harvested 11MMBF of fire killed timber on about 980 acres in the fire area. Salvage harvest was limited to areas of stand replacement fire; this is about 4% of the total fire area and about 9% of the total number of stand replacement acres. About 96% of the Pole Creek fire area or about 25,140 acres were not harvested and would continue to undergo natural succession.

About 642 acres of the 2012 Pole Creek fire (about 2.5% of the total fire area) are located in the project area, west of Forest Road 16 (final EA page 2). The areas include a mix of vegetation mortality. Many of the stands adjacent to Forest Road 16 contain varying levels of unburned fuels that could impact ingress of firefighters and egress of the recreational public along Forest Road 16 in the event of a wildfire. Forest Road 16 is located in a designated Wildland Urban Interface (WUI) as defined in the Greater Sisters Country Community Wildfire Protection Plan (final EA page 2 and pages 345-346; page 364, Figure 27; page 367, Figure 28).

The Wildland Urban Interface is included as part of the Fuels Reduction Strategy for the project (final EA pages 18-19). Fuel treatments would include thinning from below, retention of residual green trees in areas of high lodgepole mortality, mastication and/or mowing of shrubs, and prescribed burning (final EA page 18-19). Forest Road 16 within the Wildland Urban Interface would be cleared of contiguous surface fuel loading from both sides of the road; the Wildland Urban Interface can then act as defensible space in the event of a wildfire (final EA page 343). No dead trees (snags) would be removed unless they present an OSHA safety hazard.

The Scenic Views Enhancement Treatment includes about 240 acres of the 2012 Pole Creek fire. In this area small pockets of dead trees, primarily lodgepole pine less than 10 inches diameter at breast height, would be removed to create a feathered edge adjacent to Forest Road 16 to ameliorate the effects of the Pole Creek fire. Lodgepole pine snags would be retained along with any green trees. Areas would then be planted. The goal of this treatment is to meet direction for the Scenic Views land allocation (final EA pages 39-40).

A number of scientific references regarding salvage logging were supplied during the 30-day day comment period on the draft environmental assessment. Our responses are in included in Appendix J of this final environmental assessment.

Comment: *The USFS environmental analysis for Melvin Butte needs a climate change analysis that reflects that wildfires do not contribute to carbon emissions at previously assumed and erroneously stated rates, and that wildfire-- including high-intensity wildfire-- is necessary to maintaining forest ecosystem integrity throughout the west. (4.34)*

Response: The climate change analysis for the project was revised to remove quantitative estimates of CO_2 emissions associated with wildfire as better information became available using FVS and because the potential wildfire emission can vary considerably depending on the weather conditions during any burn period. The report still addresses the qualitative contribution of wildfire in GHG emissions. The climate change report does not address the role of wildfire in forest ecosystem health (final EA pages 436 - 436).

Comment: *The Melvin Butte EA should have included carbon emissions from logging. (4.35)*

Response: The climate change report was revised to include the qualitative contribution of logging in GHG emissions (final Ea pages 436-441).

Comment: *The USFS should not commercially log in mature and old growth forests, and should not log in mature and old growth mixed-conifer forests. Large tree structure is at a deficit across the landscapes, and removing the next age and size class down from trees that reach this categorization reduces large tree recruitment. (4.36)*

Response: An analysis of the old growth fragments/patches at the Deep Creek 5th field watershed level was conducted (final EA pages 183-187). The watershed contains about 1,188 acres of old growth

fragments/patches (final EA page 186; Table 166); about 662 acres of old growth fragments/patches are located in the project area. About 33% (222 acres) of old-growth fragments/patches are included in the wildlife retention strategy. All silvicultural prescriptions call for retention of old growth ponderosa pine and old growth white fir and other species (where present) to a frequency that maintains large tree structure/frequency across stands and meets the definition for old growth as described in the Interim Old Growth Definitions (final EA page 186). The project meets Northwest Forest Plan standard and guideline C-44: provide for retention of old-growth fragments in watersheds where little remain.

Thinning from below would retain trees in the codominant and intermediate crown classes which would provide trees for recruitment into larger diameter classes over time.

Comment: *The Melvin Butte project, if implemented, will negatively effect existing snags which may be felled accidentally or because of safety hazards, as well as negatively effect future large snag recruitment. Snags have lower densities after thinning and fuels reduction projects. Consequently, many snag-dependent species are negatively affected. American marten and Black-backed habitat, for example, would be negatively affected by proposed thinning in mixed-conifer forests within the project area.(4.37)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

A snag and down log analysis was completed for the Melvin Butte project. Analysis areas should be sufficiently large to encompass the range of variation in wildlife habitat types and structural conditions that occur in the area. In general, at least 20 square miles (12,800 acres) in each habitat type is suggested as a minimum size for an analysis. The Whychus and Deep Canyon watersheds (HUC 10) were used for an appropriate comparison to the vegetation inventory data in DecAID for the Melvin Butte project area. (final EA page 317) The snag analysis displays the changes in snag densities based on the proposed action and associated effects. There is no change to habitat quality as a result of proposed action since the majority of treatment do not propose to directly remove snags. A modeling of snag recruitment over time was conducted using Forest Vegetation Simulator (FVS) and display in Table 138, Table 158 and Table 159. Treatment type associated with each action alternative was modeled to display the rate of recruitment, quantity, and size of snags as a result of each action alternative and then comparted to the No Action Alternative. The modeling was used to display the rate of recruitment between No Action and the action alternatives (final EA pages 320-336). Snags may be felled during logging operations if they are an OSHA safety hazard.

Comment: *In addition, LRMP snag standards do not go far enough in providing for biological needs of snag-dependent species. LRMP snag standards may not sufficiently provide for wildlife needs. The DecAID method is being used as a de facto plan amendment even though it is not a management standard and it has not been reviewed and approved via NEPA and NFMA standards. (4.38)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The effects analysis provided in the environmental assessment contains an analysis of Snags and Down Wood (final EA pages 313-336). The project meets or exceeds standards in the Northwest Forest Plan and the Deschutes National Forest Wildlife Tree and Log Strategy for snags and down wood habitat (final EA pages 335-336).

The DecAID Advisory is used as the best available science for the Melvin Butte snag analysis (final EA pages 316-318). DecAID is a web-based dataset; it is not a model. It is a synthesis of all the best available research on dead wood. It integrates current research/studies on wildlife use of dead wood (snags, down wood, dead portions of trees) in various habitat types. From this tolerance levels are generated; a tolerance level is the percent of the studies population that would use a density of snags or down wood (final EA page 318-319; Table 136). Appendix C provides a discussion of how DecAID was used for the Melvin Butte project (final EA pages 495-503).

Comment: *If a timber harvest results in erosion of volcanic soils, the ash and other tephra cannot be replaced under normal circumstances. The cumulative effects of harvesting on ash soils should be studied in depth. The EA needs to consider the very slow or absent recovery of these soils. (4.39)*

Response: The effects of vegetation management treatments on soils in the project area is discussed in the environmental assessment (final EA pages 81-94). The existing condition for soils is described on pages 84-87. Through the implementation of project design criteria and the application of appropriate soil mitigation measures intended to protect soils, none of the activity areas are expected to exceed the Forest Plan standard of 20% detrimental soil disturbance follow proposed treatment (final EA page 87). Appendix A provides a unit by unit index of estimated detrimental soil condition after treatment (final EA pages 479-486)

Comment: *In addition to the fragile and irreplaceable nature of volcanic soils, we are concerned that mitigation measures used to justify planned violations of detrimental soil impacts may be ineffective, or may not take place due to lack of funding or other issues.(4.40)*

Response: See response 4.39.

Comment: *The Melvin Butte project EA, however, states that subsoiled areas on this Forest are expected to reach full recovery within the short-term (less than 5 years) through natural recovery processes. It is unrealistic to state that soils can be returned to their former condition in such as short time period after becoming roads and used by heavy equipment during the project. (4.41)*

Response: See response 4.39. The project does not contain any new road construction. About 0.80 miles of temporary road construction would take place under Alternative 2 (final EA page 40). The temporary road would be sub-soiled after harvest operations are completed.

Comment: *We are opposed to the use of project-specific Forest Plan amendments to circumvent regulations designed to protect important forest habitats, resources, and functions. We are also very concerned that the Melvin Butte project will degrade and destroy Scenic Views, particularly in unique and beautiful post-burn habitats. Logging impacts to these areas will impair recovery of these areas, potentially severely retarding recovery of these areas and causing negative impacts to Scenic views for many years to come. We are concerned that the Melvin Butte project will negatively impact Scenic views in the foreground, and that the heavy-handed logging prescriptions in these areas will not provide visitors with "high quality scenery that represents the natural character of Central Oregon". (4.42)*

Response: The use of amendments to existing Forest Plan standards and guidelines follow guidance contained in the 1982 Planning Rule at 36 CFR 219.7 – Effective Dates and Transition (final EA page 22).

The amendments are focused on the Scenic Views (MA-9) land allocation Foreground Retention Timber/Mixed Conifer standards and guidelines as defined in the Deschutes National Forest Land and

Resource Management Plan, as amended. The goal for Scenic Views is "To provide forest visitors with high quality scenery that represents the natural character of Central Oregon" (final EA page 22).

The project proposes to amend 1) M9-27, Timing of Cleanup Activities, from a one-year period to a five year period to treat logging slash in Scenic Foreground areas and 2) M9-90 Fire Management, a) from a five acre limitation on prescribed burn areas in Scenic Foreground areas to allowing some prescribe burn areas greater than five acres and b) allowing some tree scorch greater than 1/3 of the forest canopy where it is not possible to prevent through mechanical means.

The scenic resources within the planning area have experienced visible changes over time such as the loss of large diameter old trees in Foreground areas and large old tree dominated habitats with a 75-80% departure of late and old forest structure habitats from historic conditions across the planning area. There are higher tree densities, as well as an ongoing species shift to more shade tolerant species, such as white fir in the Scenic Views Foreground areas as a result of fire suppression and fire exclusion. The combination of these conditions has lead to a degradation of scenic quality in Foreground areas adjacent to Forest Road 16.

Additionally, areas adjacent to Forest Road 16 were impacted by the 2012 Pole Creek fire. Impacts include areas affected by the fire itself, including some areas of stand replacement fire, and fire suppression activities such as mowing, felling of snags, and back burning operations. Forest Road 16 approximates the eastern edge of the Pole Creek fire. Given the impacts of the 2012 Pole Creek fire and fire suppression effort many Foreground areas do not meet the goals and objectives for the Scenic Views land allocation and are in need of restoration.

In order to address the current condition of the Scenic Views land allocation and begin rehabilitation a Scenic Views Enhancement Treatment was designed by the IDT. The goal of the treatment is to meet the desired future condition for the Scenic Views management area defined in page 21. In order meet the long term goals for the allocation green trees and scattered clusters of fire killed trees would remain to slowly transition the area to become scenic once again in the future. Removal of some small diameter dead lodgepole pine would create a random cluster group opening and feathered edge instead of a uniformed shape and straight edge of trees when viewed from the road. Newly planted trees in the open areas surrounding the surrounding scattered clusters of dead trees would eventually change the appearance of this edge the forest over time from burned to green. Logging debris would be lopped and scattered adjacent to Forest Road 16 to meet scenic quality standards and guidelines (final EA pages 22-32; pages 411-420).

