United States Department of Agriculture
Forest Service, Pacific Northwest Region

Rocky Restoration Project

Environmental Assessment

Barlow Ranger District, Mt. Hood National Forest, Wasco County, Oregon
December 2018

Rocky Restoration Planning Area, Photo by Whitney Olsker (August 2014).

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (for example, Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

Environmental Assessment
Rocky Restoration Project

Mt. Hood National Forest
Barlow Ranger District
Wasco County, Oregon

Lead Agency: USDA Forest Service
Responsible Official: Kameron Sam
Barlow District Ranger
780 NW Court Street
Dufur, OR 97021

For Information Contact: Whitney Olsker
Eastside Silviculturist
Barlow Ranger District
780 NW Court Street
Dufur, OR 97021
(541) 467-5155

Project Summary: An environmental assessment has been prepared for the Rocky Restoration project. Project activities are proposed on National Forest System lands on the Mt. Hood National Forest, Barlow Ranger District in Wasco County, Oregon. Two alternatives have been developed based on public input and collaborative efforts. Alternative 1 is the “no action” alternative. Alternative 2, the proposed action, includes silvicultural treatments, prescribed burning, and road management activities.

Table of Contents

Chapter 1. Purpose and Need

1.1 Introduction

The Barlow Ranger District on the Mt. Hood National Forest is proposing activities in the Rocky Restoration project area (described below) to improve forest resiliency to insects and disease; enhance diversity of stands within plantations; enhance pine/oak habitat and riparian reserves; provide opportunities to safely engage an active fire near private land; and to provide forest products consistent with the Northwest Forest Plan. An interdisciplinary team of agency resource specialists have developed a proposed action to address these needs. This environmental assessment addresses the direct, indirect, and cumulative environmental impacts that may result from implementing the proposed action. Additional documentation about this project, including more detailed analyses of the project-area resources, may be found in the project planning record located at the Barlow Ranger District in Dufur, Oregon. Specialist reports are incorporated by reference and summaries of each are included in each resource topic in chapter 3.

1.2 Rocky Restoration Project Area

The Rocky Restoration project is located on the Barlow Ranger District within the Mt. Hood National Forest (the Forest). The project area is located in Wasco County approximately 28 miles southwest of the city of The Dalles, Oregon. The Rocky Restoration project area encompasses approximately 14,300 acres in the Badger-Tygh and Rock-Threemile watersheds within the White River subbasins and the following subwatersheds: Rock Creek, Gate Creek, Threemile Creek and Upper Badger. The main road access to this area is via Forest Service Road 48 off U.S. Highway 197 in Tygh Valley. See appendix A – Vicinity Map. The legal description for the project area is (township, range, sections): T3S, R10E, sections 35-36; T3S, R11E, sections 35-36; T3S, R12E, section 31; T4S, R10E, sections 1-3, 10-15; T4S, R11E, sections 1-23, 26-27; and T4S, R12E, section 6, Willamette Meridian.

1.3 Management Direction

This project is designed to meet the goals and objectives of the Mt. Hood Land and Resource Management Plan (hereafter referred to as the forest plan) (USDA Forest Service, 1990a), as amended. This Environmental Assessment is tiered to the *Mt. Hood National Forest Land and Resource Management Plan Final Environmental Impact Statement* (USDA Forest Service, 1990b) and Record of Decision (USDA Forest Service, 1990c), and incorporates by reference the accompanying forest plan. The forest plan guides all natural resource management activities and establishes management standards and guidelines for the Forest. The objectives of the management areas within the proposed treatment areas are discussed below. In addition, management direction for the area is provided in the following key forest plan amendments:

- The Northwest Forest Plan (NWFP) – Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl (USDA and USDI 1994);
- Survey and Manage – Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USDA Forest Service 2001);

- Invasive Plants – Pacific Northwest Invasive Plant Program Preventing and Managing Invasive Plants Record of Decision (USDA Forest Service 2005); and Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia Gorge Scenic Area in Oregon, including forest plan amendment #16 (USDA Forest Service 2008); and,
- Off-highway Vehicles – Record of Decision for Off-highway Vehicle (OHV) Management Plan, including forest plan amendment #17 (USDA Forest Service 2010).

1.4 Purpose and Need for Action

The purpose and need for the Rocky Restoration Project was developed by comparing the management objectives and desired conditions in the forest plan, as amended, to the existing conditions in the project area related to forest resiliency and function. Where forest plan information was not explicit, best available science and local research were utilized in a collaborative setting with stakeholders.

1.4.1 Existing and Desired Future Conditions

Over the past 100 years, fire suppression efforts and favorable climatic conditions have altered vegetation growth, accumulation of dead fuels, stand composition and structure. In 1973, the Rocky wildfire started in Rock Creek, impacting approximately 6,500 acres of Federal and private land. The fire area was rehabilitated by fertilizing and seeding, stream banks were planted with willow cuttings, and salvage areas were replanted with Douglas-fir and ponderosa pine seedlings. Several past vegetation management activities have occurred in the Rocky Restoration project area, including salvage operations within the Rocky wildfire, regeneration harvesting, and fuels reduction treatments.

The majority of past management activities have created a highly dense, homogenous stand conditions throughout much of the project area. The high density of the stands contributes to mortality of trees because of competition for nutrients, water and sunlight. Densely stocked non-fire resistant trees, diseased trees, large-scale tree mortality areas, and down fuel are creating continuous fuel ladders from the ground to the tree crowns. This has increased the risk of uncharacteristic, large-scale insect and disease-related morality as well as the risk of high-intensity wildfires.

In addition to highly dense, homogenous stands, the lack of past disturbances within the project area has resulted in conifer encroachment within riparian areas that had once been dominated by early-seral hardwood stands. As described in the White River Watershed Analysis (USDA Forest Service, 1995 pp. 4-4 and 4-7), riparian habitats in the project area should be dominated by black cottonwood, willow, alder, and quaking aspen. However, current conditions no longer mimic the natural, historical conditions that once existed. These conditions have also resulted in a lack of large wood in streams, subsequently reducing natural pooling in areas where hardwood species had previously dominated the landscape.

The Pine Hollow Wildland Urban Interface (WUI) is situated along the foothills of the Forest on the west and transitions east to the drier and flatter areas of the county. The western portions of this WUI were burned in the 1973 fire. This zone has the highest hazard risk rating of those analyzed in the Community Wildfire Protection Plan (CWPP) for Wasco County (Hulbert, December 21, 2005). The rating is based on severe weather conditions, steep slopes with an east facing aspect, and heavy fuel loads with potential long flame lengths and high crown fire likelihood. Strong westerly winds off the slopes of Mt. Hood and high lightning occurrence are common. Fuel types transition from the more flatland areas with grass and brush on the eastside of the zone to the heavy forest fuels with steep slopes on National Forest System (NFS) lands to the west.

The majority of NFS lands have been mapped as Condition Class 2 or 3, indicating they have missed one or more natural fire events and now contain unnaturally high fuel situations. Fire regimes are a national

classification of the historic conditions for fire severity and frequency for a particular environment. Canopy closure on much of the NFS lands is conducive to crown fire events. Private lands within and adjacent to the planning area contain a mix of residential homes, outbuildings, forestlands, and agricultural lands. Private landowners have expressed concern that the adjacent NFS lands be managed so that wildfire suppression can be effective and successful.

The desired future condition of the project is to improve forest health by enhancing resiliency to insects, disease and wildfire while providing opportunities for effective fire suppression near adjacent private land. Achieving this desired future condition would meet the overall goals of the land allocations described in the Table 2.

1.4.2 Purpose and Need

The overall purpose for the Rocky Restoration project is to conduct restoration activities within the planning area to improve the health and vigor of forested stands, and improve conditions for wildlife and aquatic resources, while reducing the risk of fires spreading from public lands to non-federal lands and to provide a location for fire suppression personnel to actively engage a fire safely. In order to meet this overall purpose, there are underlying needs to:

- Restore stand health to improve resiliency to insects and disease;
- Enhance forest diversity within plantations;
- Enhance and restore pine/oak habitat and riparian reserves;
- Provide opportunities to safely engage an active fire near private land; and,
- Provide forest products consistent with the Northwest Forest Plan goal of maintaining the stability of local and regional economies.

As discussed above, plantations are experiencing a slowing of growth due to overcrowding and some are experiencing stress and suppression-caused mortality. Plantations do not have the mix of tree species that were historically present; and they are relatively uniform in terms of tree size and spacing. Therefore, there is a need to restore stand health and enhance diversity, so that stands could increase diameter, height growth, and leaf area, as well as improve the health of the residual stands. Also, there is a need for greater variability of vertical and horizontal stand structure, which could allow for more sunlight to reach the forest floor so that there is a greater diversity and quantity of ground vegetation, including forage plants. If the health of the stands is improved, then forested areas are likely to result in having larger wind-firm trees that are more resilient to insects, disease activity and wildfire impacts.

In the pine/oak habitat, stands continue to be overcrowded with high density levels of non-fire resistant tree and shrub species, which has limited the natural regeneration of Oregon white oak. Also, the pine/oak habitat within the project area has low structural diversity, which is not favorable for ungulate species that need open stands for foraging. Thus, there is a need to restore conditions within the pine/oak habitat that have missed disturbance cycles.

Currently, riparian conditions within plantations do not meet all of the current and future needs associated with aquatic and riparian resources because stands have reduced capability to provide stream shade, downed woody structure, stream channel and bank stability, and micro-climate conditions of a fully functioning riparian ecosystem. Therefore, there is a need to improve these conditions within riparian areas (USDA Forest Service, 1995 pp. 5-21 and 5-23). Also, in regards to riparian areas containing aspen, there is a need to reduce competition with encroaching conifers to allow aspen greater access to available resources.

With the adjacent private lands and the Pine Hollow WUI included in the eastern portion of the planning area, there is a need to reduce the risk of a high-intensity fire spreading onto private lands. Also, there is a need to provide locations for fire suppression personnel to actively engage a fire safely.

As guided by management direction in the NWFP (p. 26), there is a need to maintain a sustainable supply of timber and other forest products to help preserve the stability of local and regional economies on a predictable and long-term basis. Also, there is a need to provide forest products at sustainable levels (forest plan, pp. Four-3 and Four-26).

1.5 Proposed Action

In order to address the needs described above, the Forest Service is proposing a suite of activities to meet the purpose and need for action: silviculture treatments, prescribed burning, and road management activities. The table below lists the proposed activities with their associated acreages or mileages. All measurements, such as acres and miles, are estimates. A detailed description of the proposed action can be found in chapter 2. Also, maps of the proposed action, including temporary roads and road closures, can be found in appendix A.

Table 1. Proposed Action Activities

Proposed Activities	Measure
Aspen enhancement and meadow restoration thinning	35 acres
Plantation thinning	5,398 acres
Oak restoration thinning	1,740 acres
Prescribed burning	1,323 acres
Temporary road construction	26 miles
Close currently open roads	38 miles

1.5.1 Forest Plan and Northwest Forest Plan Land Use Allocations

The forest plan and Northwest Forest Plan provide overall direction to meet desired conditions by identifying land use goals and objectives to reflect conditions on the ground. There are several land use allocations within the project area. Regarding the forest plan, these include: key site riparian area (A9); scenic viewshed (B2); pine-oak habitat (B4); pileated woodpecker/pine marten habitat area (B5); and timber emphasis (C1). Northwest Forest Plan land use allocations overlap with the land use allocations within the forest plan; and these include riparian reserves and matrix for this project. Where applicable, the more stringent standards and guidelines would be applied where land use allocations overlap. Maps of the land use allocations can be found in appendix A – Maps of Forest Plan Land Use Allocations and Northwest Forest Plan Land Use Allocations. The table below shows the overall goals of the land use allocations and associated acres and percentages included in the proposed action.

Table 2. Acres and Percent of Rocky Restoration Project Area by Land Use Allocation and Goals

Land Use Allocation	Goals	Acres (Percent)
Key Site Riparian Area (A9)	The goal of this area is to maintain or enhance habitat and hydrologic conditions, notable for their exceptional diversity, high natural quality (forest plan p. Four-179).	300 acres (3 percent)

Land Use Allocation	Goals	Acres (Percent)
Scenic Viewshed (B2)	The goal for this land use allocation is to provide attractive, visually appealing forest scenery with a wide variety of natural appearing landscape features. This management area should utilize vegetation management activities to create and maintain a long term desired landscape character. The major characteristics are for the visual character of the landscape resulting from prescribed visual quality objectives within distance zones from selected viewer positions (forest plan p. Four-218). For this project, Road 48 and the Rock Creek Reservoir and campground serve as the main viewer positions.	1,856 acres (22 percent)
Pine/Oak Wildlife Emphasis (B4)	The goal of this area is to maintain key deer and elk winter habitat with additional emphasis on nesting and forage production for year-round turkey and squirrel habitat. Secondary goals are to maintain a healthy forest condition through a variety of timber management practices and to provide summer dispersed recreational opportunities (forest plan p. Four-234).	2,573 acres (30 percent)
Pileated Woodpecker/Pine Marten Habitat Area (B5)*	The goal of this area is to provide mature or old growth forest habitat blocks of sufficient quality, quantity and distribution to sustain viable populations of pileated woodpecker and pine marten. A secondary goal is to maintain a healthy forest condition through a variety of timber management practices (forest plan p. Four-240).	176 acres (2 percent)
Timber Emphasis (C1)	The primary goal for this land use allocations is to provide lumber, wood fiber, and other forest products on a fully regulated basis, based on the capability and suitability of the land. A secondary goal is to enhance other resource uses and values that are compatible with timber production (forest plan p. Four-289).	3,767 acres (44 percent)
Riparian Reserves	Riparian Reserve includes areas along rivers, streams, wetlands, ponds, lakes, and unstable or potentially unstable areas where the conservation of aquatic and riparian-dependent terrestrial resources receives primary emphasis.	1,300 acres (15 percent)
Matrix	Matrix consists of Forest Service lands outside of designated areas (for instance, Congressionally Reserved Areas, Late-Successional Reserves, Adaptive Management Areas, Administratively Withdrawn Areas, and Riparian Reserves).	7,196 acres (85 percent)

*B5 areas are inclusions within other land use allocations, therefore, acres of B5 are accounted for in the dominate land use allocation (forest plan p. Four-240).

Forest Plan Exceptions

Standards and guidelines in the forest plan were not written to specifically address fuels reduction or oak restoration. Forest plan pages 4-45 states that for "should" standards "action is required; however, case-by-case exceptions are acceptable if identified during interdisciplinary project planning, environmental analyses. Exceptions are to be documented in environmental analysis (National Environmental Policy Act 1969) public documents." One exception was identified during the interdisciplinary planning that meets the purpose and need for action. The changes included in an exception are not permanent and are limited geographically to only the treatments proposed for this project. All proposed activities were found to be consistent with forest plan standards and guidelines, barring the following exception:

Organic Matter for Soil Productivity (FW-033): At least 15 tons per acre of dead and down woody material in east side vegetation communities…should be maintained and evenly distributed across managed sites (forest plan, pp. 4-50).

It is likely organic matter tonnage would be reduced to levels below forest plan standard FW-033, especially in the higher fire frequency areas. Since a goal of this project is to reduce organic matter available to burn, it is a trade-off to meet the purpose and need. Fine organic matter levels should trend upward as the forest floor in higher fire frequency areas increase in shrubs, forbs, and grasses. Also, it is likely localized acreage would be lower than forest plan standards for organic matter, which is an intention of the proposed action for reducing high fuel conditions. This exception is not expected to negatively impact the continued soil productivity because these sites are expected to retain a sufficient amount of organic matter in the mineral top soil (see soils section of chapter 3 for more information).

1.6 Public Involvement

The Rocky Project planning area was initiated in the fall of 2014, through discussion with Wasco County Commissioners and other members of the public concerned about wildland fire affecting the private land of Sportsman's Park. On October 7, 2014, Kameron Sam, District Ranger presented this proposal to the White River Watershed Council and on April 22, 2015, presented this project planning area to the Wasco County Collaborative group. A scoping letter was sent out to interested parties on October 30, 2015. Eight letters were received in response to the scoping effort. The proposed action was developed from comments and recommendations received from the Wasco County Collaborative Group and other members of the public. The Forest Service continued to provide information to the Wasco Collaborative Group at meetings and two field trips which occurred in May of 2015 and July of 2017. The Rocky Restoration project has been posted to the Forest's website and listed in the Mt. Hood National Forest Schedule of Proposed Actions (SOPA) beginning in October 2015 and in subsequent quarterly SOPAs. The Preliminary Environmental Assessment was shared with the Wasco County Collaborative group, other interested parties, and the tribes beginning in September 2018. The official 30-day comment period was initiated on September 26, 2018. Nine letters were received during the official comment period. No new issues were raised as a result of these comments. The comments and questions were the same or similar to those received during scoping. Minor clarifications to the EA were made in response to some of the comments. The comments and responses are provided as EA appendix C.

1.7 Issues and Concerns

Issues serve to highlight effects or unintended consequences that may occur from the proposed action, giving opportunities during the analysis to reduce adverse effects and compare trade-offs for the Responsible Official and public to understand. Concerns and recommendations raised during the collaborative process were addressed by refining the proposed action, including development of the project design criteria and addressing roads.

Scoping comments ranged from urging additional acres for treatment; treating less acres; treating vs. not treating riparian areas; recommendations or questions regarding the silvicultural and fuel reduction prescriptions to be utilized; minimizing the introduction and spread of non-native invasive plants; disclosure of effects on hydrology and aquatic and terrestrial wildlife habitat; utilizing only existing road systems; closing additional roads; decommissioning roads; and limiting impacts from off-highway vehicle use. The following highlights some of the primary concerns raised by the public and how they have been addressed in this environmental assessment. While concerns were expressed from the public, none of these concerns were identified as issues for the purpose of formulating fully developed alternatives. There were other comments that were not addressed by the environmental assessment for various reasons, which are also summarized in this section.

Amount of Vegetation Treatment Area

The proposed action was designed to fully meet the purpose and need for action. All treatment areas were included in the proposed action where the following conditions exist: dry fir, pine, and oak plant communities displaying undesired conditions; hazardous fuel conditions; and stands less than 80 years old, in order to strategically avoid implementing additional survey work per the Survey and Manage direction (USDA Forest Service et al. 2001). Also, treatment areas were added in the western portion of the planning area in order to make the project more economically feasible. This addition took place during the collaborative process after the scoping period. More details regarding the treatments are provided in chapter 2 and the vegetation section in chapter 3.

Vegetation Treatments within Riparian Reserves
One commenter requested that thinning in riparian reserves should be removed because commercial timber extraction from riparian reserves is not scientifically justified. The proposed action includes mechanized and non-mechanized treatments in the outer portion of the Riparian Reserves, but not within the primary shade zone. No-cut buffers range from 30 to 130 feet per side depending upon stream type and fish presence. The aspen enhancement activities are proposed within no cut buffer areas. The prescriptions within riparian reserves either meets or exceeds the widths for the riparian management zone in the forest plan prescription. Also, treatments within riparian reserves are permitted when necessary to attain Aquatic Conservation Strategy Objectives (ACSOs). Consistency with and effects on ACSOs is disclosed in the hydrology section of chapter 3.

Rationale and Science behind the Proposed Vegetation Treatments
One commenter questioned the validity of the reasoning behind the proposed activities to accomplish the project's objectives. The proposed treatments are professionally recognized as appropriate to achieve the project's purpose and need, and are supported by the best available science. Also, the proposed action will meet forest plan, as amended, standards and guidelines. Additional information can be found in the vegetation and fuels specialist reports, which include descriptions of the analysis assumptions and methodology behind the vegetative and fuel reduction treatments that have been proposed. These reports are summarized in chapter 3 of this environmental assessment, and are incorporated by reference.

Temporary Roads
Some commenters expressed concern about constructing temporary roads or re-opening previously decommissioned roads to access treatment areas, which could introduce sediment to streams and result in impairing water quality and aquatic resources. Since impacts associated with temporary roads is expected to be minimal, this concern did not warrant development of an additional action alternative. Most of the temporary roads would retrace the alignment of past temporary roads, decommissioned roads, or existing off-highway vehicle routes. The few that would be constructed in new locations would be strategically located to minimize undesirable impacts. Temporary road-related activities and the project design criteria that were developed to minimize impacts is described in chapter 2. The specific effects of temporary roads on other resources is described in chapter 3.

Decommission Roads
One commenter requested that all the roads included in the original scoping notice for the Road Decommissioning for Habitat Restoration (Increment 3) project be assessed for potential decommissioning to reduce impacts to soil, water, and aquatic species from sedimentation; and to wildlife from road density. Scoping for the "increment 3" project initially occurred in 2010; and was re-scoped in 2014. Since then, this project has been cancelled. Information, including the existing conditions, from that project was considered in developing the Rocky Restoration project, however, because no analyses was ever completed for the "increment 3" project, it is not part of this project.

All but three of the roads the commenter requested to be considered for decommissioning are proposed for closure to public use in the proposed action. The three roads that are not proposed for closure to public

use include the 4800-011, 4811-080, and 4820-120. These three roads were not included in the proposed action because they are not located within the Rocky project area. The interdisciplinary team reviewed the transportation system within the project area, and while decommissioning was considered, the Responsible Official determined that closing roads would be preferable so that they could remain available for Forest Service administrative use, as well as for emergency use activities, such as search and rescue. The proposed action includes a description for how roads would be repaired, maintained or closed, including project design criteria that would be implemented to minimize the impacts of roads on other resources. They are described in chapter 2. The effects of roads on other resources is disclosed in chapter 3.

Limiting Impacts from Off-highway Vehicle Use
Unauthorized off-highway vehicle use and impacts within the project area during and after implementation was of concern. A number of project design criteria were identified to control access during and after treatment, which are described in chapter 2. It was also evaluated in the recreation section of chapter 3.

Exceptions to Forest Plan Standards and Guidelines
One commenter was concerned about the cumulative impact of making exceptions to forest plan standards, citing concerns that the Forest Service did not make a thorough, site-specific determination that an exception would be warranted. One exception has been identified, and is described in section 1.5.1, as well as in the soils section in chapter 3. Forest Plan exceptions are acceptable per forest plan direction found on page 4-45.

Chapter 2. Alternatives

2.1 Introduction

This chapter describes and compares the alternatives considered for the Rocky Restoration project. Some of the information used to compare 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.

2.2 Alternatives Considered in Detail

The Forest Service has considered two alternatives in detail, the no action and proposed action alternatives.

2.2.1 Alternative 1 – No-action Alternative

Under the no-action alternative, no change in existing forest management would occur. Alternative 1 is designed to represent the existing condition and projected future conditions if current forest management continues. The no-action alternative is based on the assumption that ecosystems undergo change, even in the absence of active management. It serves as a baseline to compare and describe the differences and effects between taking no action and implementing an action alternative. The no-action alternative would not move the planning area towards desired conditions and does not meet the purpose and need.

2.2.2 Alternative 2 – Proposed Action

Alternative 2 is the proposed action, which responds to the purpose and need for action. The proposed action would authorize a variety of activities as described below. The order in which these activities

would be implemented is variable. Maps showing the treatment units, temporary roads, and closed roads are available in appendix A. A list of all units with proposed activities is available in appendix B.

The Forest Service interdisciplinary team for this project used input received during collaborative engagement and from other interested members of the public to inform the purpose and need and proposed action developed for this project.

2.2.2.1 Silviculture Treatments

In order to restore and enhance stands to more historical conditions, four vegetation treatments are proposed within the project area. Thinning activities would remove trees that are overcrowding stands. This overcrowding has resulted in density related mortality risk, lack of regeneration, and increased risk of crown fire.

Stands where the dominant species and fire regime are appropriate, such as ponderosa pine, Oregon white oak, Douglas-fir, and western larch which are adapted to low intensity, frequent fire return intervals, would be treated so that future under-burning could occur to maintain stand conditions. Fuels created from thinning activities as well as naturally accumulated fuels would be treated by piling and burning.

2.2.2.1.1 Aspen Enhancement and Meadow Restoration Thinning (Approximately 35 acres)

Within aspen stands, the proposed action would be to remove conifers within existing aspen clones and remove competing conifers on the edge of the clone that is within 150 feet of the aspen canopy on approximately 35 acres. Where appropriate, pile burning and/or prescribed burning would occur around and on the edges of the aspen clone once vegetative treatments have been implemented. Vegetative treatments would be a mix of mechanical and hand work and would include a variety of treatments, including but not limited to cutting, pulling, and burning.

2.2.2.1.2 Plantation Thinning (Approximately 5,400 acres)

Plantation treatments would be an intermediate variable density thinning from below treatment to approximately 40-120 ft² of basal area in even-aged managed units designed to address high density issues that are leading to fuels and forest health concerns. These concerns are stress-related mortality, limited species diversity, limited structural diversity, and limited natural regeneration of Oregon white oak. The overall desire for these treatments would be to move riparian areas as well as the upland portions of the plantations towards a properly functioning late-successional area with a large tree component that is currently absent in the majority of the stands due to wildfire, past activities and high tree densities. Where applicable, sapling thinning to approximately 40-100 trees per acre would be implemented based on site conditions in order to promote and develop more resilient stand conditions. Also, brush and piling treatments would be implemented where needed. Where possible, snags should be created to meet forest plan standards. Prescribed burning, pile burning, and/or mechanical fuels treatments would be applied to these treatment areas as well. Mechanical fuels treatments could include, but would not be limited to, lop and scattering, mechanical piling, masticating, or biomass collection. Biomass collection would include machine piling and removal of materials.

2.2.2.1.3 Oak Restoration Thinning (Approximately 1,750 acres)

Oak restoration thinning consists of thinning to approximately 40-100 trees per acre to promote and develop more resilient ponderosa pine/oak habitats to more historic conditions. An emphasis would be placed on removal of conifer encroachment out of meadows and around existing legacy ponderosa pine, aspen and Oregon white oak. Where applicable, sapling thinning to approximately 40-100 trees per acre would be implemented based on site conditions to promote and develop more diverse stand conditions. Also, brush and piling treatments would be implemented where needed. Prescribed burning, pile burning,

and/or mechanical fuels treatments would be applied to these treatment areas as well. Mechanical fuels treatments could include, but would not be limited to, lop and scattering, mechanical piling, masticating, or biomass collection. Biomass collection would include machine piling and removal of materials.

2.2.2.2 Prescribed Burning (Approximately 1,300 acres)

Underburning is the use of prescribed fire underneath existing or residual trees to treat natural fuels, such as dead woody material, needle litter and brush. Underburning would occur in stands that have stand composition and structure that can support underburning without any thinning activities prior to treatment. Underburning in stands ready for a natural disturbance would maintain stand density and regeneration levels, while maintaining fuel loadings that closely mimic historical conditions.

2.2.2.3 Transportation System Management

In 2015, the Forest completed a Travel Analysis Report (TAR), which was a synthesis of previous transportation planning efforts and set the stage for project-level decisions about whether to retain roads, close or decommission them, and what level of maintenance they should receive. Based on a review of previous travel management analysis and recommendations, there remain opportunities to make additional adjustments to the transportation system to either reduce resource risks and/or maintenance costs. Also, there is a commensurate need to consider long-term administrative and public access needs when making proposals to change the transportation system within the project area.

Currently, the project area includes approximately 106 miles of system roads, with 104 miles currently open for public and administrative use. A mix of road treatments is considered in the proposed action, including road closures, road repair and maintenance, and temporary road construction, which are further discussed in the following sections.

2.2.2.3.1 Road Closures

Although closing roads was not included in the proposed action during the time of scoping, based on comments received, the proposed action has been updated to include road closures. Discussions with the Wasco Collaborative Group regarding road closures were initially focused on closing roads in order to reduce disturbance to wildlife, particularly for deer and elk in quality foraging and wintering areas. Although seasonal closures could address this concern for wildlife, some members of the collaborative group expressed an interest in providing additional protections for wildlife. Therefore, this updated proposed action includes approximately 38 miles of road being proposed for closure to public use. A list of these roads in provided in the following table; and a map is provided in appendix A.

The roads proposed for closure would be closed to the public year-round by means of a gate or other suitable closure device. These roads would remain available for Forest Service administrative use, as well as for emergency use activities, such as search and rescue. The roads would receive minimal maintenance since no public traffic would be allowed; and the roads would be considered as Maintenance Level 2 with administrative use only. The proposed action allows for administrative use because fire management resources will continue to utilize these roads to implement and monitor prescribed fire operations in the project area, which may require multiple entries in any given year. Also, availability to access these roads will aid in future wildland fire response. The ability to quickly access, size up and engage in fire management operations is necessary within and adjacent to the Pine Hollow Wildland Urban Interface.