Comment: *Amending the Forest Plan in order to degrade Scenic views to below standards will have unacceptable negative impacts to Scenic views. How many areas of the DNF are below standards for Scenic views? How many amendments concerning Scenic views have been proposed using project-specific Forest Plan amendments to circumvent cover restrictions and standards within individual projects. Standards and recommendations for quantity and quality for viewsheds should be upheld and followed. We are concerned about the cumulative effects of repeatedly violating the Forest Plan, especially based on rationales that seem to be widespread perceived "problems" across the forest. What are the forest-wide cumulative impacts from repeatedly amending the Forest Plan to allow for degradation of Scenic views in numerous timber sales across the landscape (current, recent, and planned)? If repeated violations of Forest Plan standards and goals are allowed through the recurrent use of project-specific Forest Plan amendments, what are the cumulative impacts to the resources that Forest Plan standards are designed to protect? (4.43)*

Response: A Site-Specific Forest Plan Amendments effects analysis was prepared to address the direct, indirect and cumulative effects of the two Scenic Views plan amendments proposed for the Melvin Butte

project (final EA pages 22-32). About 189,744 acres of the Scenic Views land management allocation is located on the Deschutes National Forest (final EA page 31). Currently there is about 5,275 acres of Forest level projects, including the Melvin Butte project, with site-specific Scenic Views amendments on the Deschutes National Forest (final EA page 31, Table 5).

The project proposes to amend 1) M9-27, Timing of Cleanup Activities, from a one-year period to a five year period to treat logging slash in Scenic Foreground areas and 2) M9-90 Fire Management, a) from a five acre limitation on prescribed burn areas in Scenic Foreground areas to allowing some prescribe burn areas greater than five acres and b) allowing some tree scorch greater than 1/3 of the forest canopy where it is not possible to prevent through mechanical means.

Two assumptions were made to frame the cumulative effects analysis. The first assumption is the visual effects of treating logging debris in Scenic Views Foreground areas would be mitigated (i.e. slash piles have been burned and/or other methods used to remove logging debris) after a five year period, are not obvious to the casual forest visitor, and meet the desired visual condition for each timber type as outlined in the Forest Plan. The second assumption is that trees that have been scorched by fire (trees have blackened boles due to prescribed fire) and prescribed burned areas greater to or less than five acres in size in Foreground areas have had adequate time (greater than five years) for vegetative recovery and are now blended into Foreground areas (final EA page 31).

The cumulative effects of these amendments are expected to be beneficial over the short and long term by providing safe travel routes to Forest destinations by reducing wildfire risk. Spatially the amendments do not occur at a single location so the short term visual impacts (i.e. scorch height) are distributed across the Forest. In the long term allowing prescribed burn areas greater than five acres in size could help blend landscape features to better match the landscape by showcasing mid to large sized trees in Foreground areas and contribute to the desired future condition for the Scenic Views land allocation at the Forest Plan level (final EA pages 31-32).

The effects of the Melvin Butte Vegetation Management Project plan amendments when combined with similar project amendments at the Forest level would cumulatively have a beneficial effect in meeting project goals and achieving the desired future condition for various timber types located in the Scenic Views land allocation. Cumulatively, about 2.8% of the Scenic Views land allocation would be treated using site-specific plan amendments at the Forest Plan level (final EA page 32).

Comment: *We are concerned that the Melvin Butte project will negatively impact MIS and survey and manage species including the bald eagle; northern spotted owl; golden eagle, red-tailed hawk; osprey; northern goshawk; Cooper's hawk; sharp-shinned hawk; great gray owl; great blue heron; woodpeckers (cavity nesters), Peregrine falcon, California wolverine, American marten; elk, Mule deer, American marten, Townsend's big-eared bat, waterfowl, snags and down wood habitat.(4.44)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The Melvin Butte Environmental analysis address habitat impacts to both birds of conservation concern and landbirds associated with the Landbird Conservation Strategy of the East Slope of the Cascade Mountains in Oregon and Washington. These focal bird species were identified as a result of focal habitat associated the Deschutes National Forest. Neotropical Migratory birds are not specifically addressed within the Melvin Butte EA. The landbird analysis displays the associated direct, indirect, and cumulative effects. The project is consistent with the Biological Objectives identified for landbirds associated with the project area. (final EA pages 237, 243, 281, 287, 294, and 305)

Comment: *We are also concerned about Neotropical songbirds, and other bird species. A wide variety of bird species would be affected by the removal structural diversity proposed in the Melvin Butte project. The loss of canopy diversity and shrub layer would degrade and destroy Neotropical habitat, as commercial thinning would remove multilayered and enough closure for these species. (4.44)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

An analysis of both birds of conservation concern and landbirds associated with the Landbird Conservation Strategy of the East Slope of the Cascade Mountains in Oregon and Washington was conducted for the Melvin Butte project. The project is consistent with the Biological Objectives identified for landbirds associated with the project area. See Response 4.44.

Comment: *The Melvin Butte EA will negatively affect Northern spotted owls and important Northern spotted owl habitat, including Nesting Roosting, and Foraging habitat, and dispersal habitat. Thinning in mixed conifer based on reducing basal area and opening the stands does not benefit the NSO [underlining in original text]. (4.45)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

The Melvin Butte project is associated with approximately 3,731 acres of the northern spotted owl Critical Habitat subunit ECN 8 or 4% of the Subunit (final EA page 206; Table 76 and page 213; Table 83). The 2013 Critical Habitat Final Rule identifies Special Management Considerations for the East Cascades. These management considerations identified the essential physical or biological features of dynamic, disturbance-prone forests that should be managed to promote spotted owl conservation, respond to climate change, and restore dry forest ecological structure, composition, and processes including wildfire and other disturbances. The management considerations would; 1. Conserve older stands that contain the conditions to support spotted owl occupancy or high value owl habitat 2. Emphasize vegetation management treatments outside spotted owl territories or highly suitable habitat 3. Design and implement restoration treatments at the landscape level 4. Retain and restore key structural components, including large and old trees, large snags, and downed logs 5. Retain and restore heterogeneity within stands 6. Retain and restore heterogeneity among stands 7. Manage roads to address fire risk and 8. Consider vegetation management objectives when managing wildfires where appropriate. These management considerations were used to design the Melvin Butte Vegetation Management Project (final EA page 213).

In addition, the 2011 Spotted Owl Revised Recovery Plan emphasizes the conservation of spotted owl sites and high value spotted owl habitat (page I-2). Interim Guidance focus on site conservation priorities for reproductive status: 1) Known sites with reproductive pairs; 2) Known sites with pairs; 3) Known sites with resident singles; and 4) Historic sites with reproductive pairs, pairs, and resident singles, respectively (page III-44). Further recommendations include avoiding activities that would reduce nesting, roosting, and foraging habitat within provincial home ranges (1.2 mile radius) of reproductive pairs (III-45). In developing the proposed action the management considerations for critical habitat and conservation priorities were utilized to develop the action alternatives for the Melvin Butte project (final EA page 211). Spotted owl surveys and field reconnaissance determined no suitable spotted owl nesting, roosting, and foraging habitat occurs within the project area. Spotted owl surveys were completed to protocol from 2009 to 2011; no responses were detected and no nest sires exist within the project area (final EA page 208).

Approximately 2,796 acres of Melvin Butte dispersal habitat is associated with the Critical Habitat subunit (final EA page 209). A field review of dispersal habitat was conducted and stands containing the highest functioning dispersal habitat with the highest site potential for maintaining habitat were retained to provide habitat connectivity. Stands that were identified as dispersal habitat but minimally met criteria due to lack of canopy cover were identified for silvicultural treatment. Treatments were developed to meet the eastside forest management considerations; within multi-storied stands that the largest and oldest trees would be retained. Treatment would thin small trees from below primarily reducing ladder fuels. No snags are proposed for felling unless they pose an OSHA safety hazard during logging operations. Some dispersal habitat exists in 40 to 60 year old second growth ponderosa pine plantations; no old growth or large tree structure is associated with these stands. Plantation would be thinned in a mosaic fashion to retain patches and clumps of trees providing utility for spotted owl dispersal; however, the entire canopy cover of the stand would be reduced below minimum dispersal standards. Lastly, roads are proposed for closure that would help to manage the risk of wildfires.

The project is consistent with the 2013 Critical Habitat Rule and with the 2011 Revised Recovery Plan. (EA page 217). A Level 1 Review was initiated on August 8, 2013 to discuss project effects to spotted owl designated critical habitat. A rationale for determination of effects to spotted owl primary constituent habitat elements in designated critical habitat was discussed at that time. A Biological Assessment was submitted on February 15, 2015 and a Letter of Concurrence was received from the U.S. Fish and Wildlife Service on March 5, 2015 (final EA page 201).

Comment: *The USFS justifies Northern spotted owl habitat reduction on the basis of reducing fire and beetles through logging. However, the Melvin Butte EA fails to include best available science or acknowledge scientific controversy in their analyses around relevant issues including: HRV for fire regimes and forest stand densities (especially in mixed conifer areas), overstated threat of fire (including high intensity fire) to NSO, and possible harm to NSO habitat from thinning.(4.46)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

An analysis was completed that addresses the impacts to spotted owl dispersal habitat associated with the Melvin Butte project. A connectivity strategy was developed for the project area. (EA page 200 to 202) The project is consistent with the 2011 USFWS Revised Recovery Plan for the Northern Spotted Owl (final EA page 217). A Level 1 review was initiated with the U. S. Fish and Wildlife on August 8, 2013 to discuss the project effects to spotted owl designated critical habitat. A rationale for determination of effects to spotted owl primary constituent habitat elements in designated critical habitat was discussed at the time. A Biological Assessment was submitted on February 15, 2015 and a Letter of Concurrence was received from the U.S. Fish and Wildlife Service on March 5, 2015 (final EA page 201).

A number of scientific references regarding fire regimes and historic range of variability were supplied during the 30-day day comment period on the draft environmental assessment. Our responses are in included in Appendix J of this final environmental assessment.

Comment: *The Melvin Butte project will reduce the amount of closed canopy forest available for Pacific fishers, as well as decrease large tree structure, current snag densities, and future large snag recruitment—all of which are needed by this species. (4.47)*

Response: See Response 4.15.

Comment: *We are very concerned about listed species within he project area, including Northern spotted owls; Townsend's big-eared bats; Pallid bats; Fringed myotis; other Sensitive bats; Black-backed woodpeckers; White-headed woodpeckers; Lewis' woodpecker; Pacific fisher; wolverine; Canada lynx; wolves; Sensitive-listed plant species; Western bumblebee; Johnson's hairstreak; Silver-bordered fritillary; Crater Lake tightcoil; Evening fieldslug; Columbia spotted frog; wolverine; American peregrine falcon; Bald eagle; Greater sage grouse; bufflehead; Northern waterthrush; Harlequin duck; Horned grebe; Tricolored blackbird; Yellow rail; Tule greater white-fronted goose; and other terrestrial listed species within the project area.(4.48)*

Response: The wildlife section of the final environmental assessment was updated to refine the effects analysis associated with the action alternatives and to better clarify the effects determinations, including cumulative effects, for wildlife species of concern.

Many of these species are discussed in 4.7 and the northern spotted owl is discussed throughout these responses.