Table 3. Roads Proposed for Maintenance Level (ML) 2 – Administrative Use Only

Road #	Mileage	Current ML	Proposed ML
2710-022	0.51	ML2	ML2 with admin use
2710-170	0.59	ML2	ML2 with admin use

4800-012	0.14	ML2	ML2 with admin use
4800-014	0.60	ML2	ML2 with admin use
4800-130	2.45	ML2	ML2 with admin use
4810-011	0.41	ML2	ML2 with admin use
4810-013	0.20	ML2	ML2 with admin use
4810-014	0.20	ML2	ML2 with admin use
4810-015	0.10	ML2	ML2 with admin use
4810-016	0.61	ML2	ML2 with admin use
4810-017	0.50	ML2	ML2 with admin use
4810-018	0.20	ML2	ML2 with admin use
4810-019	0.10	ML2	ML2 with admin use
4810-130	0.20	ML2	ML2 with admin use
4810-140	2.93	ML2	ML2 with admin use
4810-141	1.10	ML2	ML2 with admin use
4810-150	0.20	ML2	ML2 with admin use
4810-160	0.70	ML2	ML2 with admin use
4810-161	0.50	ML2	ML2 with admin use
4810-180	0.86	ML2	ML2 with admin use
4810-181	0.84	ML2	ML2 with admin use
4810-190	0.81	ML2	ML2 with admin use
4810-191	0.65	ML2	ML2 with admin use
4810-200	1.08	ML2	ML2 with admin use
4810-220	2.40	ML2	ML2 with admin use
4810-221	1.20	ML2	ML2 with admin use
4810-223	0.50	ML2	ML2 with admin use
4810-224	0.50	ML2	ML2 with admin use
4810-225	0.40	ML2	ML2 with admin use
4810-230	1.21	ML2	ML2 with admin use
4811-011	0.50	ML2	ML2 with admin use
4811-021	0.52	ML2	ML2 with admin use
4811-022	0.98	ML2	ML2 with admin use
4811-171	0.10	Decommission	ML2 with admin use
4811-190	0.20	ML2	ML2 with admin use
4812-141	1.17	Decommission	ML2 with admin use
4813-120	0.50	ML2	ML2 with admin use
4820-011	1.30	ML2	ML2 with admin use
4820-012	0.40	ML2	ML2 with admin use
4820-014	0.40	ML2	ML2 with admin use
4820-018	0.40	Decommission	ML2 with admin use
4820-025	0.50	ML2	ML2 with admin use
4820-026	0.40	ML2	ML2 with admin use
4820-130	1.26	ML2	ML2 with admin use
4820-131	1.79	ML2	ML2 with admin use

4820-132	1.22	ML2	ML2 with admin use
4820-133	0.33	ML2	ML2 with admin use
4820-160	1.70	ML2	ML2 with admin use
4820-180	0.22	ML2	ML2 with admin use
4820-190	0.20	ML2	ML2 with admin use
4860-120	0.31	ML2	ML2 with admin use

All of the roads contained in the table above, were identified as "likely needed" in the TAR, with the exception of the following roads, which were identified as "not likely needed": 4800-130; 4811-171; 4812-141; 4820-018; and 4820-025. These roads are needed to remain as part of the Forest's transportation system for administrative use for fire management resources, as well as for future planning efforts.

Additionally, some of the roads proposed for closure include roads that were identified to be decommissioned in the Record of Decision for Off-highway Travel Management (2010). The following roads would be returned to the transportation system as ML2 – administrative use only: 4811-171; 4812-141; and 4820-018.

2.2.2.3.2 Road Repair and Maintenance

To facilitate the vegetation management activities proposed for the project area, it is important to ensure that the roads to be used by log trucks are safe. To address this need, the proposed action includes road maintenance and repair activities on up to approximately 90 miles of system roads. Road maintenance activities would be conducted prior to and during operations to ensure minimum safety standards and effective roadway drainage. Maintenance and repair include activities such as brushing, blading, deep patch repairs, culvert replacement, ditch and culvert cleaning, and the addition of aggregate rock to road surfaces. More information about road maintenance and repair activities can be found in the transportation specialist report.

2.2.2.3.3 Temporary Roads

Temporary roads would need to be constructed to access some of the stands proposed for treatments. Approximately 26 miles of temporary road would be needed. Most of those miles (18.1 miles) would be located on existing, non-system road prisms. About 5.5 miles of the temporary roads would be located on old road alignments that have been converted to OHV trails; and 2.2 miles would be located on decommissioned road alignments. About 0.3 miles of temporary roads would be newly constructed. A map of the proposed temporary roads is available in appendix A. The temporary roads would be rehabilitated after they are no longer needed, so that net road density would not increase. Project design criteria have been developed for the construction, use, and rehabilitation of temporary roads, which are listed near the end of this chapter.

2.2.3 Project Design Criteria

Project design criteria (PDC) are an integral part of the proposed action and serve to mitigate impacts of activities on resource areas. In addition to best management practices (BMPs) and legal requirements, these measures would be applied under the proposed action (alternative 2) during implementation. PDC and BMPs were developed using the National Core BMP Technical Guide (USDA Forest Service 2012), monitoring, field verification, professional judgment, and the best available science. PDC are considered as part of the proposed actions when analyzing for effect to resources. Any changes to these criteria or how they are applied could affect the determinations from consulting agencies.

Fuels

1. Any mechanical slash piling would be done with equipment capable of picking up (grasping) slash material and piling (as opposed to pushing/dozing) thereby meeting the objectives of minimizing detrimental soil impacts. Grapple piles would be covered, to facilitate consumption of piled fuels. Piles need to be 6-feet wide at base, 6-feet high as a minimum1. An allowance for a small deviation from the stated dimensions would be made as long as this deviation does not jeopardize meeting any other stated goals. Any piling of slash will be kept separate from the chip material.
2. Chipped material will have to be spread to a depth of no more than 6 inches and ripped after spread along skid trails and landings.
3. All slash needs to be piled and managed or removed by 2 years from contract completion (for instance, pile burning, complete pile burning, incineration, chipping).
4. Hand piles would be constructed with enough fine fuels to allow for ignition during fall and winter months, and covered, to facilitate consumption of piled fuels. Piles need to be 6-feet wide at base, 6-feet high as a minimum[1]. An allowance for a small deviation from the stated dimensions would be made as long as this deviation does not jeopardize meeting any other stated goals.
5. Piles should be as compact and free of dirt as possible.
6. Slash piles should have a sound base to prevent toppling over and should be wider than they are tall. Pile branches with their butt-ends toward the outside of the pile, and overlap them so as to form a series of dense layers piled upon each other. Use a mixture of sizes and fuels throughout the pile. Piles should be kept compact and free of soil and noncombustible material, with no long extensions. Do not construct piles on stumps or on sections of large down logs.
7. Pile size and location should be such to minimize damage to residual trees. Piles should be located at least 20-feet inside the unit boundary. Piles should not be placed on or in the following areas: pavement, road surface, ditch lines, the bottom of ephemeral channels, or within perennial or intermittent stream protection buffers.
8. Low severity burns[2] should constitute the dominant type of controlled burn within Riparian Reserves, resulting in a mosaic pattern of burned and unburned landscape.
9. Moderate severity burns[3] are permitted in no more than 20 percent of Riparian Reserves to invigorate desirable deciduous species.
10. Burning activities excluded in Riparian Reserves are as follows: mechanical piling, ignition and mechanical fire line construction (for example, dozer, tractor, etc.) within 100 feet of stream channels or springs.
11. Within Riparian Reserves; wet line or black line would be used to control prescribed fire perimeter.
12. Ignitions of hand piling slash in Riparian Reserves is permitted no closer than 30 or 60 feet of a stream, measured from the streambank.
13. Where handline is constructed, implement BMPs to reduce erosion and sedimentation risks, including constructing waterbars on all fire lines during initial fire line construction where slopes are greater than 20 percent.

---

[1] The Forest Service would meet an average width and length of 8-feet and height of 6-feet for mechanical and hand piles. From past experience with implementation, it is virtually impossible to maintain an exact dimension of fuel piles, so allowance for a small deviation would be made as long as this deviation does not jeopardize meeting the above stated goals.

[2] Low severity burn is defined as: “Small diameter woody debris is consumed; some small twigs may remain. Leaf litter may be charred or consumed, and the surface of the duff may be charred. Original forms of surface materials, such as needle litter or lichens may be visible; essentially no soil heating occurs.”

[3] Moderate severity burn is defined as: “Foliage, twigs, and the litter layer are consumed. The duff layer, rotten wood, and larger diameter woody debris is partially consumed; logs may be deeply charred; shallow ash layer and burned roots and rhizomes are present. Some heating of mineral soil may occur if the soil organic layer was thin.”

Heritage Resources

1. A 100-foot buffer zone for the exclusion of heavy machinery would be flagged around all cultural remains on significant heritage resource sites that are situated in areas scheduled for mechanical treatment.
2. A 50-foot buffer zone (each side of center line) for the exclusion of heavy machinery would be flagged or delineated along historic ditches. Ditch crossings will be limited to previous crossings.
3. Fire control line would be constructed, using either wet line or hand line, around all fire sensitive heritage resources.
4. Surface duff would be scraped away from the bases of all marked trees with telephone insulators.

Invasive Species

1. It is recommended that "pre-treatment" occur before any harvest activities are implemented along roads 4810 and 4811.
2. In order to prevent the spread of invasive plants, all equipment would be cleaned of dirt and weeds before entering National Forest System lands. This practice would not apply to service vehicles traveling frequently in and out of the project area that would remain on the roadway.
3. The process for locating all new skid trails and landing locations would be coordinated with a noxious weed specialist to insure these locations are not within any currently established noxious weed populations. If necessary, pre-treat existing landings and skid trails that may be used for project implementation where existing infestations present an unacceptable risk of spreading established invasive plant populations.
4. If the need for restoration/revegetation of skid trails and landings is identified, the use of native plant materials are the first choice for meeting this objective where timely natural regeneration of the native plant community is not likely to occur. Non-native, non-invasive plant species may be used in any of the following situations: 1) when needed in emergency conditions to protect basic resource values (for example, soil stability, water quality and to help prevent the establishment of invasive species), 2) as an interim, non-persistent measure designed to aid in the re-establishment of native plants, 3) if native plant materials are not available, or 4) in permanently altered plant communities.
5. If using straw, hay or mulch for restoration/revegetation in any areas, use only certified, weed-free materials.
6. Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and rock that is judged to be weed free by District or Forest weed specialists.
7. No underburning would occur on treated sites within one year of herbicide treatments including roadside herbicide treatments.

Recreation

1. Developed recreation sites should not be used as landings or for equipment staging and any developed recreation sites impacted should be rehabilitated when treatment is complete.
2. Recreation specialist will develop public information materials and outreach plan using a combination of key entry/exit portals, visitor information boards and outreach via websites and other information sources.
3. Implement appropriate temporary closures as necessary to provide for public safety. Post closures at all temporary road access points, and access portals during treatment period(s). Closures and re-route information will be posted at designated off-highway vehicle trailheads, parking areas, campgrounds and at information kiosks when directed by recreation specialists. Information should also be disseminated to the public by recreation staff.

4. Ensure temporary roads not associated with off-highway vehicle trails are decommissioned to impassible conditions when harvest activities are complete.

Trails

5. When possible, all mechanical brush piles and landings will be located at least 100 feet from trails not authorized for sale use. Hand piles would be located at least 50 feet from trails.
6. Within 100 feet of any system trail, skid trails should not run parallel system trail for more than 100 feet, unless approved by timber sale administrator.
7. All purposed built off-highway vehicle trails that intersect units will be flagged prior to thinning operations. Include trails as protected feature in sale map.
8. Stumps within 5 feet of trails would be cut less than 3" to reduce potential hazard to recreationists
9. Whenever possible, any trees felled within 1 tree length of the trail will be felled away from the trail. Any trees which fell across the trail would be cut or removed to prevent blockage of trails.
10. Leave trees would not be marked facing the trail within 50 feet of any system trail.
11. Maintain all trail signage, and repair any incidental damage that may occur from operations.
12. Any trail or trail crossing used for operations (temp roads, skid trails, fireline, landings, etc.) will be rehabilitated to meet standards associated with its designed use.
13. Temporary roads, skid trails, or equipment crossing system trails should be minimized. Any crossing points should be 100 feet apart and occur at right angles to the trail. Location of crossing points should be coordinated with the District Trail Manager.
14. Barriers to discourage off-highway vehicle access off trail would be installed on any equipment, temporary road, or skid trail crossings of system or non-system trails.
15. Treatment activity should not impact approximately more than 25 percent of off-highway vehicle trails or mixed use roads at one time and scattered, concurrent trail closures should be avoided.
16. Maintain higher retention (60 percent canopy) within 50 feet of system trails designated for off-highway vehicle use.

Visuals

1. All stumps from 50 feet from trails would be cut with the angle away or low stumped from the trail.
2. All brush piles and landings would be located so they are not visible from Forest Road 48 or Rock Creek Reservoir. If brush piles and landings cannot be hidden from view, then the sale administrator would work with the recreation staff officer for their placement.
3. All stumps within 100 feet of Forest Development Road 48 would be cut to 6-inches in height or less.
4. The methods used to rehabilitate landings, skid trails and temporary roads would be designed to meet VQO in the Foreground for Forest Development Road 48 unless blocked from view by topography or other features.
5. Ground disturbance and activity debris resulting from project activities would remain visually subordinate in the immediate foreground for the White River Watershed, Forest Development Roads 48 and Rock Creek Reservoir.
6. Piles would be visually subordinate along system trails, Forest Road 48 and Rock Creek Reservoir.

Aquatic Species and Habitat

1. No ground based mechanized equipment such as tractors or skidders would be allowed within 100 feet of streams, seeps, springs or wetlands. This would reduce the chance of sediment delivery to surface water.
2. No skidding in riparian reserves between October 31 and June 1.
3. No vegetation removal or mechanical treatments will occur within one site potential tree height along fish bearing streams, 60 feet along any non-fish bearing perennial streams, or 30 feet along any non-fish bearing intermittent streams. Any trees felled within designated protection buffers

would be left on site as additional stream channel woody material. Protection buffers for fish bearing streams would be a minimum of one site potential tree height (varies dependent on vegetation type of 90 feet to 130 feet), non-fish bearing perennial streams, ditches, springs and wetlands and Rock Creek Reservoir would be a minimum of 60-feet and a minimum of 30-feet for non-fish bearing intermittent streams, except as outlined in Aquatic Stream Buffer Table. Buffers are measured from the edge of the bankfull channel on both sides of the stream (or water's edge in the case of a pond or wetland). Buffers would be expanded to include slope breaks where appropriate. Underburning will still occur; and in Wildcat Creek drainage there may be a need for some brush removal and small (under 7 inch DBH) trees to be felled by hand and then hand piled prior to underburning.

4. Refuel mechanized equipment at least 150-feet from water bodies. Parking of mechanized equipment overnight or for longer periods of time would be at least 150 feet from water bodies or as far as possible from the water body where local site conditions do not allow a 150-foot setback. Absorbent pads would be required under all stationary equipment and fuel storage containers. A Spill Prevention Control and Countermeasures Plan would be prepared by the contractor as required under EPA requirements (40 CFR 112).
5. Use erosion control measures (for example, silt fence, native grass seeding) where de-vegetation may result in delivery of sediment to adjacent surface water. Soil scientists or hydrologists would assist in evaluation of sites to determine if treatment is necessary and the type of treatment needed to stabilize soils.
6. If timber transport is approved between October 31 to June 1 on aggregate surface roads then the following criteria shall be met for roads that cross Gate Creek or its' tributaries:
    a. Haul routes must be inspected weekly, or more frequently if weather conditions warrant. Inspections will focus on road surface condition, drainage maintenance, and sources of soil erosion and sediment delivery to streams.
    b. Sediment traps will be inspected weekly during the wet season and entrained soil would be removed when the traps have filled to 3/4 capacity. Dispose of these materials in a stable site which is not hydrologically connected to any stream.
7. Logging activities will not be allowed in Riparian Reserves from October 31 to June 1 in lower elevation units.
8. Maintain physical and water quality integrity of facilities associated with the Springbox and watertank for the Sportsmans Park water supply during operations.
9. Protect or enhance existing dry and wet meadows by not allowing new temporary roads, landings or ground based equipment.
10. All culvert replacements located on fish bearing streams shall follow the Forestwide Aquatic Organism Passage Restoration Decision Memo from May 2018.

Roads

1. All signing requirements on roads that are open for public use within the Mt. Hood National Forest would meet applicable standards as set forth by the Manual of Uniform Traffic Control Devices (MUTCD). Some roads accessing State and County highways would require additional signing to warn traffic of trucks entering onto or across the highway.
2. Temporary roads and National Forest System roads which are designated for 'project use only' would be closed to public use. The purchaser should sign the entrance to such roads with "Logging Use Only" signs and make every reasonable effort to warn the public of the hazard and to prevent any unauthorized use of the road.
3. The use of steel-tracked equipment on asphalt or bituminous surfaced roads is strongly discouraged. If a suitable site for the loading and unloading of equipment and materials is not available, then use of a paved surface may be permitted provided that the purchaser uses approved matting materials

(such as wood chip or crushed rock) to protect the road surface. Purchaser is responsible for restoring roads to existing condition.

4. Temporary roads and landings located on or intersecting National Forest System roads that are asphalt or bituminous surfaced would have 3-inch minus or finer dense graded aggregate placed at the approach to prevent surface damage. The purchaser should purchase the material from a commercial source and place the material so that the approach flares are wide enough to accommodate the off-tracking of vehicles entering onto or leaving the site.
5. Temporary roads and landings would not obstruct ditch lines. Temporary roads and landings that obstruct ditch lines or drainage ways should be improved by the purchaser, prior to commencing operations, with temporary culverts, French drains, drivable dips, or measures that provide effective drainage and prevent erosion.
6. On aggregate surfaced roads, mineral soil contamination degrades and reduces the load bearing capacity of the existing road surface. All appropriate measures would be taken to prevent or reduce such contamination. If contamination occurs, the purchaser should repair contaminated areas with specified aggregate surfacing.
7. Temporary roads and landings on temporary roads would be blocked, scarified, seeded and or mulched before the unit is released. Culverts would be removed and cross-drain ditches or water bars shall be installed as needed. Disturbed ground shall be seeded and mulched and available logging slash, logs, or root wads would be placed across the road or landing surface. Post-harvest motorized access would be prevented through the construction of a berm, placement of large boulders, or other approved techniques.
8. Pit run rock may be used when necessary to reduce erosion, ponding, rutting, and compaction on temporary roads and landings. To provide an efficient substrate for vegetative growth and water infiltration, rock would be removed or incorporated into the soil by de-compacting to a depth of 24" or scarifying the roadbed following harvest activities.
9. Unsuitable excavation (any excavated soil that is silty, sandy, saturated, frozen, or contains clay, organics, or other deleterious material, or is otherwise unsuitable for use in road construction and maintenance work) derived from road maintenance or construction operations would be disposed of only at Forest Service approved sites outside riparian p*r*otection buffers (PDC A-2 and Table 2-7). Material disposed of should be spread evenly over an appropriate area in non-conical shaped piles with a maximum layer thickness of 4 feet. All disposals should be seeded and mulched at the completion of operations, and prior to the wet season. The wet season is the time of year with light to heavy amounts of precipitation occurring regularly characterized by saturated soils and higher stream flows; includes all days of the year not considered to be the dry season.
10. Stockpiles of aggregate intended for use on the project would be staged only at Forest Service approved sites. Materials should be placed in non-conical shaped piles with a maximum layer thickness of 3-feet. Stockpiles should be covered with weighted plastic sheeting when inclement weather is expected to protect it from precipitation and to prevent water quality degradation from runoff.
11. Existing vegetation in ditch lines hydrologically connected to streams (as defined in NWFP) must not be removed unless a sediment control feature such as biodegradable check dams constructed of bio-bags, straw bales, or other materials are installed. Sediment control features would be maintained until the sale is released and left in place.
12. Scheduled soil disturbing road maintenance or reconstruction would occur during the dry season, unless a waiver is obtained. Dry season is the time of year with light to moderate amounts of precipitation occurring sporadically, characterized by dry soils and lower stream flows; generally June 1 through October 31, but variable from year to year.
13. Follow the appropriate Oregon Department of Fish and Wildlife (ODFW) guidelines for timing of in-water work (in this watershed the in-water work window is July 1 to October 31. Exceptions to the ODFW in-water work windows must be requested by the Forest or its contractors, and

subsequently approved by ODFW, U.S. Army Corps of Engineers, and Oregon Division of State Lands.

14. New temporary roads and landings should be located outside of Riparian Reserves. Use of existing facilities within riparian reserves may be allowed if erosion potential and sedimentation concerns could be sufficiently mitigated.

Log and Rock Hauling

1. Log and rock haul outside of the dry season shall not occur on native surface roads or established snowmobile routes.
2. Log haul, rock haul, and transport of heavy equipment may be allowed during the wet season on paved or aggregate forest system roads if approved by the district ranger with input from the appropriate resource specialist(s) and the following criteria are met:
   (a) Haul routes would be inspected weekly or more frequently as weather conditions may warrant to determine the condition of the road to adequately support heavy haul without undue damage to the transportation resource or other natural resources. Alternatively, the responsible official may give written approval of haul during the wet season.
   (b) Sediment traps would be installed where there are potential sediment inputs to streams. Sediment traps would be inspected weekly by the timber sale administrator (or other delegated qualified government representative) during the wet season and entrained soils would be removed when the traps have filled to 3/4 capacity. Dispose of these materials in a stable site not hydrologically connected to any stream.
   (c) Precipitation amounts are similar to those found during the dry season, defined as follows: The daily precipitation level remains below the average daily maximum precipitation for the June through October period as measured at the precipitation gage nearest the project area; AND the two-week cumulative total precipitation remains less than the average maximum two-week precipitation levels during the June through October period as measured at the precipitation gage nearest the project area; AND no visible sedimentation is occurring in road ditches or culverts that can be attributed to the haul.
   (d) Haul would cease at any time there is 1.0 inches of precipitation or greater within any given 24-hour period as measured at the lowest elevation along the haul route. To measure precipitation, the purchaser would install a temporary rain gauge on National Forest land near or adjacent to the lowest elevation along the haul route as agreed upon; otherwise, precipitation would be measured according to a local RAWS station as agreed upon prior to beginning operations.
   (e) Haul would cease whenever 24 hours of continuous rain occurs regardless of measured precipitation amounts.
   (f) Haul on established snowmobile routes and haul during weekends and federal holidays would occur only with written approval from the Responsible Official as informed by the Forest Service recreation specialist.
3. Log haul and heavy vehicle transport on forest system roads shall be prohibited when the temperature of the road surface, as measured at the lowest elevation along the haul route on National Forest System lands, is above 28 degrees Fahrenheit and when the temperature as measured at the highest elevation on the active haul route is between 28 and 38 degrees Fahrenheit or at any time when the designated timber sale administrator determines that freeze-thaw conditions along the haul route exist.

Soil

1. All skid trails would be rehabilitated immediately after harvest activities. Existing landings not associated with temporary roads would have erosion control measures installed following fuels or reforestation treatments.

2. Ground-based harvest systems should not be used on slopes greater than 30 percent to avoid detrimental soil and/or watershed impacts.
3. Skid trails would be designated and approved prior to logging by the timber sale administrator and would be located on already disturbed areas where available.
4. Where practical, skid trails would avoid ephemeral draws. Crossings would be perpendicular to ephemeral draws.
5. If a proposal to implement winter logging is presented, the following should be considered by the line officer if the ground is not frozen hard enough and/or insufficient snow depth to support the weight and movement of machinery in moist to wet soil conditions (these are based upon observations and monitoring of winter logging in Sportsman's Park):
   (a) The proposal should be considered on a unit by unit basis using soil types in the area since some soils may be more prone to detrimental damage than others.
   (b) Because the margin of difference between not detrimental and detrimental soil damage can be so slim under moist to wet soil conditions, monitoring of the logging activity may need to occur daily, or more, as agreed to by sale administration and soil scientist.
   (c) Equipment normally expected to traverse the forest, such as feller bunchers, track mounted shears, etc., should be restricted to skid trails once soil moistures are such that even one or two trips are causing detrimental soil damage out in the unit (for instance, not on landings or skid trails).
   (d) Due to higher PSIs than track mounted equipment, no rubber tired skidders should be used even on skid trails once soils become fully saturated (approach their liquid limit).

Vegetation

1. Tree planting would occur in gaps and areas where canopy closure would allow for the establishment of native tree species in both the uplands and riparian reserves.
2. Openings will not be created within 100 of non-temp road trails
3. Harvest operations (cutting) could occur between October 1 and April 1 in units 1-41

Wildlife Species and Habitat

1. Northern spotted owl nest sites would be protected through the implementation of seasonal operation restrictions (March 1 thru July 15) for units 3, 23, 66, and 67. In the event that a new activity center is located during the period of the contract, seasonal operating restrictions would be implemented to units that are within the 65 yard disruption distance.
2. No activities may take place within 0.25 miles of a spotted owl nest site between March 1 and July 15. The following units are within 0.25 miles of a spotted owl nest area: 3, 22, 23, 65, 66, 67, and 69.
3. No activities may take place within 0.25 miles of a bald eagle net site between January 15 and August 15.
4. An average of 6 logs per acre in decomposition classes 1, 2 and 3 should be retained. Logs should be relatively solid, retention of additional hollow and substantially fractured logs should be encouraged, and tops should generally not be included. Logs should be at least 20 inches in diameter at the small end and have a volume of 40 cubic feet. Prior to harvest, contract administrators would approve skid trail and skyline locations in areas that would avoid disturbing key concentrations of down logs or large individual down logs where possible.
5. All snags would be retained where safety permits. If snags must be cut for safety reasons they would be left on site.
6. All Firewood activity would be restricted from December 1 – April 1.
7. Bald eagle winter roosting and perching sites will protected in units 53, 62, 63, 68, and 69.
8. Perch trees within 200 feet of shore line used by eagles would be maintained in Units 53, 62, and 69.

9. Raptor nesting areas would be protected according to the forest plan standards (Table Four-15) and by minimizing habitat management activities during the nesting season: March 1 to June 30.

Range

1. Protect existing range improvements

2.2.4 Additional Project Design Features that apply to the aspen thinning and meadow enhancement areas only:

Aquatic Species and Habitat

1. Mechanical equipment should be kept a minimum of 30 feet from streambanks.
2. When needed leave concentrations as structure in the channel and riparian area in order to meet project goals and objectives.
3. Felled conifers from the riparian reserve should be decked in designated area(s) near the stream channel to allow post-project instream placement of felled conifers into the stream channel with the use of heavy equipment.

Fuels

1. Burning activities should be excluded from suckers of aspen stands and limited within 150 feet of aspen stands

Soils

1. Provide soil effective groundcover as needed within 60 feet of watercourses prior to the first winter following implementation.
2. Work should occur during the driest part of the year (for example, July 15 – Oct 1). When possible access to aspen stand 81 would be from the north off the 4811 road.
3. Low PSI (typically track mounted) equipment is required. Low is defined as being below 8 pounds per square inch.

Vegetation

1. Do not cut ponderosa pine over 21 inches in diameter or Oregon white oak over 12” diameter at root coaler. If no ponderosa pine over 21 inches exist within 150’, leave the largest diameter ponderosa pine closer to the aspen stand.
2. Focus on removing grand fir and Douglas-fir within 150’ of aspen stand.
3. Minimize residual tree damage to aspen through the use of hand falling any trees within 25 feet of any live aspen over 12” diameter.
4. Do not cut aspen.
5. Do not remove alder unless directly competing with the aspen.

Wildlife Species and Habitat

1. After treatments protection aspen regeneration from ungulate browsing. When possible protection measures should be adaptable to future treatments.
2. Where possible, fell trees directionally into the aspen stand to serve as a barrier to ungulate browsing.

2.2.5 Monitoring

After the presale work for the timber/stewardship contract is completed, the project moves into the appraisal and contract preparation phase. One of the first steps in the process is to complete the contract project design and implementation crosswalk form. The purpose of the crosswalk is to ensure that all components of the NEPA Decision Notice, including the PDC, Best Management Practices, and terms and conditions from consultation, are incorporated into the timber/stewardship contract. For each required component of the NEPA decision, the crosswalk identifies how and what stage in the process the component would be addressed (for example, presale, contract, sale administration, post contract monitoring). The information generated from the cross-walk process is used to guide the contract preparation process and to identify any issues that need to be addressed by resource specialists. The crosswalk is usually prepared by the primary person responsible for developing the appraisal and contract, and signed by the district ranger.

Since May 2012, the district rangers are required to conduct a "plan in hand" review on a minimum of one timber/stewardship sale within each zone every other year. The review is conducted after all presale work is completed, including all timber marking, and prior to the timber/stewardship sale entering the appraisal and contract preparation stage. The goal of the review is to monitor and evaluate forest resource management prescriptions to measure compliance with goals and objectives, review effects, and adjust subsequent management actions when needed as required by Forest Service Manual direction. The overarching management direction is used as the basis for the review and includes the final NEPA decision as well as Forest Service Handbook, Forest Service Manual and Stewardship Guide (where applicable) regulations and direction.

Prior to advertisement, a final review is conducted by the interdisciplinary team and the Forest Service representative (FSR)/contracting officer in order to ensure that the contract is prepared with the proper contract provisions and language; the PDC are properly inserted and contractually enforceable; and, the contract and appraisal meets Forest Service Handbook, Forest Service Manual and Stewardship Guide (where applicable) regulations and direction.

During implementation, the sale administrator in conjunction with the FSR and contracting officer are responsible to ensure that the contract is administered properly throughout all stages of implementation. The sale administration team monitors compliance with the contract which contains the provision for resource protection, including but not limited to: seasonal restrictions, snags and coarse woody debris retention, stream protection, erosion prevention, soil protection, road closure and protection of historical sites. The sale administrator records observations demonstrating compliance as well as any concerns/issues on inspection reports that are signed by both the Forest Service and contractor representative. The inspection reports would also document any resolutions that have been identified. As needed during the implementation process, the sale administration team may request a resource specialist or line officer to come for a field visit to discuss a resource issue that has been identified. Also, a resource specialist may visit a sale without a formal request to conduct monitoring and to make sure that the project is being implemented as directed by the NEPA decision.

Resource specialists may visit the site to conduct a post-harvest review before completing any secondary activities, such as slash clean up, prescribed burning, KV or retained receipt projects. Based on these reviews, post-harvest activities would be adjusted where needed to achieve project and resource objectives.

Lastly, monitoring is also conducted at the forest level as part of the forest plan implementation, including monitoring of noxious weeds and best management practices. The monitoring of noxious weeds and invasive plants would be conducted where appropriate to track changes in populations over time and

corrective action would be prescribed where needed. Monitoring reports including these findings as they are available can be found on the forest's website at: Mt. Hood National Forest.

Best management practices monitoring may be conducted on projects after treatment is complete. According to The National Best Management Practices for Water Quality Management on National Forest System Lands - Volume 1: National Core BMP Technical Guide (April 2012), monitoring is one of four steps outlined in the BMP process. Monitoring is used to inform and improve management activities and share with other appropriate Federal, State and local agencies. The Technical Guide states "The Forest Service Nonpoint Source Strategy uses "programmatic monitoring" to evaluate BMP implementation and effectiveness; that is, aside from project administration described above, BMP are not monitored on every project or activity that occurs on NFS lands.