- *Pallid bats*: The project may impact individuals or habitat would not likely lead to a trend towards federal listing (final EA pages 225-230). The Melvin Butte project does not propose to remove snags within the mixed conifer and ponderosa pine habitat types except those posing a hazard to operations under OSHA guidelines and those incidentally lost from prescribed burning operations.
- *Black-backed woodpeckers:* See Responses 4.20 and 4.25.
- *White-headed woodpeckers*: The project may impact individuals or habitat would not likely lead to a trend towards federal listing (final EA 237-244).
- *Lewis' woodpecker*: The project may impact individuals or habitat would not likely lead to a trend towards federal listing (final EA 233-237).
- *Canada lynx*: No Canada lynx habitat occurs on the Deschutes National Forest.
- *Western bumblebee*: See Response 4.16.
- *Silver-bordered fritillary*: There are no proposed treatments in riparian habitat. There would be no impact to the silver-bordered fritillary (final EA pages 219-220).
- *Evening fieldslug*: There are no proposed treatment activities in wet meadows, springs, or seeps. There would be no impact to the evening field slug (final EA page 220).
- *Columbia spotted frog*: This species is not known to occur on the Sisters Ranger District. There would be no impact to the Columbia spotted frog (final EA page 220).
- *Greater sage grouse*: There is no sagebrush habitat in or adjacent to the project area. There would be no impact on the greater sage grouse (final EA page 221).
- *Harlequin duck*: There are no proposed treatments in stream or riparian habitats. There would be no impact to the harlequin duck (final EA pages 221-222).
- *Horned grebe*: There are no proposed treatments in stream or riparian habitats. There would be no impact to the horned grebe (final EA page 222).
- *Tricolored blackbird:* There are no proposed treatments in mashes with cattails and tules. There would be no impact to the tricolored black bird. (final EA page 222)
- *Yellow rail*: There are no proposed treatments in wet meadows or riparian areas. There would be no impact to the yellow rail (final EA page 222).
- *Tule greater white-fronted goose*: There are no proposed treatments in marshes or tules. There would be no impact to the Tule greater white-fronted goose (final EA page 222).

Comment: *In addition, we are concerned about the effects of extensive upland logging on riparian habitats and water quality, and aquatic and riparian species including Bull trout, Redband trout, and*

Oregon spotted frogs. Upland logging can affect stream temperature, sediment loading, and watershed hydrology (including reduction in base flows). (4.49)

Response: There will be no effect to bull trout critical habitat or bull trout populations (final EA pages 132-133). There will be no impact to redband trout populations (final EA pages 129-132). No habitat exists for the Oregon spotted frog within the project area (final EA page 220). The project is in consistent with all nine objectives of the Aquatic Conservation Strategy (ACS) (final EA pages 133-139). No Riparian Reserves would be treated; there would be no detrimental soil impact affecting stream flow (final EA page 103-108; Tables 23, 25, 26, and 27); there would be no detrimental soil impact affecting sedimentation (final EA page 106-108, Table 25); there would be no detrimental soil impact affecting water temperature (final EA page 109, Table 26); and there would be no detrimental soil impact affecting channel condition (final EA page 110-112, Table 27).

Comment: *All logging and burning in the Melvin Butte project that will affect these areas [wilderness, potential wilderness, Oregon Wild unroaded, never logged areas, and undeveloped area] should be dropped, such as the acres proposed for logging in Potential Wilderness Areas. PWA areas should be managed to preserve the untrammeled, unmanaged wilderness character of the areas, and no actions should jeopardize future possible Wilderness designation by congress. (4.50)*

Response: There are no harvest units located in any Inventoried Roadless Area (final EA pages 423-427; Table 200; page 426, Figure 37). A Potential Wilderness Areas (PWA) analysis was conducted for the project (final EA pages 427-432). About 7,395 acres meet the Forest Service Handbook criteria for potential wilderness area (final EA page 428, Table 201; Appendix H, pages 524-529)). Silvicultural treatment of unit 57 would affect about 16 acres of the total inventory (final EA pages 404-405, Table 200). No harvest units in the project area are located adjacent to a Wilderness area (final EA page 431, Figure 38).

A Citizen Unroaded Areas analysis was conducted for the project (final EA pages 433-436, page 434, Figure 40). About 46 acres would receive silvicultural treatment, including prescribed fire.

Comment: *The actions proposed by the Melvin Butte sale within PWA will degrade these areas and jeopardize possible future Wilderness designations. The PWA acres that include proposed logging are directly adjacent to Wilderness.(4.51)*

Response: See response 4.50.

Comment: *The Melvin Butte EA failed to analyze potential effects to water quality, Bull trout, and other special-status and native aquatic species. (4.52)*

Response: See response 4.49.

Comment: *Potential negative impacts to stream temperature variability due to the Melvin Butte project also need to be analyzed- both in relation to the logging in the riparian reserves and also in relation to heavy logging and high road density throughout the project area and the sub-watersheds.(4.53)*

Response: No water bodies in the project area are listed on the Oregon 303(d) list for water temperature that is above the State standard (final EA page 109). No Riparian Reserves would be treated. See Response 4.49.

Comment: *Building new roads or reopening closed roads, both of which occur in the Melvin Butte project will create opportunities for non-natives to be transported into previously un-invaded areas. This is particularly concerning in the Melvin Butte area which already has patches of noxious weeds.(4.54)*

Response: Alternative 2 would build 0.80 miles of temporary road; the road would be closed and restored after use (final EA page 40). Alternative 3 does not build any temporary roads (final EA page 48). No currently closed roads in the project area would be opened. Resource Protection Measures are required to address invasive plants: before arriving at the site equipment would be cleaned to insure they are weed free (final EA page 61).

Comment: *The project area is in the Northwest Forest Plan. In order to fireproof the stands and protect the healthy dominant old ponderosa pine, no diameter limits should be implemented for treating these stands. A diameter limit was considered by the planning team, but we support your recommendation of no diameter limits.(5.1)*

Response: See 1.1.

Comment: *Winter logging and logging on slopes over 30% should have some flexibility. The low snow packs that have occurred during several of the past winters should not be a deterrent to treating the stands. QS Suggest mitigating measures be included in the contract to allow ground based skidding should snow or freezing conditions not be present. Further, limiting ground based harvest to slopes of 30% or less greatly reduces the options for using economical ground-based systems. Many of the new feller bunchers used today do quite well on slopes over 30% with minimal impacts to soil and the residual stands.(5.2)*

Response: See 1.2.

Comment: *The project is contained within the CFLRP landscape and thus snag analysis of the project should encompass the entire landscape. When taking this view into account there is a severe excess of large snags on the landscape, mainly due to recent wildfires, thus creation of snags is not necessary to meet forest plan guidelines and the Historical Range of Variability for the landscape and project.(5.3)*

Response: The project meets Forest Plan standards and guidelines for snags and down wood (final EA pages 335-336).

Comment: *QS supports the use of thinning with group openings to better treat the areas that are infected with mistletoe and in areas where the residual stands are not healthy. This will allow for the planting healthy trees that will quickly grow into an older age class component. Using this harvest method will also increase early seral forage species needed for deer and elk. The opening sizes should not be arbitrarily limited, and should be based on ground and stand conditions, to best meet forest health and individual tree biophysical needs.(5.4)*

Response: Group openings are part of the Thinning with Group Openings Treatment type (final EA page 39) and the Lodgepole Pine Improvement Treatment type (final EA pages 37-38). Placement of group openings would be located based on fine-scale stand conditions including relative proportions of ponderosa pine vs. white fir and other site variables.

Comment: *QS supports the use and construction of temporary roads to help access the treatment areas as found in Alternative 2. Well-placed temporary roads often cause fewer impacts accessing with longer skidding distances. It is our belief that the transportation system within the National Forest should be maintained and kept open to provide access for firefighting, land management activities, and recreation.*

Only where absolutely necessary, should the Forest consider closure or decommissioning of a system road or trail. (5.5)

Response: Alternative 2 proposes 0.80 miles of temporary road construction; Alternative 3 does not proposes the construction of temporary roads. Both action alternatives proposed road closure and road decommissioning. Road closure and decommissioning in the project area is based on the Melvin Buttes Roads Analysis that was conducted in an interdisciplinary team setting (see the Melvin Butte Roads Analysis Report contained in the project record). The effects of road closure and road decommissioning are discussed in the environmental assessment (final EA pages 441-445).

APPENDIX J: CONSIDERATION OF SCIENCE

A number of scientific papers were referenced during the comment period on the draft Melvin Butte Vegetation Management Project environmental assessment. The papers were reviewed by the appropriate resource specialist on the project interdisciplinary team to determine their relevancy to the project.

At this time, about 40 peer reviewed papers on climate change submitted by commenters have received a cursory review. No information has surfaced that would change our methodology or assumptions. A final review would be completed by the close of the objection period.

	Source	Science Cited in Comments on the draft Melvin Butte EA	Summary and Response
1	*BMBD*	*Management for Mountain Pine Beetle Outbreak Suppression: Does Relevant Science Support Current Policy?*, Six et al. (2014)	**Summary**: This paper provides a literature review of silvicultural treatments for forested areas associated with ongoing mountain pine beetle outbreaks. **Response**: There are no current (years 2015/2016) outbreaks of the mountain pine beetle in the project area. The environmental assessment and Forest Health and Protection Review identifies the existing condition and the effects of insects and disease on forested vegetation. Silvicultural treatments, including thinning from below, would be conducted as a preventative measure to increase stand health, resistance, and resilience in the face of future unknown disturbances, including resilience to potential bark beetle outbreaks.
2	*BMBD*	*Hanson, C. 2015 Forest and Wildlife Fire Science Synthesis*	**Summary:** The paper cites numerous studies showing that spotted owls use post-fire habitats more than previously thought, particularly mixed-intensity post-fire habitats that include high-intensity patches. This includes nesting, roosting, and foraging. Papers 3 -13 are cited in this paper.
3	*BMBD*	*Bond, M. L., D. E. Lee, R. B. Siegel, & J. P. Ward, Jr. 2009a. Habitat use and selection by California Spotted Owls in a post-fire landscape. Journal of Wildlife Management 73: 1116-1124.* *(copy on file)*	**Summary**: This paper examined the effects of fire on 7 radio marked California spotted owls from 4 territories by quantifying use of habitat for nesting, roosting, and foraging according to severity of burn.in the southern Sierra Nevada, California, 4 years after fire. Three nests were located in mixed-conifer forests, 2 in areas of moderate-severity burn, and one in an area of low severity burn, and one nest was located in an unburned area of mixed-conifer–hardwood forest. Most owls foraged in high-severity burned forest more than in all other burn categories; high-severity burned forests had