Projects to monitor or specific monitoring sites are selected in a manner that results in objective and representative data on BMP implementation and effectiveness. Often, a random or systematic random selection procedure is used to choose monitoring locations across a forest or grassland where specific activities or Pre targeted." This project would go into a pool of similar projects to be selected for project level BMP implementation and effectiveness monitoring as per the National BMP Monitoring Protocol. If selected, an interdisciplinary team would evaluate whether the site-specific BMP were implemented and the effectiveness of the BMP. Monitoring for each BMP is outlined in appendix 2: Best Management Practices for Water Quality Protection.

Chapter 3. Environmental Consequences

3.1 Introduction

This section presents information on the physical, biological, social, and economic environments of the affected planning area, and the potential direct, indirect and cumulative effects to those environments due to the implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in chapter 2. The National Environmental Policy Act defines direct, indirect and cumulative effects as:

- **Direct**: Effects which are caused by the action and occur at the same time and place;
- **Indirect**: Effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable; and,
- **Cumulative**: Impacts that result from the incremental impact of an action, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions.

This Preliminary Environmental Assessment incorporates by reference the project record (40 CFR 1502.21), including specialist reports, biological evaluations, and other technical documentation used to support the analysis and conclusions in this document. Analyses were completed for silviculture, fuels, transportation, hydrology, soils, fisheries, wildlife, botany/non-native invasive species, heritage resources, and recreation/visuals. Full versions of these reports are available on the Forest's website and in the project record, located at the Barlow Ranger District office in Dufur, Oregon.

Projects considered in the cumulative effects analysis for each resource are listed in table 3.

Table 4. List of projects considered in the cumulative effects analyses

Past Activities
Timber harvests on federal, county and private lands (including associated road/landing construction)
Road decommissioning and road closures
Aquatic restoration projects
Rocky fire from 1973
Rocky burn salvage
Conifer environmental assessment (early 1990s)
Sportsman's Park fuels reduction
Rock Creek spillway improvements
Ongoing Activities
Timber harvests on federal, county and private lands (including associated road/landing construction)
Road decommissioning and road closures
Culvert replacement on Three mile and Gate Creek irrigation ditches
Rock Creek off-highway vehicle trail construction and maintenance
Pre-commercial thinning and mastication of small diameter plantations
NFS road and trail maintenance
Site-specific noxious weed treatments
Grasshopper range allotment management
Utility corridor operations and maintenance

Past Activities
Special uses permits, such as irrigation ditches
Recreation events permits
Snowmobile use
Developed and dispersed campsite operations and maintenance
Future Activities
Timber harvests on federal, county and private lands (including associated road/landing construction)
Grasshopper range allotment management and livestock grazing

3.2 Vegetation

This section summarizes how vegetation would be affected by the proposed action. Stand-level data was utilized in determining the project's potential effects. Generally, the proposed action would have a beneficial effect to forest stands both at the site-specific and landscape scale in the short and long term. Proposed vegetation treatments would help to create stands more resilient to disturbances such as insect, disease, and fire, while also enhancing long-term stand productivity and vigor.

3.2.1 Existing Condition

The project area occurs within the White River watershed. The proposed treatment area is predominantly located in one moisture regime (dry mixed-conifer) and comprised of eight plant associations:

- Douglas-fir/pinegrass-elk sedge
- Grand fir/vine maple/vanilla leaf
- Grand fir/oceanspray
- Douglas-fir/common snowberry-ninebark
- Ponderosa pine/bluebunch wheatgrass
- Grand fir/pinegrass-elk sedge
- Other Dry Mix Conifer PAG mix
- Other Moist Mix Conifer PAG mix

Currently, the project area contains stands of immature plantations less than 80 years old in both moist mix conifer, dry mix conifer, and pine/oak plant communities. The majority of the proposed treatment areas are in the stand initiation, stem exclusion, and stand re-initiation stages dominated by small to medium size material with a quadratic mean diameter (QMD) ranging from 3 to 12 inches and an average height of 60 feet. Plantations range in age from 25-71 years old and are dominated by stands in the initiation stage in dry mix conifer plant communities and the stem exclusion and stand re-initiation stage in the moist mix conifer. Regeneration in the plantations is dominated by shade tolerant species like grand fir and is averaging around 200 trees per acre. Stands have an abundance of ladder fuels built up in the understory principally in the form of shrubs and small diameter down wood.

Currently, there are roughly less than 1 snag per acre that are 20 inches diameter at breast height (DBH) and larger. On average, stands proposed for treatment have 1 snag per acre that are 11 inches DBH and larger.

Ecological processes and disturbances directly affect the diversity of plant and animal communities within an area over space and time. Ecological processes and disturbances include nutrient and biomass cycling, forest succession (the change in vegetation over time), weather events (for instance, windstorms), insects, pathogens, fire, and human influences (for instance, timber harvest).

Insects and diseases are natural elements of the ecosystem and can exert equal, if not greater, influence on forest development and conditions than fire. Most of these organisms have co-evolved with their host species over thousands of years. The balance between forests and their major pathogens is dynamic and fluctuates through time. Over time past management practices and a lack of small scale or low intensity disturbances have created densely stocked stands. Stand density has been found to exert a strong influence on forest susceptibility to insects and diseases (Powell, 1999). Over time, tree mortality within the proposed action treatment areas have been influenced by Douglas-fir beetle, Mountain pine beetle, Western pine beetle, dwarf mistletoe and root disease. In general native pathogens influence the species compositions, structure, and snag and large wood availability". Timber harvesting has also contributed to the change in vegetative conditions that have occurred across the project area as well as the rest of the White River watershed. These changes consist of altering and simplifying stand structure and species composition to a more homogeneous state dominated by stand initiation and stand reinitiation stages of development.

The desired future conditions for the stands would be to move them towards a more properly-functioning plant community as defined by White River Watershed Analysis and forest plant association guides. By moving stands towards the desired future conditions, stands would be moved towards a more open two-storied stand structure in the dry mixed-conifer communities. In the dry mixed-conifer stands, a stand structure that allows the efficient reintroduction of natural fire is desired, and in the long term, natural fire starts can resume their normal processes and be beneficially managed. Stands should be monitored over the next 50 years to evaluate the response to the thinning and to determine if a re-entry thinning and/or burning is needed maintain or create the desired future conditions.

3.2.2 Direct and Indirect Effects

The analysis area for disclosing effects at the site-specific level is encompasses the Lower and Upper Badger, Gate, Boulder, Rock, and Threemile Creek sub-watersheds (within the White River Watershed). This analysis area totals 14,278 acres and represents the area where stands were evaluated for discrepancies between desired future and existing conditions. Detailed documentation on individual stand conditions and the selection process is available in the project record (reference where).

The baseline condition against which changes to the vegetation, after thinning treatments, would be measured is the existing condition. Criteria used to determine effects on vegetation include:

- Total acres treated and acres treated within each affected plant association;
- Changes in forest structure and composition (SDI, BA, QMD, Height);
- Effects on residual trees (QMD, Height, TPA); and
- Effects on insect and disease processes and forest vulnerability to these elements (BA, SDI).

Stand density level differences between the proposed action and taking no action are displayed in table 4. Compared to the no-action alternative, the proposed action would reduce the trees per acre, basal area, and stand density index (SDI) while increasing stand quadratic mean diameter (QMD) in the short term. Lower trees per acre (TPA) and basal areas would result in stands that reflect more natural conditions for these plant associations. Increased diameters and tree heights would move the stands toward late successional characteristics (USDA 1995a). The stands would also be less vulnerable to large insect and disease outbreaks. Stands that are more widely spaced have less competition related stress, light, and nutrient availability on or for residual trees, making them less vulnerable to large scale insect outbreaks. With the use of variable density thinning treatments, species composition and stand structure would move towards a more historic, site appropriate, and sustainable condition. Larger openings would increase the regeneration of shade intolerant tree and shrub species. Within the openings, new age classes would be

established; thereby moving the stand towards a multi-aged stand. Within the first fifty years after treatment lower densities and larger tree heights would be maintained in the proposed action versus no-action alternative. The QMD of the proposed action would be lowered, due to the variety of size classes thinned and because created openings would contribute to an increase in regeneration. These small trees would contribute to the stand basal area thus lowering the overall QMD.

Table 5. Alternative Comparison over a 100-year Period from Forest Vegetation Simulator (FVS) Modeling

Time After Treatment	BA		SDI		TPA		QMD		Average Height	
	No Action	Action	No Action	Action	No Action	Action	No Action	Action	No Action	Action
2014	128	88	275	153	645	140	7.2	10.7	61	60
2054	275	234	516	428	637	483	9.5	10.0	100	100
2114	315	315	530	517	415	378	12.5	13.1	104	104

3.2.3 Cumulative Effects

Discussions of the cumulative effects are limited to those past, present and reasonably foreseeable activities that have been determined to have a potential cumulative effect on the vegetative resource. A summary of all possible activities that were considered in this cumulative effects analysis is at the beginning of chapter 3 of this environmental assessment. Of the activities listed in Table 4, timber harvesting, pre-commercial thinning, fuels reduction activities, and past fire and salvage activities were analyzed further for cumulative effects because they are activities possibly affecting vegetation in the project area. Like the existing condition, the spatial context for the following cumulative effects analysis is measured at the landscape and site-specific scales. The temporal context depends on the past, existing or future project/activity and if there is an overlap in time from an effects perspective at both the landscape and site specific scales.

At the landscape scale there are no direct or indirect effects that would cumulate from other projects due to the minimal amount of area being treated. The total acreage treated by thinning in the proposed action is approximately 8,496 acres which makes up around 4 percent of the White River watershed. The total cumulative effects at the landscape scale for this project would be very nominal, and no cumulative effects are expected as a result of the proposed action due to the small amount of acreage that is being moved towards the desired future conditions. Because the proposed action would move more than half of the project area towards more historical conditions, effects would be beneficial because conditions for stand health, composition, and structure would be improved. In areas with past fuels reduction and pre-commercial thinning and the proposed action stands will maintain historic stand density that support natural disturbance regimes while still maintain stands that are less vulnerable to large scale disturbance. In stands that have past salvage activities and the proposed action they would be moved towards more historic density levels while providing areas for the establishment of new age classes and species composition in the future.

3.3 Fuels

This section summarizes how fuel loading and wildfire risk (fire hazard) would be affected by the proposed action. They are addressed through consideration of the existing and predicted fire regime and condition classes, fuel models, canopy structure, and fire behavior (rate of spread, flame length, and large fire potential).

3.3.1 Existing Condition

Historically, dominate disturbance regimes in mixed-conifer forests took the form of wildfires, insect, disease, and weather (Stine et al. 2014). With Euro-American settlement a new disturbance regime arrived in the form of timber harvest, development of transportation infrastructure, fire suppression and grazing. The combination of timber harvest and fire suppression has led to denser mixed conifer forests with a greater number of small, fire-intolerant tree species with fewer large, fire-tolerant trees species than were historically present (Hessburg and Agee 2003, Hessburg et al. 2005).

Fire Regime Condition Class (CC)

Fire regime condition class is a measure of departure from reference conditions expressed as a percentage. The departure can be a wide array of ecosystem, vegetation, or fuels characteristics including fire frequency, severity, and pattern (Hann et al. 2008). It is important to note the cause of departure is not limited to natural processes (it can be affected by disease infestation, timber harvest, grazing, etc.). Condition Class (CC) 1 is a numerical value representing less than 33 percent or the least departed from reference conditions. CC 3 represents the most departed or greater than 66 percent departed from reference conditions, and CC 2 represents values between 33 percent and 66 percent. The project area was assessed for FRCC. Currently 51 percent of the project area is in CC 2; 33 percent in CC 1; and 16 percent in CC 3.

Fire History

The fire occurrence data over a 20 year period was reviewed for the watershed that the Rocky project is within. 44 percent of the fire starts were caused by lightning, while 56 percent were human caused. The human caused fires account for 70 percent of the acres burned. Averages for any given year were about 4 fires per year and 4 acres per year burned. This is an increase from an assessment conducted in 2004, which indicated an occurrence of less than one fire per year.

The Rocky Fire of 1973, a human caused fire, burned over 7500 acres of National Forest System and private lands, and threatened hundreds of homes.

Fuel Models

Fuel models are based on vegetation types and observed fire behavior. They are used to predict potential fire behavior and to prescribe vegetation/fuel reduction treatments that are likely to be effective for lowering the risk of catastrophic fires and increasing the likelihood of successful initial attack by fire suppression resources. The primary fuel models currently present within the Rocky Project area including acres and percent of the project area are as follows:

TU4 – Short conifer trees with grass or moss understory. Fire rate of spread is moderate as are flame lengths. This fuel model was used to model the plantation thinning units in the 3B and 3C fire regimes. 606 acres, 7.1 percent of the project area.

TU5 - High load, dry climate timber and shrub. The primary carrier of fire is litter, shrubs and understory trees. Fire rate of spread and flame lengths are moderate. This fuel model was used to model the plantations of the Rocky Burn area, as well as some managed stands to the south of the burn area. 5,202 acres, 61.3 percent of the project area.

TL9 – Very high load, fluffy. Fire rate of spread is moderate as are flame lengths. This fuel model was used for the untreated, dry mixed conifer and oak units, pre-treatment. 1,359 acres, 16.0 percent of the project area.

TL8 – Moderate load and compactness may include small amount of herbaceous load. Fire rate of spread is moderate and flame lengths are low. This fuel model also represents the planned fuels condition after all proposed treatments are completed. 1,322 acres, 15.6 percent of the project area.

Canopy Structure

Stand structure plays a significant role in fire behavior characteristics. Aside from foliar moisture, three components of canopy structure are associated with passive (torching) and active (fire spreading through the crown) fire: canopy bulk density (CBD), canopy base height (CBH) and canopy cover (cover). CBD primarily acts as a carrier once a fire has entered the crown. While a wind or slope must be present to sustain an active canopy fire, sufficient fuels must also be available. CBD is the measure of those available fuels as a mass of foliage in a given volume of crown (kg/m3) (Agee et al. 2005). CBD was modeled for the project area using Forest Vegetation Simulator (FVS), for a pre and post treatment level. CDB is currently 0.073 (kg/m3).

Fire Behavior

Fire Behavior is represented by the potential Rates of Spread, Flame Length, and crown fire potential under the 97th percentile (generally accepted as extreme fire potential). Fire behavior was modeled for the Rocky project area using the BEHAVE model.

The existing stands, under the 97th percentile weather, exhibit fire behavior well above what is considered direct attack capability from ground resources (Flame Lengths, FL >4’), needing extra equipment (dozers, aircraft, engines), and a potential indirect suppression strategy (fire events with flame lengths < 4’, may use a direct attack strategy). Spotting is another mechanism by which fire propagates, and in the above cases this spotting would be up to 1/3 of a mile or more, depending on the ember source, as torching is an output of all the modeling for crown fire potential in the above fuel models. New spot fires increase pre-heating ahead of the main fire, and tend to increase the size of fires rapidly. The potential size of a fire in any of the fuel models described earlier assumes a continuous fuel bed and spread without spotting; so final fire size could be much larger than modeled.

Rate of Spread

The Rate of Spread (ROS) is defined as the distance in chains (66 feet) per hour that a fire under specific weather, fuel, and topographic conditions will move in a direction out from a fire perimeter. While the ROS under existing conditions is not overly fast in any of the proposed treatment units (6-9 chains/hour; a single engine module or 5 person hand crew can exceed the line production rate); the Flame Length (FL) exceeds any safe threshold for direct attack by either hand or possibly mechanized attack.

Flame length

Flame length is measured at the leading area of the flaming front. Existing conditions for the 97th percentile weather scenario exceed direct attack by hand, and in the TU4/TU5 fuel models, mechanized direct attack strategies are limited. The likelihood of a crown fire (passive or active) initiated under the 97th percentile weather scenario is highly probable given the FL is averaging 4’-7’ feet and the crown base height is less than 2 feet. A surface fire would likely transition to the canopy fuels in a majority of the stands mostly as a passive crown fire (torching), but with an active crown fire component as well for short distances.

Large Fire Potential

Based on the BEHAVEplus modeling, current large fire potential for the Rocky project area is significant based on the 97th percentile weather. The area within the Rocky burn scar, based on the modeling assumptions would likely see a fire in excess of 200 acres in a single burn period (and likely larger with spotting) from a wind driven fire. Passive crown fire (torching) is also likely due to the closed canopy and low Crown Base Height (CBH) of 2' or less with the shrub component in the stands in many areas that have not been treated by previous fuels reduction projects.

3.3.2 Direct and Indirect Effects

3.3.2.1 No Action

Under the no-action alternative fuel reduction activities would not occur. Stand overcrowding would not be addressed. There would continue to be higher density related mortality risk, lack of regeneration, and increased risk of crown fires. Fire suppression efforts would continue to occur as they are currently managed. In the short term (one to five years), the fire hazard would remain constant and at a high risk. In the future, dead or dying trees would fall down increasing the fire hazard. Natural fuels (pine needles and other dead vegetation) would continue to accumulate and natural decay processes in the dry conifer forest types would continue prior to the next fire occurrence. As the available fuel increases (live and dead), so would the potential for a large stand replacing wildfire event. Large, stand-replacing wildfires pose greater risks to the public and fire suppression personnel. Also, larger fires tend to incur greater costs for fire suppression efforts.

Fire Regime Condition Class

The No action alternative does not change the current Fire Regime Condition Class (FRCC). Without a natural ignition or prescribed fire occurring, the FRCC would move further away from the current status to a higher departure from the reference conditions (moving from a 1 to a 2, and from a 2 to a 3). As this departure increases, there is a higher likelihood of greater impact to the stands if an unplanned ignition occurs.

Fuel Models

The current fuel models used to represent the project area and as described under existing condition, would continue to apply. While some fuel models may change slightly over time, without a major disturbance event (fire, insect and disease, wind-throw, etc.) they would remain in a similar state.

Canopy Structure

The current stand structure would not be altered, resulting in a decrease in Canopy Base Height (CBH) over time as ladder fuels (brush, seedlings, and saplings) increase. As CBH drops, the conditions become more conducive to a surface fire initiating a crown fire event (passive and active), which would reduce existing canopy structure significantly.

Fire Behavior (Rate of Spread, Flame Length, Large Fire Potential)

There would be no change in the fire behavior. The rate of spread and flame length should a fire get started would be the same as described under the existing condition. Fires would be expected to exceed direct suppression actions based on the flame lengths.

Crown fire potential and acreage would likely increase over time as understory (ladder fuels) vegetation increases.

3.3.2.2 Proposed Action

Four vegetation treatments (aspen thinning, plantation thinning, oak restoration thinning, and under-burning) are proposed within the Rocky Restoration planning area that would restore and enhance stands to more historical conditions. Thinning activities would remove trees that are overcrowding stands. This overcrowding has resulted in higher density related mortality risk, lack of regeneration, and increased risk of crown fire. These problems would be addressed.

Stands where the dominant species and fire regime are appropriate, such as ponderosa pine, Oregon white oak, Douglas-fir, and western larch which are adapted to low intensity, frequent fire return intervals, would be treated so that future under-burning could occur to maintain stand conditions. Fuels created from thinning activities as well as naturally accumulated fuels would be treated by piling and burning. These activities would reduce overall fuel loadings, thereby decreasing the flame length (FL), and potential for crown fires. In the event of a fire start within the project area, reduced fuel loading could allow fire suppression forces to more safely and effectively contain and control a fire. In some areas the rate of spread may increase due to decreased canopy interception of general/local winds, but with lower fire intensities. Additionally, over 90 percent of the thinning units would be under-burned following timber harvest activities, thereby further reducing fuel loadings. Under-burning would also allow the project area to return to a more fire adapted ecosystem.

Fire Regime and Condition Class

Based on the Condition Class of 1 and 2, 64 percent of the Fire Regimes are moving from condition class of 2 or 3 to a condition class of 1 (fire return interval based CC only); 33 percent of the units are currently in CC of 1, either due to a longer return interval (Fire Regimes 3A, 3B, 3C), or recent prescribed fire activity (within the past 35 years or less). Most of the Rocky Burn Scar is currently in Fire Regime 1, Condition Class 2 (last fire cycle was the Rocky Fire of 1973, 45 years ago). By the end of the treatments most units will have moved towards a fire CC of 1, as prescribed fire will maintain or re-introduce fire to the units in a controlled process. A few of stands in the 3B, 3C Fire Regimes would not change due to still being within their normal return interval for fire events.

Fuel models

The current fuel models would change under the action alternative. They represent the proposed action moving all the treated units within the project area towards the TL8 fuel model (less trees per acre, reduced canopy cover, reduced fuel loadings) from their existing fuel models. This change of Fuel Model represents the change in fire behavior for a particular unit or stand, by reducing surface fuel loadings (shrub, 1hr. to 100 hr. time lag fuels, and litter), canopy closure, and increasing CBH.

Canopy Structure

Canopy structure would change by reducing canopy closure, and thus the crown bulk density (CBD). By treating the surface fuels (dead down woody debris and shrubs) the canopy base height (CBH) would be increased from 2 to 6 feet or more depending on the surface fuels remaining after treatment (estimated from the modelling assumptions).

Fire Behavior/Severity

After treatments, fire behavior would moderate, even under the 97th percentile weather, to a level where direct attack by one or two modules could effectively suppress an ignition. Flame lengths would be under 4 feet, and rate of spread moderated due to the lower fuel loadings, and limited torching potential. Most

treated units would see a reduction in most areas of fire behavior by 30 to 70 percent, at the 97th percentile weather.

Table 6 displays how the fuel models described under the existing condition would change under the proposed action, as compared to taking no action. As described under existing condition, TU8 is the desired fuel model for moderate spread rates and low flame lengths.

Table 6. Primary fuel models as a proportion of the project area under each alternative.

Fuel Model	No Action Acreage	Proposed Action Acreage	No Action percent of Project Area	Proposed Action percent of Project Area
TU4	606	7	7.1	0.1
TU5	5,202	0	61.3	0
TU9	1,359	0	16.0	0
TU8	1,322	8,482	15.6	99.9

Rate of Spread and Flame Lengths

Most of the previously treated units would maintain their current state with regard to expected Rate of Spread (ROS) and Flame Length (FL) and most previously untreated units would move to a state where ROS and FL are significantly reduced. Figures 1 and 2, show the desired future condition for most stands in the project area. Figure 1 is a photo of a treated unit within the Rocky burn scar, just west of Sportsman Park community, showing increased Canopy Base Height (CBH), and reduced surface fuels. This unit was thinned, pruned, piled, and the piles were later burned. Figure 2 is a photo of Sportsman Park, unit #9 (now Rocky unit #68). It shows the increased CBH, lowered Crown Bulk Density (CBD), and reduced surface fuels. It was thinned, whole tree yarded, masticated, pruned, and underburned.

Figure 1. A treated unit showing increased CBH and reduced surface fuels.

Figure 2. A treated unit showing the increased CBH, lowered CBD, and reduced surface fuels.

Crown Fire Potential

The action alternative changes the conditions for Crown Fire initiation or impacts (still an occurrence for a passive or "torching" crown fire to occur.). As crown base height (CBH) begins to increase, the fire behavior changes from torching to a surface fire, which reduces the opportunity for spot fires, and thereby increasing wildfire suppression options and firefighter safety. While the initial CBH of 6' still produces a passive crown fire potential, the likely increased growth of the remaining stand moves the CBH into the greater than 6' category, allowing the fire to become a surface fire. Future treatments (under-burning, mastication, or a combination of treatments) would work to keep this value increasing as the remaining stand continues to increase in height.

3.3.3 Cumulative Effects

There are no direct or indirect effects that would cumulate from other projects due to the minimal amount of area being treated. The total acreage treated by thinning, mastication, and underburning in the proposed action is approximately 8,489 acres of the overall watershed. Therefore, the total cumulative effects at the landscape scale for this project would be very nominal, and no cumulative effects are expected as a result the proposed projects to the vegetation resource. At the project scale approximately 90 percent of the proposed project area is proposed for an underburn treatment if stand conditions are able to accept fire without overly detrimental outcomes (mortality). With more than 8,400 acres of proposed treatment within the dry mix conifer plant communities, we are moving more than 90 percent of the available dry mix conifer acres towards historical conditions from which fire could play a vital role in maintaining stand health, composition and structure.

3.4 Air Quality/Smoke Management

Air quality is of particular concern on the Mt. Hood National Forest Airsheds. Airshed is defined as a geographical area that, because of topography, meteorology, and climate, share the same air (Boutcher 94; MHFP, Glossary-1). Portions of the Mt. Hood Wilderness are federally designated as a Class I Airshed (MHFP, FW-046, and FW-047). The Mt. Hood Wilderness is 7 miles west/northwest of the Rocky Environmental Assessment planning area. The Badger Creek Wilderness, a Class II Airshed is approximately 1 mile north of the Rocky Environmental Assessment planning area. Management activities shall comply with all applicable air quality laws and regulations, including the Clean Air Act and the Oregon State Implementation Plan (SIP) (MHFP, FW-040).

Also, in compliance with the Clean Air Act, the Forest Service is operating under the Oregon Administrative Rule OAR 629-43-043. The Forest Service is complying and would continue to comply with the requirements of the OSMP (Oregon Smoke Management Plan), which is administered by the Oregon Department of Forestry.

Smoke management is defined as: The management of fuel treatments from forest activities so that there is no or reduced effect to local areas surrounding the project. This primarily deals with impacts to people or air quality.

The effects of smoke management from activity created fuel on the surrounding area are described below and the procedures and guidelines followed when utilizing prescribed fire as a management tool. All Forest-wide Standards and Guidelines for Air Quality FW-039 thru FW-053 (LRMP-MTF, 4:51-52) would be followed to minimize problems of Forest burns affecting air quality in local communities. All prescribed burning activities would comply with Forest Service Manual direction (FSM 5100, chapter 5140). Currently, and in the future, all planned ignitions are and would be conducted according to the Operational Guidance for the Oregon Smoke Management Program (OSMP). The Operational Guidance contains the direction for meeting the terms of the OSMP. The Environmental Protection Agency has approved the OSMP as meeting the requirements of the Clean Air Act, as amended.

The OSMP, which is administered by the Oregon State Forester, regulates the amount of forestry related burning that could be done at any one time. The amount of burning that could occur on any one day depends upon the specific type of burning, the tons of material to be burned, and the atmospheric conditions available to promote mixing and transportation of smoke away from sensitive areas.

The size class distribution for wood smoke particles is such that 82 percent of the particles range between 0.01 and .099 microns, 10 percent range between 1.0 and 4.99 microns, and 8 percent range between 5.0 and 15.0 microns. The most efficient particle size for scattering light (and thus reducing visibility) ranges between 0.3 and 0.7 microns. The majority (82 percent) of particulate emissions from wood combustion are in the size range that reduces visibility.

The PM (Particulate Matter) 10 (microns) and PM 2.5 (microns) have been established as primary air quality parameters because of potential adverse human health effects. These small particulates could be inhaled and cause respiratory problems, especially in smoke sensitive portions of the population, such as the young, elderly, or those predisposed to respiratory ailments. Coarse particles could accumulate in the respiratory system and aggravate health problems such as asthma. Fine particles, which penetrate deeply into the lungs, are more likely than coarse particles to contribute to the health effects associated with hospital admissions.

There is currently only one designated Smoke Sensitive Receptor Area (SSRA) near the Rocky planning area which is the Columbia River Gorge National Scenic Area (CRG-NSA), which is over 25 miles north

of the planning area. Communities near the project area that could be impacted include: Sportsman Park (within project boundary), Pine Hollow (3 Miles E/NE), Tygh Valley (8 miles E), Wamic (5 miles NE), Pine Grove (6 miles SE), Maupin (16 miles E/SE), Simnasho (CTWS, 16 miles S/SE) and Dufur (18 miles NE). Burning would only be conducted when predicted and actual atmospheric conditions would minimize the possibility of smoke affecting these areas.

3.4.1 Direct and Indirect Effects

3.4.1.1 No Action

Because the no-action alternative does not prescribe any use of fire, there would be no direct effects to air quality from taking no action. However, because there is an increased risk of large scale wildfire from taking no action, there is the potential for an indirect effect of a reduction in air quality from this alternative.

No action would have the least immediate impact on air quality, as there is no prescribed burning or pile burning (beyond current approved plans from previous CE'\s and environmental assessments). All biomass remain available for consumption by wildfires and it would continue to accumulate, increasing the potential for large amounts of smoke during the summer months (typical fire season of June 1–Oct. 15), when diurnal inversions can concentrate smoke at low elevations. Wildfires tend to occur at the driest time of the year, and fuels are more completely consumed and typically produce three to five times more emissions than early or late season prescribed fires. These smoke concentrations can have high particulate levels that can cause health problems, or violate summertime Class I and Class II air quality visibility standards for Wilderness areas. The surrounding communities of the Sportsman Park, Pine Hollow, Pine Grove, Wamic, Tygh Valley, Maupin, and Simnasho would be impacted by smoke from a wildfire in this area. Past wind patterns have also set up in such a manner as to potentially impact the City of Portland and surrounding communities during a wildfire (Dollar Lake, 2011), under large scale ignition events. Any biomass that has accumulated is prone to be released back into the atmosphere by either combustion in a wild fire or by decomposition. See Table 7 for Air Quality/Smoke Emissions (lbs. /acre) amounts.

Table 7. Air quality and smoke emissions resulting from wildfire and prescribed fire

Pollutant	Wildfire (Lbs./Ac), Very dry conditions	Rx Fire (Lbs./Ac), Spring	RX Fire (Lbs./Ac), Fall	Percent Difference, Spring	Percent Difference, Fall
CO2 (Carbon Dioxide)	93258	67127	79702	-28.0 percent	-14.5 percent
CO (Carbon Monoxide)	16776	12046	15116	-28.2 percent	-9.9 percent
CH4 (Methane)	772	554	694	-28.2 percent	-10.1 percent
NOX (Nitrous Oxide)	46	33	33	-28.3 percent	-28.3 percent
SO2 (Sulfur Dioxide)	70	50	50	-28.6 percent	-28.6 percent
PM 2.5 (microns)	1289	926	1157	-28.2 percent	-10.2 percent
PM 10 (microns)	1521	1093	1365	-28.1 percent	-10.3 percent

3.4.1.2 Proposed Action

There would be no long-term effects to air quality from smoke generated by prescribed burning or pile burning due to implementation of preventative measures and compliance with the Oregon Smoke Management Program (OSMP).