			greater basal area of snags and higher shrub and herbaceous cover, parameters thought to be associated with increased abundance or accessibility of prey. They recommend that burned forests within 1.5 km of nests or roosts of California spotted owls not be salvage-logged until long-term effects of fire on spotted owls and their prey are understood more fully. **Response:** The purpose on the Melvin Butte project is to maintain and restore forest resiliency and forest health and is not designed as a timber salvage project. The project purpose and need is not focused on the economic recovery of fire killed timber as occurred in the adjacent 2013 Pole Creek Fire Timber Salvage Project. About 640 acres of the Pole Creek fire is associated with the Melvin Butte project area. These acres burned a varying fire intensities and are not associated with northern spotted owl nesting, roosting, and foraging (NRF) habitat pre-fire. Of the 640 acres, about 242 acres are associated with the Scenic Views Enhancement Treatment. This treatment would retain all green trees and large snags and remove concentration of dead trees <10 inches in diameter to meet scenic objectives for the Forest Road 16 corridor. The remaining 398 acres would be treated using prescribed fire, thinning from below using variable density thinning, and precommercial thinning of plantations. No snags or down wood are targeted for removal. Snags maybe felled if they pose a safety hazard under OSHA guidelines. No NRF habitat or historic or occupied sites for the northern spotted owl occur within the project area. Project design would maintain dispersal habitat for the northern spotted owl in the project area.
4	*BMBD*	*Bond, M.L., D.E. Lee, R.B. Siegel, and M.W. Tingley. 2013. Diet and home-range size of California spotted owls in a burned forest. Western Birds 44: 114-126* *(copy on file)*	**Summary**: This paper assessed the diets and sizes of the breeding-season home ranges of seven Spotted Owls occupying burned forests in the southern Sierra Nevada 4 years after a fire and compared the results with data from previous studies in unburned forests within the range of the subspecies. Prey captured by owls in the burned area comprised pocket gophers and northern flying squirrels. In contrast, in unburned areas of the Sierra Nevada owls fed primarily on flying squirrels, or on both flying squirrels and woodrats. In unburned southern California forests they fed overwhelmingly on woodrats. Home range in the burned forest was similar to that recorded in unburned forests of the Sierra Nevada. These results are consistent with hypotheses that the burned habitat in the study area was rich in gophers and that Spotted Owls foraging on gophers in burned forests do not require home ranges substantially larger than do owls in unburned forests. They could not conclusively attribute variation in diet or home-range size to the influence of fire. Use of rodenticides and herbicides in managing burned Spotted Owl

			habitat may reduce the owl's key prey. **Response:** See response to reference number 3**.** No rodenticides or herbicides were identified for use in post fire habitat.
5	*BMBD*	*Franklin, A.B., D.R. Anderson, R.J. Gutierrez, and K.P. Burnham. 2000. Climate, habitat quality, and fitness in northern spotted owl populations in northwestern California. Ecological Monographs 70: 539-590.* *(copy on file)*	**Summary:** This paper studied a population of marked Northern Spotted Owl (*Strix occidentalis caurina*) in northwestern California from 1985 through 1994. Examined the magnitude of temporal and spatial variation in life history traits (survival, reproductive output, and recruitment), the effects of climate and landscape characteristics on temporal and spatial variation in these traits, respectively, and how this variation affected aspects of population dynamics. Climate explained most of the temporal variation in life history traits. Annual survival varied the least over time, whereas recruitment rate varied the most, suggesting a ''bet-hedging'' life history strategy for the owl. A forecast of annual rates of population change estimated from life history traits, suggested that Northern Spotted Owl populations may change solely due to climate influences, even with unchanging habitat conditions. In terms of spatial variation, annual survival on territories was positively associated both with amounts of interior old-growth forest and with length of edge between those forests and other vegetation types. Reproductive output was negatively associated with interior forest, but positively associated with edge between mature and old-growth conifer forest and other vegetation types. A gradient existed in territory specific estimates of fitness derived from these life history estimates. This gradient suggested that a mosaic of older forest interspersed with other vegetation types promoted high fitness in Northern Spotted Owls. Habitat quality, as defined by fitness, appeared to buffer variation in annual survival but did not buffer reproductive output. **Response**: See response to reference number 3. Surveys for the northern spotted owl were conducted to protocol and no detections were recorded in the project area.
6	*BMBD*	*Lee, D.E., M.L. Bond, and R.B. Siegel. 2012. Dynamics of breeding-season site occupancy of the California spotted owl in burned forests. The Condor 114: 792-802* *(copy on file)*	**Summary:** This paper compared probabilities of local extinction and colonization of California Spotted Owl (*Strix occidentalis occidentalis*) at burned and unburned sites while accounting for annual and site-specific variation in detectability. No significant effects of fire were found on these probabilities, suggesting that fire, even fire that burns on average 32% of suitable habitat at high severity within a California Spotted Owl site, does

			not threaten the persistence of the subspecies on the landscape. Simulations suggest that to determine whether and how habitat disturbance affects California Spotted Owl occupancy within 3 years, managers should strive to annually survey ≥200 affected and ≥200 unaffected historical owl sites throughout the Sierra Nevada 5 times per year. Recommends more than one year of surveys be used to determine site occupancy before management that could be detrimental to the Spotted Owl is undertaken in potentially occupied habitat given the low probability of detection in one year. Mixed-intensity wildland fire, averaging 32% high-intensity fire effects, did not decrease California spotted owl territory occupancy, and actually had higher occupancy than unburned mature/old forest, but post-fire salvage logging adversely affected occupancy. **Response:** No historic or occupied spotted owl territories occur in the Melvin Butte project area or areas immediately adjacent. See response to reference number 3. No post-fire salvage logging is proposed with this project.
7	*BMBD*	*Moors, A. 2012&2013. Occupancy and reproductive success of Mexican spotted owls in the Chiricahua Mountains. Annual reports to the Coronado National Forest, Arizona for 2012 and 2013 field seasons.*	**Summary:** This paper addressed a 223,000-acre fire in the Coronado National Forest; after the fire there was an increase in Mexican spotted owl occupancy. Reproduction also increased, particularly in the territories that had the highest levels of high-intensity fire. **Response:** The Mexican spotted owl does not occur on the Deschutes National Forest. No historic or occupied northern spotted owl home ranges occur in the project area or in areas immediately adjacent. No NRF habitat is associated with the project area. See response to reference numbers 3 and 6.
8	*BMBD*	*Ganey, J.L., S.C. Kyle, T.A. Rawlinson, D.L. Apprill, and J.P. Ward, Jr. 2014. Relative abundance of small mammals in nest core areas and burned wintering areas of Mexican spotted owls in the Sacramento Mountains, New Mexico. The Wilson Journal of Ornithology 126: 47-52.* *(payment only)*	**Summary:** Mexican Spotted Owls (*Strix occidentalis lucida*) are common in older forests within their range but also persist in many areas burned by wildfire and may selectively forage in these areas. These results of this paper suggest that wintering owls moved to areas with greater food resources, rather than to areas with milder weather. They further suggest that relative prey abundance was greater in burned wintering areas than in the nest core areas >5 years post-fire, and that these burned wintering areas provided important habitat for Mexican Spotted Owls in our study area during an energetically stressful season. **Response:** The Mexican spotted owl does occur on the Deschutes National

			Forest. The response to reference number 3.
9	*BMBD*	*Hanson, C.T. Odion, D.A. DellaSala, and W.L. Baker. 2009. Overestimation of fire risk in the Northern Spotted Owl Recovery Plan. Conservation Biology 23:1314–1319.* *(copy on file)*	**Summary:** This paper recommends that more time be taken to address adaptive management strategies for the northern spotted owl in areas reported to experience high severity. The paper suggest that decadal data are inherently too short given infrequent large fires, underestimate the time needed for old-forest recruitment, and are lower than reported in the US Fish and Wildlife Northern Spotted Owl Recovery Plan. From the standpoint of fire risk there appears to be amble time for research on fire and proposed treatments effects on the northern Spotted owl before designating extensive management actions or eliminating reserves. **Response:** The Northern Spotted Owl Recovery Plan was not used to determine fire risk for the project. Stand, watershed, landscape level analyses to determine fire risk was modeled using FLAMMAP, LANDFIRE, FOFEM, and FFE-FVS. Proposed treatments raise canopy base heights and reduce crown bulk densities across the project area. These treatments reduce the risk of stand replacement fire to desired levels when modeled under 90th percentile weather conditions. Treatments reduce the predicted mortality within treated areas by moving the majority of the potential fire type acres to surface and passive crown fire. The Northern Spotted Owl Recovery plan was used to identify habitat restoration objectives. These objectives were incorporated into the project design. Informal consultation was initiated with the U.S. Fish and Wildlife Service and a letter of concurrence was issued.
10	*BMBD*	*Hanson, C.T., D.C. Odion, D.A. DellaSala, and W.L. Baker. 2010. More-comprehensive recovery actions for Northern Spotted Owls in dry forests: Reply to Spies et al. Conservation Biology 24:334–337* *(copy on file)*	**Summary:** This paper is a reply to Spies et al which defended the fire risk assessment in the Final Recovery Plan for the Northern Spotted Owl. The authors feel that abandoning reserves and conducting extensive fuels treatments in the dry forest of the eastern Cascades would adversely effect the Northern Spotted Owl. **Response:** The Northern Spotted Owl Recovery Plan was used to identify habitat restoration objectives for the Melvin Butte project. These objectives were incorporated into the project design and informal consultation was initiated with the U.S. Fish and Wildlife Service. Since 2002 20% of the Whychus watershed has burned, including the 26,120 acre 2012 Pole Creek fire, with 11% of the watershed characterized as high severity. Also since

			2002 the Sisters Ranger District has lost 18 Northern Spotted Owl nest cores to fire.
11	*BMBD*	*Lee, D.E., and M.L. Bond. 2015. Occupancy of California spotted owl sites following a large fire in the Sierra Nevada, California. The Condor 117 (in press).*	**Summary:** California spotted owl occupancy in the large (approximately 257,000 acres), intense Rim fire of 2013, at one year post-fire—before logging—was 92%, which is substantially higher than average annual occupancy in unburned mature/old forest, and pair occupancy was not reduced even when most of the territory experienced high-intensity fire (*summary provided in comment letter*). **Response:** No historic or occupied northern spotted owl territories occur in the Melvin Butte project area or areas directly adjacent. No NRF habitat is associated with the project area. See the response to reference number 3.
12	*BMBD*	*Pilliod, David S.; Bull, Evelyn L.; Hayes, Jane L.; Wales, Barbara C. 2006. Wildlife and invertebrate response to fuel reduction treatments in dry coniferous forests of the Western United States: a synthesis. Gen. Tech. Rep. RMRS-GTR-173. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 34 p* *(copy on file)*	**Summary:** This paper synthesizes available information on the effects of hazardous fuel reduction treatments on terrestrial wildlife and invertebrates in dry coniferous forest types in the West. Focused on thinning and/or prescribed fire studies in ponderosa pine (*Pinus ponderosa*) and dry-type Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), and mixed coniferous forests. Management activities that consider the retention of habitat structures (such as snags, down wood, and refugia of untreated stands) may increase habitat heterogeneity and may benefit the greatest number of species in the long run. **Response:** A dispersal connectivity strategy for the northern spotted was developed for the project area. These areas include untreated forest stands that can retain down wood and act as wildlife refugia for many wildlife species. The Melvin Butte project does not propose to remove snag habitat unless snags pose a safety hazard under OSHA guidelines. The primary silviculture treatment would thin green stands from below, maintaining large diameter legacy ponderosa pine on the landscape.
13	*BMBD*	*Roberts, S.L. 2008. The effects of fire on California spotted owls and their mammalian prey in the central Sierra Nevada, California. Ph.D. Dissertation, University of California at Davis*	**Summary:** California spotted owl reproduction was 60% higher in a mixed-intensity fire area [no salvage logging] than in unburned mature/old forest. **Response:** We were not able to obtain a copy of this dissertation. No historic or occupied northern spotted owl territories occur in the Melvin Butte project area or are directly adjacent. No NRF habitat is associated with the project

			area. No post-fire salvage logging is proposed with this project. See response to reference numbers 3 and 6.
14	*BMBD*	*Odion et al. (2014) Effects of Fire and Commercial Thinning on Future Habitat of the Northern Spotted Owl. The Open Ecology Journal, 2014, 7, 37-51* (copy on file)	**Summary**: This paper found that rotations of severe fire (the time required for high-severity fire to burn an area equal to the area of interest once) in spotted owl habitat since 1996, were 362 and 913 years for the two regions of interest: the Klamath and dry Cascades. Over 40 years, habitat loss would be far greater than with no thinning because, under a "best case" scenario, thinning reduced 3.4 and 6.0 times more dense, late-successional forest than it prevented from burning in high-severity fire in the Klamath and dry Cascades. Even if rates of fire increase substantially, the requirement that the long-term benefits of commercial thinning clearly outweigh adverse impacts is not attainable with commercial thinning in spotted owl habitat. Exclusion of high-severity fire may not benefit spotted owls in areas where owls evolved with reoccurring fires in the landscape. **Response:** No historic or occupied spotted owl territories occur in the Melvin Butte project area or are directly adjacent. No NRF habitat is associated with the project area. A landscape assessment of inherent soil quality was conducted for the Melvin Butte project. The assessment identified the site potential of mixed conifer stands across the entire Sisters Ranger District. Based on the inherent soil quality, the site potential was identified for each active and historic owl territories. Mixed conifer stands were then mapped that contain similar site potentials and inherent soil quality of the active and historic territories across the district. The assessment displayed that the majority of highly productive mixed conifer capable of producing suitable reproductive habitat occurred primarily on the north end of the Sisters Ranger District which correlates directly with active and historic territory distribution. Due to the site potential associated with the Melvin Butte project area and with 100 years of ongoing fire suppression, no suitable habitat has developed in association with active fire exclusion. The Melvin Butte project proposes to thin green stands from below. The project objectives do not propose to develop reproductive habitat but would maintain green stands for owl dispersal in the project area.
15	*BMBD*	*Baker, W. 2015. Historical Northern spotted owl habitat and old-growth dry forests maintained by mixed-severity wildfires. Landscape Ecol (2015) 30:655–666*	**Summary**: Baker used public land-surveys to spatially reconstruct NSO habitat and old-growth forests in dry forests in Oregon's Eastern Cascades in the late-1800s. Mixed- and high-severity fires strongly shaped historical dry forests and produced important components of historical NSO habitat. Focus

		(copy on file)	on short-term loss of nest sites and territories to these fires is misdirected. Fuel treatments to reduce these natural fires, if successful, would reduce future habitat of the NSO in dry forests. **Response:** No historic or occupied spotted owl territories occur in the Melvin Butte project area or are directly adjacent. No NRF habitat is associated with the project area. The 2002 B&B fire destroyed 18 northern spotted owl nest cores. See the response to reference numbers 3, 6, and 14.
16	*BMBD*	*Manning et al. 2012. Thinning of young Douglas-fir forests decreases density of northern flying squirrels in the Oregon Cascades, Manning et al. 2012* *(coy on file)*	**Summary**: Densities of northern flying squirrels (*Glaucomys sabrinus*) were measured 11-13 years post commercial thinning of young (55-65 years) Douglas-fir forests in the Cascade Range of Oregon. Four study plots were measured: Heavy Thin; Light Thin; Light Thin with Gaps; and Control. Thinning decreased density of northern flying squirrels. Lowest densities were found in heavily thinned stands. Maintaining sufficient area and connectivity of dense, closed canopy forest is recommended to provide habitat requirements of this important species while promoting late-seral forest structure. **Response:** Douglas-fir forest are not found in the project area. There have been no documented cases of northern flying squirrel in the project area. No nesting roosting or foraging habitat occurs in the project area. No historic or occupied spotted owl home ranges occur in the Melvin Butte project area or are directly adjacent. See response to reference number 3, 6, and14.
17	*BMBD*	*Baker, W., 2012. Implications of spatially extensive historical data from surveys for restoring dry forests of Oregon's eastern Cascades. Ecosphere 3(3)* *(copy on file)*	**Summary:** Using GLO data, reconstructions- In dry mixed-conifer forests of the southern Cascades forests showed about 13.5% of these forests had low tree densities. **Response:** In this project we recognize variability in fire behavior and the resultant fire severities in the event of a wildfire. As such a retention strategy that includes no treatment as well as treatments that are limited to 8"dbh are used. In addition, silviculture prescriptions call for management of white fir in the mixed conifer group openings treatment as well as other microsite locations in the dry mixed conifer series. Douglas fir or any hardwood species does not occur within the forest types seen in Melvin Butte. As a result and across the planning area, it is expected resultant fire effects would

			be sensitive to this residual density and range in severities dependent upon fire weather/ local conditions. "Restoration needs of MS (mixed fire severity fire regime forests) Forests are the subject of debate. Hanson et al. (2009, 2010), Baker (2012), Williams and Baker (2012), Dellasala and Hanson (2015), Odion et al. (2014), and Baker (2015) have argued against fuels reduction or landscape restoration of any magnitude in Inland West pine and mixed conifer forests. They provide evidence that current large patches of high-severity fire may be within the historical range of variability for these forests, and the risk of loss of dense multistoried forest to high-severity fire is relatively low. Likewise, they suggest that widespread and ecologically important changes have not occurred in these forests in the last century, and that restoration activities on any significant scale are unjustified. Their inferences are based on conclusions drawn from vegetation reconstructions using General Land Office (GLO) or federal Forest Inventory and Analysis (FIA) data. While these data are useful for general descriptions and tabulations of historical vegetation conditions, they are unsuited to making spatially accurate inferences as to local historical vegetation conditions, or for inferring disturbance regimes from size distributions of trees (Fulé et al., 2014; Stevens et al., in press). While needs vary both regionally and locally, we strongly disagree with the contention that ecological restoration is unnecessary in MSForests of the Inland Pacific West, as do a host of authors throughout the Inland West: Barth et al. (2015), Collins et al. (2011a, 2015), Gaines et al. (2010a, 2010b), Spies et al. (2010), Hessburg and Agee (2003), Hessburg et al. (1999a, 1999b, 2000a, 2005, 2013, 2015), Taylor (2004), Stephens et al. (2009, 2010, 2015), Moghaddas et al. (2010), Scholl and Taylor (2010), Hagmann et al. (2013, 2014), Merschel et al. (2014), Perry et al. (2011), Harris and Taylor (2015), and Franklin and Johnson (2012). However, we recognize the importance of stand-replacing fire in appropriate forest types, and at appropriate spatial and temporal scales. The goal of ecological restoration is not to eliminate severe fire, but to have it resume a more characteristic role." (fromTamm Review- in Hessburg et al. 2016, pages 227-228).
18	*BMBD*	*Dillon, G.K., et al. 2011. Both topography and climate affected forest and woodland burn severity in two regions of the western*	**Summary:** No increase in fire intensity was found in most forested regions of the western U.S., including no increasing trend of fire intensity in forests of the Pacific Northwest, Inland Northwest, and northern Rocky Mountains,

		US, 1984 to 2006. Ecosphere 2: Article 130. *(copy on file)*	while mixed results were found in the Southwest **Response:** The paper describes its own limitations of which does not include recent fires that have occurred after the sample years (2006). The paper further describes limitations to vegetation conditions, structure, and more ignoring landscape factors influencing burn severity. It is for these reasons this paper was not utilized (referenced) for a small-scale (5375 acre project). In addition, since 2006 a large relative proportion of the Whychus Watershed has seen fire in a relatively short amount of time (i.e. 2012 Pole Creek fire).
19	*BMBD*	*Donato, D., Fontaine, J., Robinson, W., Kauffman, J., and Law, B., 2009. Vegetation response to a short interval between high-severity wildfires in a mixed-evergreen forest. Journal of Ecology 97: 142-154.* *(copy on file)*	**Summary:** The high-intensity re-burn high-intensity fire occurring 15 years after a previous high-intensity fire had the highest plant species richness and total plant cover, relative to high-intensity fire alone [no re-burn] and unburned mature/old forest; and the high-intensity fire re-burn area had over 1,000 seedlings/saplings per hectare of natural conifer regeneration. **Response:** Since 2002 (14 years) 20% of the watershed has seen wildfire. Since 1998, 25% has burned with 11% characterized as high severity (stand replacement) (2013 Whychus Watershed Assessment). Subsequently, fire has induced the stand initiation phase and subsequent floristic relationships found in early seral habitats and is common within the watershed.
20	*BMBD*	*Gonzalez, P., R.P. Neilson, J.M. Lenihan, and R.J. Drapek. 2010. Global patterns in the vulnerability of ecosystems to vegetation shifts due to climate change. Global Change and Biogeography 19:755-768.*	**Summary:** Climate change threatens to shift vegetation, disrupting ecosystems and damaging human well being. 1/10th to 1/2 of global land may be highly to very highly vulnerable. Temperate mixed forest, boreal conifer and tundra and alpine biomes show highest vulnerability often due to changes in wildfire. Spatial analyses of observed climate and projected vegetation indicate widespread vulnerability of ecosystems to biome change. A mismatch between vulnerability patterns and the geographic priorities of natural resource organizations suggests the need to adapt management plans. Approximately a billion people live in the areas classified as vulnerable. **Response:** This paper refers to large-scale (global) vegetation biomes. The scale of this paper was decided as too large for the planning area and specifically no mention is made to Oregon (or central Cascades)
21	*BMBD*	*Hamlet, A.F., P.W. Mote, M.P. Clark, D.P. Lettenmaier. 2007. Twentieth-century trends in runoff, evapotranspiration, and*	**Summary:** The paper describes the relationship between evapotranspiration, runoff, soil moisture (SM) over the entire western US. Areas with warmer

		soil moisture in the western United States. Journal of Climate 20:1468-1486. *Copy on file)*	winter temperatures show increasing trends in runoff with colder areas as late as June. Trends toward earlier spring SM recharge are apparent and increasing trends in SM on 1 April are evident over much of the region. The 1 July SM trends are less affected by snowmelt changes and are controlled more by precipitation trends. Precipitation trends in the western U.S. from 1916-2003 show increases- whereas precipitation trends in this same area from 1947-2003 show decreasing trends. However, temperature shows increasing trends during either time period. **Response:** Water is the most limiting site factor limiting site productivity and thinning treatments are designed to reduce competition thus reallocating resources including water to residual trees (less interception). Thinning would maintain large diameter legacy ponderosa pine in the project area.
22	*BMBD*	*Haney, A., Apfelbaum, S., and Burris, J., 2008. Thirty years of post-fire succession in a southern boreal forest bird community. The American Midland Naturalist 159: 421-433.* *(copy on file)*	**Summary:** 30 years after high-intensity fire, bird species richness increased 56% relative to pre-fire mature unburned forest. **Response:** No boreal forest exists on the Deschutes National Forest. The majority of the project area (89%) is not associated with post fire habitat. See response to references numbers 3, 6, and 14.
23	*BMBD*	*Hanson, C.T., D.C. Odion, D.A. DellaSala, and W.L. Baker. 2009. Overestimation of fire risk in the Northern Spotted Owl Recovery Plan. Conservation Biology 23:1314–1319.* *(Copy on file)*	**Summary:** The U.S. Fish and Wildlife Service's recent recovery plan for one of the Northern Spotted Owl (*Strix occidentalis caurina*), recommended a switch from a reserve to a no-reserve strategy in up to 52% of the owl's range. Fuel treatments (e.g., thinning) at regular intervals also would occur on up to 65–70% of dry forests in this area. However, were based on less than a decade of data and an anecdotal assessment of a single, large fire. Suggests decadal data are inherently too short, given infrequent large fires, to accurately predict fire risk and trends. Rates of high-severity fire, based on remote-sensing data, are far lower than reported in the plan and in comparison with the rate of old-forest recruitment. In addition, no increase in the proportion of high-severity fire has occurred in over a 22-year period. Findings refute the key conclusions of the plan. Adaptive-management framework is needed to address these strategies using the best available science. States there appears to be ample time for research on fire and proposed treatment effects on Spotted Owls before designing extensive