To avoid impacting smoke sensitive areas, units would be burned only when smoke management forecasts predict mixing heights and transport winds that would carry smoke away from or over these

areas. If intrusions occur, no additional areas that could contribute to the intrusion would be ignited, and burning material may be extinguished if necessary. Signs would be posted on roads that are near prescribed burn operations when visibility could be affected. Traffic flaggers and pilot cars would be required for public safety if visibility on State or Federal Highways is reduced to less than 750 feet. Any particulate emission from prescribed burning would be substantially less per acre than a wildfire.

Smoke management concerns may require that some stands that have proposed under-burning be treated by hand and/or machine piling. Pile burning could be accomplished during the passage of weather fronts that move smoke out of the area very quickly, whereas under-burning requires very specific environmental conditions to implement, to limit impacts to airsheds and the public, based on daily smoke weather forecasts from the State of Oregon. The Smoke Sensitive Receptor Area (SSRA) of the Columbia River Gorge National Scenic Area (CRG-NSA) would not likely be impacted due to prevailing wind patterns during pile burning or under-burning, distance from the project boundary, and intervening terrain channeling local wind patterns to the east and northeast.

Smoke emissions from prescribed burning are 10 to 28 percent less than those produced by a wildfire due to fuel moistures and seasonality.

The amount of smoke produced as a result of prescribed burning is directly related to the amount of timber volume removed. Direct effects include reduced visibility and an increased level of small diameter particulates, specifically PM 2.5 and PM 10, which are of concern for human health. Indirect effects are limited to the air quality degradation, as a result of PM 2.5 and PM 10 particulates, and increased haze. PM 2.5 and PM 10 levels would rapidly disperse as they are carried by local and general winds. The predicted amount of emissions resulting from prescribed burning dry conifer sites is displayed in table 8.

Table 8. Emissions of PM 2.5 and PM 10 as a result of wildfire vs. prescribed burning dry conifer sites in spring vs. fall

Pollutant	Wildfire, Tons/AC	RX Fire, fall T/Ac	RX Fire, Spring, T/Ac
PM 2.5 (microns)	0.64	0.46	0.58
PM 10 (microns)	0.76	0.55	0.68

3.4.2 Cumulative Effects

The cumulative effects on air quality of prescribed burning smoke, produced as a result of implementation of the proposed alternatives, would result in an incremental, short term, decrease in air quality as PM 2.5 and PM 10 particles from this source combine with other particles produced both by the implementation of other aspects of this project, as well as other local and regional sources located upwind. Prescribed burning of logging slash, on other federal, state or private lands, would also contribute particulates, as would agricultural burning. Particulates from industrial and automotive sources also contribute to regional particulate loading. Other vehicle traffic agricultural and industrial sources within the planning area would also contribute to the cumulative particulate loading. It is not possible to predict the amount of particulates contributed by these sources, however this amount is controlled by timing of prescribed fire activities to be least impactful as possible by following the Oregon State SIP.

3.5 Transportation System

This section of the environmental assessment is a summary of the transportation system analysis conducted for this project. The proposed action, with regard to the transportation resource, is consistent with direction from the forest plan. PDCs for road reconstruction and maintenance include sediment and

erosion control as well as protection of natural resources and implement the guidance of the Northwest Forest Plan. BMPs associated with this project together with the applicable road maintenance specifications (USDA, 2008) meet or exceed all requirements set forth by the State of Oregon for mitigating and minimizing environmental impacts of road maintenance and road reconstruction under OAR 629-625-0000 and per "Oregon Department of Forestry, State Forests Program, Forest Roads Manual", 2000. Additionally, the proposed changes to Forest System Roads are appropriate and primarily consistent with the Travel Analysis Report (TAR) moving the road system toward the desired future condition. Given these measures, the proposed action would result in increased effectiveness and overall value of the Forest's transportation system while correcting or mitigating detrimental effects on other resources.

3.5.1 Existing Condition

The forest's transportation system provides multi-use access for trans-forest travelers, the recreating public, commercial users, and administrative users. The majority of roads within the analysis area have been in existence for more than 40 years. While a few of the primary roads within and adjacent to the analysis area have existed as travel routes to and through the forest since early in the 20th Century, most of the secondary and tertiary road system has been constructed to provide access for vegetative management purposes. Some of these roads have since been converted to OHV trails.

Within the project area, summer recreational traffic consists of OHV use, camping at established campgrounds and dispersed camp sites as well as boating and fishing at Rock Creek Reservoir. Roads also provide access to Sportsman's Park, which is an area of private ownership with year-round residents. Summer commercial traffic consists primarily of log haul and other timber purchaser traffic necessary for operations, including commuting of workers into the Forest and transport of heavy equipment. Elevated use typically occurs in the late summer and fall with the commencement of the deer and elk hunting seasons. Winter brings lowered usage of the roads with arterial through-routes being used mostly by those seeking access to winter use of OHV routes as well and other winter recreation.

Overall, the condition of roads are in moderate, fair, or poor shape. Some system roads have begun to deteriorate to a point where passage by passenger vehicles and commercial heavy haul vehicles is hazardous under current conditions. Vegetative growth along roadsides has begun to encroach upon the road prism, limiting sight distances around horizontal curves. Many of the stream crossing and drainage culverts on this road system, while originally sized for hydrologic capacity, are undersized for passage of runoff associated debris and become plugged on a frequent basis. Compounding this problem, ditch lines and drainage structures along the roadway are filled with slough and slide material or are blocked by trees which have grown in excess of four inches in diameter, causing these drainage features to operate inadequately or fail. Standing water in ditches then either flows over the roadway, causing surface erosion, or begins to percolate through the road base and subgrade causing potholes, sinkholes, and road slumps.

The paved and bituminous treated roads that are part of the Forest transportation system (for instance, not including State Highways) in this area suffer from severe cracking, potholing, or surfaces which are beginning to break apart entirely. Generally, the aggregate surfaced and improved (pit-run) roads in this area hold together very well in areas where the terrain is relatively flat and erosion is less of an issue, whereas in a few locations where steeper terrain prevails these roads exhibit severe erosion characterized by loss of surface materials and delivery of sediment to streams. Native surface roads in this area are characterized by moderate rutting caused by public and OHV use during wet conditions.

Across the forest, the historic needs for and uses of the road system have shifted as timber harvest has declined and other uses, such as recreation, have grown. Steady decline of funding to maintain the system

accompanied by the reductions in timber harvest funding for road maintenance have resulted in funding lower than the level needed to properly maintain the open roads on the Forest. In the project area, the value of timber removed is the primary funding mechanism to accomplish work, since timber operators are required to maintain and repair system roads. Recent trends show that appropriated funds that are distributed to the Forest provide only enough to maintain or make repairs to about 15 percent of the road system annually. The need to maintain the current operational transportation system while the primary funding sources decline, constrains and challenges how the priorities of annual maintenance funds are allocated to the transportation network. Consequently, roads with lower level maintenance designations have only been maintained sporadically as commercial timber operations occur.

3.5.2 Direct and Indirect Effects

3.5.2.1 No Action

The no-action alternative would have no heavy haul of materials, which is the most impactful action regularly applied to the transportation resource. Also, wear and tear that would come from recreation and administrative use would continue to occur; normally in passenger vehicles. Due to budget prioritizations, no action would mean that no road maintenance would occur in the near future. Road reconstruction issues such as current road failures, drainage failures, and erosion control problems that have been identified within this road system would not be addressed. Lack of road maintenance and reconstruction would result in an adverse effect with respect to both safety and the environment.

This alternative would not include system road status changes such as road closures and consequently, there would be no displacement with respect to the transportation system users. The current use pattern of roads within the planning area would not change. Commercial road use on this system would continue through the issuance of Road Use Permits to facilitate ingress and egress for adjoining or in-held private lands. Volume of public use on this system would not change over the near term, but could decrease slightly over time due to decreased navigability of the roads. Administrative use on this system would not change, although access would become increasingly difficult due to lack of road maintenance and lack of funding sources with the capability of appropriately addressing road reconstruction issues. Road densities and road use designations would both remain unchanged with no action.

3.5.2.2 Proposed Action

The proposed action would involve haul of commercial timber. While heavy haul of materials is the most impactful action regularly applied to the transportation resource, this action is expected to be limited in its duration and would be accompanied by increased quantities and frequency of road maintenance. Road maintenance activities create limited disturbances contained within existing road prisms and is conducted prior to and during operations to ensure minimum safety standards and effective roadway drainage. Also, the majority of roads used for haul would receive some type of reconstruction work that is considered beyond the definition of maintenance. Collector and primary haul routes would likely receive more road repairs and constructive improvement work than some others to accommodate heavy use.

In order to reduce impacts to natural resources while still being accessible for firefighting, patrols and management, search and rescue, as well as necessary administrative uses, approximately 38 miles of roads currently open would be closed to public traffic allowing administrative use only and remaining at a Maintenance Level 2. These roads would be closed with a gate or another suitable closure device. A list of the roads proposed for status changes can be found in table 3 in chapter 1.

With regard to access, the road closure status changes affect roads that receive no use by trans-forest travelers and low use by the recreating public. The recreational traffic on these roads is very low, limited

mainly to unauthorized OHV use, low levels of dispersed camping, and use by seasonal hunters. These road status changes, for the most part, reflect the recommendations of the 2015 TAR and serve to move the Forest Transportation System toward its desired future condition. All of the roads contained in the Table 3, were identified as "likely needed" in the TAR, with the exception of the following roads, which were identified as "not likely needed": 4800-130; 4811-171; 4812-141; 4820-018; and 4820-025.

There are certain instances, however, where the proposed action deviates from past management decisions based on an analysis of the site-specific conditions. More specifically, three roads had been identified for decommissioning in the 2010 Record of Decision for Off-highway Vehicle Management, but would be added back to the system under the proposed action. The following roads that would be returned to the transportation system as ML2 – administrative use only are: 4811-171; 4812-141; and 4820-018.

3.5.3 Cumulative Effects

The analysis area for cumulative effects is the project area and the haul roads outside the planning area. Haul of commercial products over the analyzed transportation system would likely occur over the next five to 10 years originating from privately owned lands adjacent to the project area. Any entities desiring to haul would be required to obtain a Road Use Permit prior to hauling over these roads, affording the Forest Service the opportunity to request completion of road maintenance or require payment of fees to cover maintenance costs. Also, require implementation of resource protection measures similar or identical to the PDC included with this proposed action. In addition to other haul, replacement of aquatic organism passage culverts authorized under the 2018 Forest-Wide Aquatic Restoration Decision Memo would likely occur over the next 5-10 years. The proposed action along with these foreseeable actions, would result in increased effectiveness and overall value of the Forest's transportation system while minimizing impacts to other resources. There would be no substantive cumulative effects because all projects that use roads also provide maintenance and repair commensurate with their use.

3.6 Botany

This section addresses the rare botanical and non-native invasive species that are documented or suspected to occur within the general project area. Only those species which may be directly, indirectly, or cumulatively affected by the proposed actions are considered. There are no known occurrences of federally listed endangered or threatened botanical species on the Forest and the Forest has no habitat recognized as essential for listed plant species recovery under the Endangered Species Act. The actions proposed have direct, habitat-disturbing effects to the target species discussed below; and the harvesting activities would create disturbed conditions for invasive species growth. Fuels reduction and prescribed burning activities would also create disturbed conditions for weed spread. Project design criteria and mitigations would be employed to reduce the direct effects of these actions to acceptable and potentially beneficial results; and minimize the high risk of invasive species spread. One objective is to avoid a trend toward federal listing under the Endangered Species Act (ESA). This section summarizes the Botany Report and Invasive Species report, both of which are incorporated by reference (Project Record, Specialist Reports).

3.6.1 Existing Condition

The plantation and sapling thin units were composed primarily of Douglas-fir or ponderosa pine trees under 80 years. The project area also includes plantation stands within the hemlock zone. These plantation stands had similar characteristics, with closed canopies and reduced understory diversity. These sites were not found to be suitable habitat for any target plant or fungi species.

No sensitive species were found within the proposed aspen thinning enhancement stands, although these moist, open habitats could provide potential habitat for sensitive sedge and grape-fern species. The oak

restoration thinning stands are potential habitat for a few lichen and several fungi species, although none were found during surveys. Known sites do occur outside of the project area within East Cascades coniferous forest stands or pine-oak savanna. These stands were composed of ponderosa pine, Douglas-fir and Oregon white oak. The oaks were becoming shaded out by conifer species, primarily Douglas-fir, and the stand diversity was lower as a result of closing canopies.

The following plant, bryophyte and lichen species are known or suspected to occur east of the Cascades in the habitat types which are found in this project area: *Cypripedium montanum, Botrychium minganense, Botrychium montanum, Brotherella roelli, Entosthodon fascicularis, Rhizomnium nudum, Schistostega pennata, Tritomaria exsectiformis, Calicium abietinum, Collema nigrescens, Leptogium burnetiae, Leptogium rivale* and *Leptogium teretiusculum.*

The following fungi species are known to occur outside the project area in dry, mixed conifer forest: Albatrellus flettii, Hygrophorus caeruleus and Polyozellus multiplex. For a complete list of the fungi species considered, please refer to appendix 1 of the Botany Specialist Report (project record).

The Rocky Restoration project area is primarily within dry ponderosa pine/Oregon white oak stands to moist, mid-elevation hemlock stands. The geographical boundary analyzed during this project was within the Rock Creek, Threemile Creek and Gate Creek 6th field subwatersheds and surveys were limited to the project area. Much of the proposed project units had relatively low native species diversity, due to dense canopy closure within plantation stands. There were moderately low populations of invasive weeds in this area. Diffuse knapweed (*Centaurea diffusa*), spotted knapweed (*Centaurea stoebe*), St. Johnswort (*Hypericum perforatum*) Canada thistle (*Cirsium arvense*) and bull thistle (*Cirsium vulgare*) were found predominantly on road shoulders. There are some Canada thistle in the associated seasonally wet meadow as well. Medusahead rye (*Taeniatherum caput-medusae),* North African grass (*Ventenata dubia*) and sulfur cinquefoil (*Potentilla recta*) are known from within the Rock Creek and Gate Creek watersheds. Cheatgrass (*Bromus tectorum*) is found throughout the project area, especially within heavily disturbed openings or on road shoulders.