			management actions or eliminating reserves. **Response:** No historic or occupied spotted owl home ranges occur in the Melvin Butte project area or are directly adjacent. No NRF habitat is associated with the project area. The Northern Spotted Owl Recovery Plan was used to identify habitat restoration objectives. These objectives were incorporated into project planning and informal consultation was initiated with the U.S. Fish and Wildlife Service and a letter of concurrence was issued. See response to reference numbers 3, 6, and 14.
24	*BMBD*	*Hanson, C., 2015. Use of higher severity fire areas by female Pacific fishers on the Kern Plateau, Sierra Nevada, California, USA. Wildlife Society Bulletin 39: 497-502* *(copy on file).*	**Summary:** Using a Pacific fisher scat-detection approach, the current hypothesis among land managers that fishers will avoid higher-intensity fire areas was rejected, and fishers used unlogged higher-intensity fire areas at levels comparable to use of unburned dense, mature/old forest. Female fishers demonstrated a significant selection in favor of the large, intense McNally fire over adjacent unburned mature/old forest, and the highest frequency of female fisher scat detection was over 250 meters into the interior of the largest higher- intensity fire patch (over 12,000 acres). **Response:** No fisher habitat exists within the project area. Carnivore monitoring occurred in the project area and is ongoing within the watershed. No fishers have been detected. No snags or down wood are targeted for removal unless they pose a safety hazard under OSHA guidelines. See response to references 3 and 6.
25	*BMBD*	*Hessburg, P. F., R. B. Salter, and K. M. James. 2007. Re-examining fire severity relations in pre-management era mixed conifer forests: inferences from landscape patterns of forest structure. Landscape Ecology 22:5-24.* *(couldn't locate this document)*	**Summary:** Mixed severity fires were most prevalent, regardless of forest type (dry or moist mixed conifer). The structure of mixed conifer patches, in particular, was formed by a mix of disturbance severities. In moist mixed conifer, stand replacement effects were more widespread in patches than surface fire effects, while in dry mixed conifer, surface fire effects were more widespread by nearly 2:1. **Response:** Melvin Butte project area does not contain the Douglas-fir forest type. Additionally over 46,000 acres has seen wildfires in recent years with high severity within the Pole Creek Drainage. No treatment is scheduled within the Three Creek Riparian Reserve (an intermittent stream). However, an uncontrolled wildfire in this area (under 90th percentile fire weather

			conditions) could create moderate to high severity fire effects.
26	*BMBD*	*Malison, R., and Baxter, C., 2010. The fire pulse: wildfire stimulates flux of aquatic prey to terrestrial habitats driving increases in riparian consumers. Canadian Journal of Fisheries and Aquatic Sciences 67: 570-579.* *(copy on file)*	**Summary:** In ponderosa pine and Douglas-fir forests of Idaho at 5-10 years post-fire, levels of aquatic insects emerging from streams were two and a half times greater in high-intensity fire areas than in unburned mature/old forest, and bats were nearly 5 times more abundant in riparian areas with high-intensity fire than in unburned mature/old forest **Response:** No Riparian Reserves, including the use of prescribed fire, would be treated in the project area
27	*BMBD*	*Odion D., Hanson C., Arsenault A., Baker W., DellaSala D., Hutto R., Klenner W., Moritz M., Sherriff R., Veblen T., Williams M., 2014. Examining historical and current mixed-severity fire regimes in ponderosa pine and mixed-conifer forests of western North America. PLoS ONE 9: e87852.* *(copy on file)*	**Summary:** Most forests appear to have been characterized by mixed-severity fire that included ecologically significant amounts of weather-driven, high-severity fire. Our findings suggest that ecological management goals that incorporate successional diversity created by fire may support characteristic biodiversity, whereas current attempts to "restore" forests to open, low-severity fire conditions may not align with historical reference conditions in most ponderosa pine and mixed-conifer forests of western North America. **Response:** See response to reference number17.
28	*BMBD*	*Raphael, M., Morrison, M., and Yoder-Williams, M., 1987. Breeding bird populations during twenty-five years of post fire succession in the Sierra Nevada. The Condor 89: 614- 626.* *(copy on file)*	**Summary:** At 25 years after high-intensity fire, total bird abundance was slightly higher in snag forest than in unburned old forest in eastside mixed-conifer forest of the northern Sierra Nevada; and bird species richness was 40% higher in snag forest habitat. In earlier post- fire years, woodpeckers were more abundant in snag forest, but were similar to unburned by 25 years post-fire, while flycatchers and species associated with shrubs continued to increase to 25 years post-fire. **Response:** See response to reference number 3.
29	*BMBD*	*Schieck, J., and Song, S., 2006. Changes in bird communities throughout succession following fire and harvest in boreal*	**Summary:** This paper reviewed studies of birds (mainly grouse, woodpeckers, and songbirds) from boreal forests of western North America

		forests of western North America: literature review and metaanalyses. Canadian Journal of Forest Research 36: 1299-1318. *(copy on file)*	and conducted meta-analyses to compare the similarity of bird communities occurring post fire versus postharvest. Compared bird communities at five seral stages and summarized effects of retaining large live trees at harvest. Communities postharvest differed greatly from those post fire. Differences between disturbance types disappeared as the forest regenerated, and both disturbance types became dominated by relatively few bird species in 31- to 75-year-old forests. During the period 76–125 years post disturbance, old-forest birds became present and bird species richness increased. However, the trajectory of forest succession during this period influenced bird communities. Although most bird species had clear peaks in abundance in a specific forest type, no species with more than five detections was limited to a single forest type. **Response:** No boreal forest occur on the Deschutes National Forest. See response to reference numbers 3, 6, and 14.
30	*BMBD*	*Williams, M. and Baker, W., 2012a. Spatially extensive reconstructions show variable-severity fire and heterogeneous structure in historical western United States dry forests. Global Ecology and Biogeography. DOI: 10.1111/j.1466-8238.2011.00750.* *(copy on file)*	**Summary:** Historically, fires in western U.S. conifer forests, including those of the Southwest, were mainly mixed-intensity and high-intensity in most areas, and forests were far denser than previously assumed. Even the largest and most intense current fires are well within the natural historical range of variability. The results were based upon historic U.S. government field plots from the 1800s covering entire landscapes, which were extensively field-checked by the authors. **Response:** See response to reference number 17.
31	*BMBD*	*Hanson, C.T., and D.C. Odion. 2014. Is fire severity increasing in the Sierra Nevada mountains, California, USA? International Journal of Wildland Fire 23: 1-8.* *(copy on file)*	**Summary:** The rate of high-severity fire has been lower since 1984 than the estimated historical rate. Responses of fire behavior to climate change and fire suppression may be more complex than assumed. Management could shift from a focus on reducing extent or severity of fire in wildlands to protecting human communities from fire” Response: The forest types describes in this paper do not reflect local conditions found within the Melvin Butte project area and within the

			watershed. See also response to reference number 17.
32	*BMBD*	*Hutto, R. 2008. The ecological importance of severe wildfires: some like it hot. Ecological Applications, 18(8), 2008, pp. 1827–1834* *(copy on file)*	**Summary:** While fire suppression, grazing, timber practices have created unnatural and unhealthy conditions in the dry, ponderosa pine of the western United States it is unclear how these generalizations can be extrapolated over time and space. Using black backed woodpecker data the study suggests burning in many forests in the intermountain west may not be unnatural or unhealthy. **Response:** Since 2002 20% of the watershed has seen wildfire. Since 1998, 25% has burned with 11% characterized as high severity (stand replacement) (2013 Whychus Watershed Assessment). Subsequently, fire has induced the stand initiation phase and subsequent early seral habitats and is common within the watershed. Also see the section on black back woodpecker in the environmental assessment.
33	*BMBD*	*Donato, D.; Fontaine, J.; Campbell, J.; Robinson, W.; Kauffman, J.; Law, B.; 2006. Post-wildfire logging hinders regeneration and increases fire risk. Science (New York, N.Y.) 311 (5759) p. 352* *(Could not locate this document)*	**Summary:** "[S]evere fires are typically expected to be deleterious to forest flora and development; however, these results indicate that in systems characterized by highly variable natural disturbances (e.g. mixed-severity fire regime), native biota possess functional traits lending resilience to recurrent severe fire. Compound disturbance resulted in a distinct early seral assemblage (i.e. interval- dependent fire effects), thus contributing to the landscape heterogeneity inherent to mixed-severity fire regimes. Process-oriented ecosystem management incorporating variable natural disturbances, including 'extreme' events such as SI severe fires, would likely perpetuate a diversity of habitats and successional pathways on the landscape." **Response:** See response to reference 32.
34	*BMBD*	*Swanson, M., Franklin, J., Beschta, R., Crisafulli, C., DellaSala, D., Hutto, R., Lindenmayer, D., and F. Swanson, 2010. The forgotten stage of forest succession: early-successional ecosystems on forest sites. Front Ecol Environ*	**Summary:** Naturally occurring, early-successional ecosystems on forest sites have distinctive characteristics, including high species diversity, as well as complex food webs and ecosystem processes." Post-disturbance ecosystems are also often rich in biological legacies, including surviving

		2011; 9(2): 117–125. *(copy on file)*	organisms and organically derived structures, such as woody debris. These legacies and post- disturbance plant communities provide resources that attract and sustain high species diversity, including numerous early successional obligates, such as certain woodpeckers and arthropods. Early succession is the only period when tree canopies do not dominate the forest site, and so this stage can be characterized by high productivity of plant species (including herbs and shrubs), complex food webs, large nutrient fluxes, and high structural and spatial complexity. Different disturbances contrast markedly in terms of biological legacies, and this will influence the resultant physical and biological conditions, thus affecting successional pathways." **Response:** See response to reference 32. In addition, group openings will improve early seral conditions in discrete locations (~250 acres) in the mixed conifer plant association group.
35	*BMBD*	*Noss, R., Franklin, J., Baker, W., Schoennage, T., and P. Moyle, 2006. Managing fire-prone forests in the western United States. Front. Ecol. Environ 2006; 4(9): 481–487.* *(copy on file)*	**Summary:** The complexity created by variability in fire regimes defies a one-size-fits-all management prescription • Restoration is warranted where fire exclusion has led to substantial alterations in ecosystem qualities • Post-fire logging usually has no ecological benefits and many negative impacts; the same is often true for post-fire seeding • Although many forests will require continued management, a common sense conservation goal is to achieve forests that are low maintenance and require minimal repeated treatment **Response:** We agree complexity and variability in silvicultural prescriptions is key to successfully implementing forest restoration in the project area. A varied approach to the project planning was taken including soil considerations, plant associations, and habitat function. The watershed contains a high proportion with recent fires with some of these fires overlapping. The treatments are designed to address further loss of forested cover in a watershed that has a high abundance of early seral (recent wildfire) habitat.

36	*BMBD*	*Lindenmayer, D.; Hunter, M.; Burton, P.; Gibbons, P.; 2009. Effects of logging on fire regimes in moist forests. Conservation letters, doi: 10.1111/j.1755-263X.2009.00080.x* *(copy on file)*	**Summary:** Salvaged-replanted sites also had significantly more stumps, bare area, and moss cover than unsalvaged plots. Soil organic matter and nonnative species cover did not differ. Nonnative species were not important components of any plots. **Response:** This paper was not considered since Melvin Butte project is primarily a green tree thin. Were this is not the case, the portion of the project that overlaps the Pole Creek Fire (2012), thinning activities are designed to meet the intent of the Wildland Urban Interface and standards and guidelines for the Scenic Views management area. Much of this area contains small trees where the primary thinning tool consists of small tree thin (8"dbh limit- in "Prescribed fire treatment"- no ground based equipment) or removal of some small diameter fire killed trees, as well as retention of clusters of fire killed and green trees.
37	*BMBD*	*Rhodes, J.J., 2007. The watershed impacts of forest treatments to reduce fuels and modify fire behavior. Pacific Rivers Council, Eugene, OR.* *(copy on file)*	**Summary:** Paper reviews literature on the use of mechanical fuels treatments on aquatic resources/ watershed condition as well as effects of wildland fire on watershed and aquatic systems. Mechanical treatment incur ecological costs by damaging soils, vegetation and hydrological processes. **Response**: No proposed activities are scheduled within Riparian Reserves. Fuels reduction activities are proposed as a part of the need to reduce the likelihood for large stand replacement fire and loss of interior forest habitat.
38	*BMBD*	*Hutto, R. 2006 Towards Meaningful Snag-Management Guidelines for Post-fire Salvage Logging in North American Conifer Forests* *(copy on file)*	**Summary:** This paper synthesizes available information on the effects of hazardous fuel reduction treatments on terrestrial wildlife and invertebrates in dry coniferous forest types in the West. Focused on thinning and/or prescribed fire studies in ponderosa pine (*Pinus ponderosa*) and dry-type Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), and mixed coniferous forests. Suggests that management activities that consider the retention of habitat structures (such as snags, down wood, and refugia of untreated stands) may increase habitat heterogeneity and may benefit the greatest number of species in the long run.

			Response: The Melvin Butte project is not a fire salvage project. Project design retains all snags on the landscape unless they pose a safety hazard under OSHA guidelines. Snags would also be retained in untreated areas. Snags would also be recruited over the long-term. See response to reference number 1.
39	*BMBD*	*Thompson, J and Spies, T. 2010. Factors associated with crown damage following recurring mixed-severity wildfires and post-fire management in southwestern Oregon. Landscape Ecology 25 pp.775-789* *(copy on file)*	**Summary:** The paper found that areas that had previously experienced burning and salvage logging after the 1987 Silver Fire in southwestern Oregon had more extensive crown damage during the 2002 Biscuit fire than areas that had not been salvaged logged after the Silver Fire. **Response:** The Melvin Butte project is not a fire salvage project. Silvicultural treatments would raise crown base heights and reduce crown canopy coverage which would ameliorate a passive crown fire. Project design retains all snags on the landscape unless they pose a safety hazard under OSHA guidelines. Snags would also be retained in untreated areas. Snags would also be recruited over the long-term.
40	*BMBD*	*Hanson, J.; Stuart, J.; 2005. Vegetation responses to natural and salvage logged fire edges in Douglas-fir/hardwood forests. Forest Ecology and Management 214 p. 266–278.* *(copy on file)*	**Summary:** The paper looked at the effects of salvage logging on veg. composition in adjacent forest edges & interiors. They found that two out of three exotic plants surveyed were more abundant in edges next to salvaged area compared to edges next to un-“salvaged” areas. Specifically, *Bromus techtorum* and *Erechtites glomerata* were more abundant in edges next to “salvaged” areas. **Response:** The paper originates from northwest California where slopes are reported as "common exceeding 60%" and average rain fall of 1260mm (~50") both of which do not describe the biophysical environment of the project area. In addition, the forest type in this study is comprised of Doug-fir and hardwoods- both of which are absent from the Melvin Butte project area. Best management practices in all areas and conditions include processes/procedures that call for mitigation of non-native/ invasive species entry into planning area.

41	*BMBD*	*Lindenmayer, D.; Noss, R; 2006. Salvage Logging, Ecosystem Processes, and Biodiversity Conservation. Conservation Biology 20 (4) p. 949-958* *(Copy on file).*	**Summary:** Summarized documented and potential impacts of salvage logging. Potential impacts of such activities were assigned to three broad and interrelated effects: (1) altered stand structural complexity; (2) altered ecosystem processes and functions; and (3) altered populations of species and community composition. Some impacts may be different from or additional to the effects of traditional logging that is not preceded by a large natural disturbance because the conditions before, during, and after salvage logging may differ from those that characterize traditional timber harvesting. Suggests ecologically informed policies regarding salvage logging are needed prior to major natural disturbances. Policies should lead to salvage-exemption zones and limits on the amounts of disturbance-derived biological legacies (e.g., burned trees, logs) that are removed where salvage logging takes place. **Response:** See response to reference number 3.
42	*BMBD*	*Titus, J.H.; Householder E.; 2007. Salvage logging and replanting reduce understory cover and richness compared to unsalvaged-unplanted sites at Mount St. Helens, Washington. Western North American Naturalist 67(2) p. 219–231* *(copy on file)*	**Summary:** This paper looked at vegetation in salvage-logged and replanted plots vs. vegetation in non-salvaged logged and unplanted plots in the blast zone of the Mount St. Helens eruption. They found that salvaged logged and replanted areas had lower herb and shrub diversity and richness, and more bare areas and moss than un-salvaged areas. Post-fire logging can effect the natural replacement seed banks if plants begin to germinate following fire but then are destroyed by logging activity. **Response**: This paper was not considered since Melvin Butte project is primarily a green tree thin. Where this is not the case, the portion of the project that overlaps the Pole Creek Fire (2012), thinning activities are designed to meet the intent of the Wildland Urban Interface and standards and guidelines for the Scenic Views management area. Much of this area contains small trees where the primary thinning tool consists of small tree thin (8"dbh limit- in "Prescribed fire treatment"- no ground based equipment) or removal of some small (<8” dbh) diameter fire killed trees, as well as retention of clusters of fire killed and green trees. In addition, the biophysical environment present in Mt. Saint Helens blast zone occurs within a different ecological province and is not represented in Melvin Butte.

43	BMBD	*Beschta, R.; Rhodes, J.; Kauffman, B.; Minashall; Karr, J.; Perry, D.; Gresswell, R.; Frissell, C.; Hauer, R.; 2004. Post fire Management on Forested Public Lands of the Western United States. Conservation Biology 18 (4) p. 957–967.* *(Copy on file)*	**Summary:** This paper reviews other papers that have looked at various studies on ecosystem processes from post-fire management. **Response:** This paper was not considered since Melvin Butte project is primarily a green tree thin. Where this is not the case, the portion of the project that overlaps the Pole Creek Fire (2012), thinning activities are designed to meet the intent of the Wildland Urban Interface and standards and guidelines for the Scenic Views management area. Much of this area contains small trees where the primary thinning tool consists of small tree thin (8"dbh limit- in "Prescribed fire treatment"- no ground based equipment) or removal of some fire killed trees as well as retention of clusters of fire killed and green trees.
44	BMBD	*Karr, J.; Rhodes, J.; Minshall, W.; Hauer, R.; Beschta, R.; Frissell, D.; 2004. The Effects of Postfire Salvage Logging on Aquatic Ecosystems in the American West. BioScience 54 (11) p. 1029* *(Copy on file)*	**Summary:** Recent changes in the forest policies, regulations, and laws affecting public lands encourage post-fire salvage logging, an activity that all too often delays or prevents recovery. In contrast, the 10 recommendations proposed here can improve the condition of watersheds and aquatic ecosystems. **Response:** See response to reference number 43.
45	BMBD	*Steele, A. and Beckman, B. (2014) Stream Temperature Variability: Why It Matters To Salmon.* *(Could not download this document)*	**Summary:** Commonly used degree-day accumulation model is not sufficient to predict how organisms respond to stream temperatures. Changes in how the degree days are delivered have the potential to alter the timing of life history transitions in Chinook salmon and other organisms. Emerging from the gravel a few days earlier or later could directly affect their survival due to changes in available food resources, competition for feeding grounds, or strong currents. **Response:** The project does not treat Riparian Reserves. There would be no effects to stream temperature from silvicultural activities.

46	*BMBD*	*Frissel et al. (2014). Conservation of Aquatic resources in the Pacific Northwest: Implications of New Science for the Aquatic Conservation Strategy of the pacific Northwest. Coast Range Association* *(Copy on file)*	**Summary**: Frissel suggest that new road construction- including temporary roads- should be prohibited unless longer and more damaging segments are decommissioned. They also suggest that temporary roads and landing should be considered in road density levels for several decades after decommissioning, and that forestry and development projects should meet a target of road density reductions. They also reported that Bull trout populations suffered in watersheds where road densities exceeded 0.6 miles per square mile- they recommend watershed densities of 0.5 miles per square mile; for other salmon and steelhead they recommend 1 mile per square mile. **Response:** The project complies with all nine objectives of the Aquatic Conservation Strategy. The Melvin Butte project would decommission 8 miles and close 6 miles of Forest Roads
47	*BMBD*	*Nelson et al. (2008)*	This paper could not be located. A full reference was not given.
48	*BMBD*	*Coulter et al. 2010*	This paper could not be located. A full reference was not given.
49	*BMBD*	*Hanson, J.; Stuart, J.; 2005. Vegetation responses to natural and salvage logged fire edges in Douglas-fir/hardwood forests. Forest Ecology and Management 214 p. 266–278.* *(Copy on file)*	**Summary:** A study looking at species composition along the edge of burned/ unburned and salvaged logged/ unlogged areas in Doug-fir/hardwood forests in northwestern California. Results suggest salvage logging altered plant composition and structure of the edge zone**.** **Response:** This paper was not considered since Melvin Butte project is primarily a green tree thin. Where this is not the case, the portion of the project that overlaps the Pole Creek Fire (2012), thinning activities are designed to meet the intent of the Wildland Urban Interface and standards and guidelines for the Scenic Views management area. Much of this area contains small trees where the primary thinning tool consists of small tree thin (8"dbh limit- in "Prescribed fire treatment"- no ground based equipment) or removal of some fire killed trees as well as retention of clusters of fire

			killed and green trees.
50	*OW*	*Heiken, D. 2010. Log it to save it the search for an ecological rationale for fuel reduction logging in Spotted owl habitat. Oregon Wild v. 1.0.*	This paper could not be located.
51	*OW*	*Mitchel, Harmon, O'Connel. 2009. Forest fuel reduction alters fire severity and long-term carbon storage in three Pacific Northwest ecosystems. Ecological Applications 19(3) 2009, pp. 643-655.* *(Copy on file)*	**Summary:** An ecosystem simulation study (STANDCARB) was conducted looking at tradeoffs between effects of fuel reduction and long-term carbon dynamics from 3 different forest types within Oregon. Simulations tend to indicate (at least in 2 of 3 forest types) treatments should be foregone if maximum amelioration of atmospheric CO2 is desired. **Response:** Melvin Butte project area is an "east-side" forest type with ponderosa pine and at higher elevations stands dominated by white fir. The purpose of the project includes the maintenance and restoration of forest resiliency and health and provide habitat for interior forest species by lessening risk of stand replacement fire in project area.
52	*OW*	*Aubry et al 2013. Meta-Analyses of Habitat Selection by Fishers at resting Sites in the Pacific Coastal Region. The Journal of Wildlife Management 77(5): 965-974* *(Copy on file)*	**Summary:** Conducted formal meta-analyses of habitat selection by fisher (*Pekania pennanti*) at resting sites in 8 study areas located from central British Columbia to the southern Sierra Nevada in California. Each study included in themeta-analyses measured environmental attributes at sites used by fishers for resting (i.e., the immediate vicinity of resting structures; typically _0.5 ha) and at random or systematically located sites representing resource availability in each study area. Fishers selected sites for resting that had steeper slopes, cooler microclimates, denser overhead cover, a greater volume of logs, and a greater prevalence of large trees and snags than were generally available. Findings provide empirical support for management or conservation actions that promote the retention or development of these environmental attributes for fishers within the Pacific coastal region. **Response:** See response to reference number 24. .
53	*OW*	*Lehmkuhl, Gaines et al. 2015. Silviculture and monitoring guidelines for integrating restoration of dry mixed conifer forests and spotted owl habitat management in the eastern Cascade Range. Gen. Tech. Rep. PNW-GTR-915. U.S.*	**Summary:** Report that addresses the need for developing consistent regional guidelines for stand-level management that integrates goals and objectives for dry mixed conifer forest restoration and habitat management for the

		Department of Agriculture, Forest Service, Pacific Northwest Research Station. 158 p. *(office copy)*	northern spotted owl. **Response:** The project area does not support nesting roosting, foraging habitat for northern spotted owls. However, major concepts from this paper are within the proposed action and include- variable density thinning, created openings, "light thinning", as seen in "burn only" and "plantation" and "heavy thinning" as seen in the "MCGO" and "thinning" treatment types. The combination of these treatments in addition to the retention strategy are developed to reduce likelihood of a high proportion of project area to experience stand replacement fire and also allow for northern spotted owl dispersal habitat**.**
54	*OW*	Wilson and Baker 1998. .	This paper could not be located. A full reference was not given
55	*OW*	*Lee and Irwin 2005. Assessing risks to spotted owls from forest thinning in fire-adapted forests of the western United States. Forest Ecology and Management 211 (2005) 191–209.* *(Copy on file)* .	**Summary:** Lee and Irwin use published literature and data from the southern Sierra Nevada to examine the potential effects of landscape-level reductions in canopy cover (CC) on owl occupancy and reproduction. Analysis supports the hypothesis that habitat needs for owl reproduction can be incorporated in developing effective fire and fuels management strategies that lessen the chances of uncharacteristic wildfire. Projections of future population trends are tempered by the knowledge that non-habitat factors such as variations in weather profoundly affect population dynamics. **Response:** No nesting, roosting, and foraging habitat occurs within the project area. No spotted owl occupancy occurs within or adjacent to the project area. No historic territories exist within or adjacent to the project area. The project proposes a thinning strategy within both mixed conifer and ponderosa pine stands. The project will retain existing spotted owl dispersal habitat, as well as promote the development of future dispersal habitat within the project area. In the short-term, the thinning proposed in the project area will reduce hazardous fuels associated with existing dispersal habitat.
56	*OW*	*Roloff et al. 2005, 2012. A process for modeling short- and long-term risk in the southern Oregon Cascades. For. Ecol.*	**Summary** A modeling study was conducted to determine differences among passive and active management scenarios and potential habitat effects to

		Manage. 211, 166–190. *(Copy on file)*	northern spotted owl. Results indicated both passive and active management scenarios resulted in decline of spotted owl habitat. Study results suggest a spatially explicit, more aggressive hazardous fuels approach may be needed for long-term risk reduction but may conflict with current land management policies. **Response:** Proposed activities adjust canopy base heights and crown bulk densities across the project area. Treatments reduce the risk of stand replacement fire to desired levels when modeled under 90th percentile weather conditions. Proposed action greatly reduces the predicted mortality within treated areas, by changing the majority of the potential fire type acres to surface and passive crown.
57	*OW*	*Calkin et al 2005. Modeling tradeoffs between fire threat reduction and late seral forest structure Can. J. For. Res., 35 (2005), pp. 2562–2574* *(Copy on file)*	**Summary:** This paper uses a case study from a forest reserve (LSR) in the northwestern United States to quantify trade-offs between fire threat (FT) and late-seral forest (LSF) structure at stand and landscape levels. Simulation of forest dynamics was done with and without silvicultural treatments. A landscape optimization algorithm maximized FT reduction subject to constraints on amount of LSF structure and total area treated. Results suggest that compatibility between the two objectives is possible at the landscape level when LSF structure is about 45% or less of the total reserve area. Conflict can exist between them at the stand level and when more area is required to be in LSF structure in the reserve landscape. **Response:** The Late Successional Reserve land allocation is not located in the project area. However an analysis was conducted on old growth fragments in accordance with NW Forest Plan's Standard and Guideline C-44 for the Matrix land allocations. Specific treatment type and/or silviculture prescription elements provide for the retention of old growth fragments within the project area.
58	*OW*	*Hummel and Calkin 2005. Costs of landscape silviculture for fire and habitat management. Forest Ecology and Management 207 (2005) 385–404*	**Summary:** Paper evaluates economic efficiencies of various silvicultural treatments within an LSR forest reserve with implicit financial constraints. **Response:** The Late Successional Reserve land allocation is not located in

		(Copy on file)	the project area. The purpose and need describe economic benefits as a by-product of restoration landscape level treatments.
59	*OW*	*Ager et al 2007. Modeling wildfire risk to northern spotted owl (Strix occidentalis caurina) habitat in Central Oregon, USA. Forest Ecology and Management 246. 45-46.* *(Copy on file)*	**Summary:** Ager et al demonstrate a probabilistic risk analysis system for quantifying wildfire threats to spotted owl habitat and compare the efficacy of fuel treatment scenarios. Used wildfire simulation methods to calculate spatially explicit probabilities of habitat loss for fuel treatment scenarios on a 70,245 ha study area in Central Oregon, USA. Wildfire modeling revealed a strong spatial pattern in burn probability created by natural fuel breaks (lakes and lava flows). A non-linear decrease in the probability of habitat loss with increasing treatment area was observed. Fuels treatments on a relatively minor percentage of the forested landscape (20%) resulted in a 44% decrease in the probability of spotted owl habitat loss averaged over all habitat stands. Conclude that the modeling system advances the application of quantitative and probabilistic risk assessment for habitat and species conservation planning. **Response:** In this project- stand, project, watershed, landscape level analyses were conducted. Fire Risk was modeled using FLAMMAP, LANDFIRE, FOFEM, FFE-FVS. Proposed activities adjust canopy base heights and crown bulk densities across the project area. Treatments reduce the risk of stand replacement fire to desired levels when modeled under 90th percentile weather conditions. Proposed action greatly reduces the predicted mortality within treated areas, by changing the majority of the potential fire type acres to surface and passive crown fire. No historic or occupied spotted owl home ranges occur in the Melvin Butte project area or areas directly adjacent. No NRF habitat is associated with the project area. The Melvin Butte project is a thinning project that proposes to thin green stands from below. The project objectives propose to maintain and develop stands to provide spotted owl dispersal habitat dispersal over the long-term.
60	*OW*	*Rhodes and Baker 2008. Fire Probability, Fuel Treatment Effectiveness and Ecological Tradeoffs in Western U.S. Public*	**Summary:** A west-wide regional U.S. analysis was conducted to determine the likelihood of fire encountering fuels treatments. Authors concede their study looks at broad-scale fire occurrence that may not be relevant to

		Forests. The Open Forest Science Journal, 2008, 1, 1-7 1 *(only the abstract is available)*	specific or finer scale areas. **Response:** The Melvin Butte project area address fuels in a small (relative to study) area and addresses the likelihood of a specific fire type during a 90th percentile day in the project area. Proposed treatment would still maintain all fire severities (high to low) within the project area with a lower relative area likely to burn under high (stand replacement) severities vs the no action.
61	*OW*	Buchanam et al 1995, 1998	These papers could not be located.
62	*OW*	*Cruz and Alexander 2010.* ***Assessing crown fire potential in coniferous forests of western North America: a critique of current approaches and recent simulation studies.*** *International Journal of Wildland Fire 19(4) 377–398* *(Copy on file)*	**Summary:** Paper examines modeling simulations of potential fire effects using different fire behavior software. Results indicate that under predictions or over predictions may exist where modeling parameters are not calibrated precisely. **Response:** This paper is identified as a citation for modeling limitations. Modeling tools were used largely to determined (compare) relative difference among alternatives and not to be used for exact outcomes.
64	*OW*	*Hanson 2013. Habitat Use of Pacific Fishers in a Heterogeneous Post-Fire and Unburned Forest Landscape on the Kern Plateau, Sierra Nevada, California. The Open Forest Science Journal, 2013, 6, 24-30* *(copy on file)*	**Summary:** Hanson investigated the relationship between Pacific fisher (*Martes pennanti*) and fire in the southwestern Sierra Nevada. Scat samples were collected and genetically verified to determine concentration of movements and habitat use in unlogged post-fire forests with mixed-severity effects from large fires, and in unburned forests. Fishers selected Sierran mixed-conifer forests in both post-fire and unburned areas, and selected closed-canopied, mature/old forest in unburned and burned forests. Fishers used dense, mature/old forest that experienced moderate/high-severity fire at the same level as unburned dense, mature/old forest, and both males and females were found several km within the fire perimeter. These findings suggest fishers may benefit from the structural complexity of such post-fire habitat for foraging. **Response:** No fisher habitat exists within the project area. Carnivore monitoring occurred in the project area and is ongoing within the watershed. No fishers have been detected. No snags or down wood are targeted for removal in the project area: one exception is EA unit 57 where heaving

			concentrations of dead and down lodgepole pine infer with logging operations. The Melvin Butte project is a thinning project that proposes to thin green stands from below. No post-fire salvage logging is proposed with this project.
65	*OW*	*Stephens 2001. Migration, habitat use, and diet of northern goshawks (Accipiter gentilis) that winter in the Uinta Mountains, Utah. Thesis, Department of Zoology and Physiology, University of Wyoming, Laramie, USA.*	Unable to obtain a copy of this thesis.