3.6.2 Direct and Indirect Effects

The geographical boundary analyzed during this project was within the Rock Creek, Threemile Creek and Gate Creek 6th field subwatersheds and surveys were limited to the project area. The species considered in this section are listed as sensitive by the Pacific Northwest (Region 6) Regional Forester (revised July 2015) as well as species included in the 2001 Record of Decision for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (henceforth, the 2001 record of decision) (USDA, USDI 2001). These are species for which population viability is of concern, as evidenced by current or predicted downward trends in population numbers or density, or by concerning trends in habitat availability that would reduce a species' distribution. The 2001 record of decision is based upon the 2000 Final Supplemental Environmental Impact Statement (SEIS). The 2000 Final SEIS analyzed the effects of applying Survey and Manage mitigation measures during habitat-disturbing activities. The method for which surveys were conducted within the project area followed the seven-step process outlined in the August 17, 1995 Regional Foresters memo for Regions 1, 4, and 6. A pre-field analysis (or pre-field review) is used to determine the probability that TES species, and /or their respective habitats are located within or adjacent to the project area, and to determine the extent and intensity of previous survey efforts.

Multiple surveys were conducted within the project area for botanical species in the R6 Sensitive Species List (2015), and 2001 record of decision during the 2015 field season. Field surveys were conducted using the intuitive controlled method. All survey protocols for 2001 record of decision species were followed and in compliance with regional guidelines (Van Norman and Huff 2012). Since the stands

associated with this project were all under 80 years old and were primarily plantations, there were no requirements for category B fungi surveys, however surveys for fungi within certain areas were included during this project.

Executive Order (EO) 13112 directs federal agencies to consider the potential effects of invasive species when proposing and planning federal actions. The EO defines invasive species as a species that is 1) non-native (or alien) to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. The goal of EO 13112 is "to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause." To achieve this goal, federal agencies should identify those actions they take that may affect the status of invasive species, take positive steps within their authorities to prevent the introduction of invasive species and prevent the spread of existing invasive species, provide for the control of invasive species, and minimize the economic, ecological, and human health impacts that invasive species cause.

Specific invasive plant management direction is found in the 2005 Record of Decision (record of decision) for Preventing and Managing Invasive Plants (USDA 2005) as well as the record of decision for the Final Environmental Impact Statement (FEIS) for Site-Specific Invasive Plant Treatments for the Forest and Columbia River Gorge National Scenic Area (USDA 2008b). Both of these documents amended the forest plan (1990). The 2008 FEIS provides more site-specific guidance for managing invasive plants on this forest. The management direction includes invasive plant prevention and treatment/restoration standards intended to help achieve desired future conditions, goals, and objectives, and is expected to result in a decreased rates of spread of invasive plants while protecting human health and the environment from the adverse effects of invasive plant treatment.

3.6.2.1 No Action

With no action all ongoing activities such as off-highway vehicle use and maintenance of trails and roads, and utility maintenance would continue to occur. No timber harvest or fuels reduction activities would occur. This would have no impact on sensitive vascular plants, bryophytes, lichens and fungi.

The no-action alternative would have no direct effects to any of the target species.

The no-action alternative would have few short-term effects to non-native invasive species. None of the thinning treatments, fuels reduction or connected actions (temporary roads) would take place. Conditions of invasive species would continue to persist at similar levels.

There is a high likelihood that this area would experience a stand-replacing wildfire within the next several years. The dense canopies and heavy fuel loading would result in severely burned conditions on the ground. This would create favorable conditions for invasive species colonization and spread.

3.6.2.2 Proposed Action

While implementing the buffers and treatment design criteria described in chapter 2 for botany, the proposed action may directly impact individuals or habitat for sensitive plants, but would not likely contribute to a trend towards federal listing or loss of viability for the population or species.

The project is consistent with the survey protocols in the 2001 record of decision and the applicable standards identified in the forest plan (Botany Specialist Report, Project Record). No survey and manage species were found during field surveys, and no known sites were present in the project area. Habitats with potential for these species will be protected through other mitigations such as riparian buffers.

The proposed action would involve cutting trees, temporary road building, and landing construction, which would cause a reduction in canopy and stems. This would provide favorable light conditions for invasive species establishment. Harvest activities (yarding material) and grapple piling, could expose and compact soils which would provide a seedbed for invasive species establishment and reduction of native understory plant diversity. Machinery moving through infested areas would pick up and move seeds distributed within the soil. Under burning treatments would also potentially create conditions favorable for the spread of invasive species.

This project has a moderate risk of invasive species infestation. The project area includes populations of invasive species, but only on road shoulders, and not in great quantities. The road systems in the area have been treated regularly under the previous NEPA (FEIS Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River National Scenic Area in Oregon including forest plan Amendment #16). The project work will include potential weed vectors such as heavy equipment and contractor vehicles. There is also continuing use of this area for off-highway vehicles and other recreation. These vectors increase the risk of invasive species introduction and spread.

Project Design Criteria associated with the proposed action would provide mitigation for the introduction of new weed species, and would help prevent the spread of current invasive species into areas without infestation as well as to other areas of the forest. This prevention would occur through the cleaning of equipment, use of weed-free materials, and restoration with native seed. Machinery would be washed prior to its arrival on forest land. Wash stations would be set up within the project area as needed. Haul routes, landings and certain known infestations within treatment units would be treated prior to implementation.

Long term treatments are not proposed as part of this project, and would be conducted under a separate program and NEPA document (FEIS Site-Specific Invasive Plant Treatments for the Forest and Columbia River National Scenic Area in Oregon including forest plan amendment #16).

3.6.3 Cumulative Effects

The area analyzed for cumulative effects was within the Rock Creek, Threemile Creek and Gate Creek 6th field subwatersheds. This serves to include the appropriate habitats for target sensitive species as well as the habitats targeted for improvement during these proposed actions. The temporal scale of this cumulative effects analysis includes past thinning projects, the Rocky Burn, the ongoing Rock Creek off-highway vehicle Trail Construction and Maintenance project, and future thinning and fuels reduction proposed as part of this analysis.

Measures may be taken to greatly reduce these cumulative effects. Monitoring and aggressive weed treatment immediately after discovery of new sites would lessen the impact and spread of new noxious weed species. Treatment would include manual and herbicide treatments followed by seeding with native plant species appropriate for this area. Project Design Criteria, as discussed above, would mitigate for the introduction and spread of invasive species. Under the 2008 Site-Specific Invasive Plant Treatment EIS, roadside populations would be treated regularly depending on the need and level of infestation. These combined actions would lower the risk of invasive species introduction within the project area. This would be addressed separately through the FEIS Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River National Scenic Area in Oregon including forest plan amendment #16.

3.7 Hydrology

This section summarizes how water quality and quantity would be affected by the proposed action. Water quality is evaluated by considering stream water temperature, sedimentation, and physical stream habitat. Water quantity is evaluated by considering existing and potential changes in peak flows. Research, relevant monitoring, field data, and modeling were used to provide a context, amount and duration of potential effects for each of the alternatives on water quality and quantity.

The following assumptions were utilized in the Water Quality Analysis:

- All Best Management Practices (BMP) and Project Design Criteria (PDC) listed in Environmental Assessment, chapter 2, section 2.3 would be implemented as described.
- The areas of impact outlined in environmental assessment, chapter 2 are actual areas of disturbance.
- Monitoring implementation and effectiveness of BMPs and PDCs would be a component of project implementation.

All surface water areas were verified in the field.

This section summarizes the Hydrology Report which is incorporated by reference (Project Record, Specialist Reports).

3.7.1 Existing Condition

Water Quality

Gate Creek, Rock Creek and Threemile Creek are all 303(d) listed as Water Quality Limited for summer temperatures; however, the Total Maximum Daily Load (TMDL) has yet to be initiated. Gate Creek is also listed as water quality limited for sedimentation from river mile 0 to 14.3. In addition, Gate Creek Irrigation Ditch that connects Gate Creek to the Rock Creek Reservoir was added by the EPA to the 2010 Oregon State Water Quality Integrated Report as water quality impaired for Biological Criteria. Badger Creek has been identified as potential concern for stream temperatures; Threemile Creek has been identified as having a potential concern for sedimentation; and Gate Creek, Rock Creek, Badger Creek and Threemile Creek have been identified as having a potential concern for habitat modification.

Stream surveys indicate perennial streams in the project area are mostly. Approximately 0-5 percent of the total stream length was determined to be unstable. In the lowest reach of Rock Creek, about 18 percent of its length was identified as unstable. Mt. Hood Forest Plan standards FW-102 and FW-103 state that "Streambank and/or shoreline stability of the riparian management areas shall be maintained in its natural condition. If the existing streambank condition is degraded due to past management activities, the natural condition should be restored." Generally, it is desirable for bank stability to be greater than 80 percent (USDA 1990a).

The LRMP standard FW-097 states that "spawning habitat shall maintain less than 20 percent fine sediments (for instance, particles less than 2.0 millimeter in diameter for this analysis) on an area weighted average." Stream survey data indicated that at least five of the twelve reaches sampled had pebble counts where fine sediment comprised more than 20 percent of the transect. These observations were in the lower gradient depositional reaches of Gate, Rocky, and Threemile Creeks. But overall, the average percent of fines that were observed for all reaches observed averaged about 18 percent on an area

weighted basis. Within the project, the average for fine sediment is estimated to be about 13 percent, meeting the LRMP standard.

Road densities within a watershed that exceed 1.7 to three miles per square mile generally indicate areas with the potential for sediment related problems. Generally, the higher the road density, the lower the proportion of subwatersheds that support strong populations of key salmonids (USDA and USDI 1996). Threemile Creek and Upper Badger Creek Subwatersheds within the National Forest Boundary are below three mi/mi2 (miles per square mile). Gate Creek and Rock Creek Subwatersheds exceed three mi/mi2. Motorized trails within the project area are part of the designated Rock Creek off-highway vehicle trail system located within the Gate Creek and Rock Creek Subwatersheds. Its trail length increases the densities to over 3 mi/mi2.

The Grasshopper grazing allotment overlaps much of the project area, and has several active pastures. Field surveys conducted in 2016 found unfenced wetlands and streams that exhibited post-holing and streambank alteration from cattle. The extent of streambank alteration from grazing is not currently known.

Rock Creek reservoir is likely to have also influenced the accumulation of fine sediments in the lower Reaches of Rock creek. Stored water that backs up into lower Rock Creek would have a tendency to slow flow velocity when the reservoir is filling and turbidity is typically at its highest, causing deposition in those reaches.

Water Quantity

Roads can decrease the time it takes for precipitation, in the form of runoff, to enter the stream channel potentially resulting in increased peak flows. Areas with high road densities, high drainage densities, and a high density of stream crossings typically result in higher connectivity of the road and stream network. It is estimated that roads and off-highway vehicle trails have increased the drainage network in the project area in the Gate Creek subwatershed by about 8 percent, in Rock Creek by 10 percent, in Threemile Creek by 3 percent, and in Upper Badger by 1 percent.

3.7.2 Direct and Indirect Effects

Best Management Practices (BMPs) and Project Design Criteria (PDC) were developed for the Rocky Environmental Assessment using the National Core BMP Technical Guide (USDA Forest Service 2012), monitoring, field verification, professional judgment, and the best available science. They are the primary tools to minimize or mitigate potential unwanted effects to water quality and quantity that could result from proposed activities.

3.7.2.1 No Action

Water Quality

Stream temperatures are expected to remain at current levels in the watershed due to no reduction in streamside shading. No harvest activities would occur in primary or secondary shade zones of the riparian corridors along all streams and would continue to fill in with understory vegetation.

Densely vegetated riparian areas would be more susceptible to high severity fire due to excess fuel accumulations. In the event of a wildfire, riparian areas would have the potential to burn hot in areas where fuel loads are high. Some studies have shown that stream temperatures can be increased following severe wildfire as much as 17° F when compared to an undisturbed forest watershed.

Sediment delivery to streams in the project area is expected to remain at current levels over the long-term; however, if wildfires occur, due to overstocked conditions, fire intensities would be expected to be high and sediment delivery to project area streams would increase. Roads and roads converted to trails with impaired drainage will continue to contribute sediment to streams in the project area. Road and trail densities would remain comparatively high, and their connectivity to the drainage network would be unchanged, continuing the deposition of fine sediment being delivered to streams, particularly near stream crossings.

Water Quantity

Road density would not change, so the length of the drainage network would remain as is. The potential for peak flows to become elevated would remain moderately high. If a severe wildfire were to occur however, its extent could result in large areas becoming denuded for several years. More precipitation could become available as runoff, increasing the potential for elevated peak flows for 2 to 5 years post fire.

3.7.2.2 Proposed Action

Water Quality

Mechanized and non-mechanized thinning in the outer portion of the riparian reserve would occur, but not within the primary shade zone. Effective stream shading would be maintained along the streams, so a measureable effect on existing stream temperatures would not be expected.

Since the primary shade zone would not be treated, elevated accumulations of forest fuels would remain where present. The riparian reserves would continue to be susceptible to a wildfire late in the dry season. The potential for shade to be diminished along the stream corridors as a result of a severe wildfire could be high, and cause stream temperatures to become elevated.

Some ground disturbing activities in this alternative have the potential to dislodge soil particles which in turn may increase erosion. These activities include construction or reopening of temporary roads, landings, skid trails, yarding corridors, burn piles and areas of road maintenance and repair. A detailed discussion of soil erosion and sedimentation is contained in the soils section of the environmental assessment. According to the soils analysis, risks of erosion and potential sediment delivery are expected to be small due to maintaining protective groundcover along with implementation of Best Management Practices (BMP) or Project Design Criteria (PDC).

Road improvements to the existing system roads would occur on segments of primary arterial routes where needed to facilitate the transportation of forest products to market. Improvements to segments of arterial road, or where there are stream crossings, would be expected to repair and improve drainage features such as relief culverts, ditch lines, and surfacing. This would, for a time, alleviate and diminish sediment that has been generated as a result of drainage structures that have been functioning inadequately.

Year-round road closure treatments would block vehicles from entering 35.3 miles of road. These roads would remain on the forest's transportation system and receive minimal maintenance. They would remain available for administrative access for Forest Service uses or emergency services. Sediment generated as a result of vehicular use would be nominal. Closure methods would include storm-proofing them so that runoff is minimized.

Temporary roads would need to be constructed to access some of the stands proposed for treatments. Approximately 26 miles of temporary road would be needed. Most of those miles (18.1) would be located

on old non-system road prisms no longer in use. About 5.5 miles would be located on off-highway vehicle trails that had been converted from older road prisms, and 2.2 miles would be located on decommissioned road alignments. About 0.3 miles of temporary roads would be newly constructed. Most of the temporary roads would be rehabilitated after they are no longer needed, so that net road density would not increase. PDCs include measures of rehabilitation that would mitigate road related erosion, reduce compaction, increase infiltration rates, and re-establish natural drainage patterns. Off-highway vehicle trails that would be used as temporary roads would be reverted to off-highway vehicle trails, with re-established drainage features.

Three of the temporary roads would re-establish former stream crossings in the Rock Creek sub-watershed. These roads would access units 29, 44, and 52. All three roads would cross seasonally flowing streams that in most years flow only during the spring freshet. PDCs specific to these crossings would be employed to minimize the potential for sedimentation. Road maintenance prior to log haul would help maintain the design drainage of the road surface which reduces the potential for larger sediment inputs that eventually may enter stream courses. This includes the placement of new aggregate surfacing where necessary, blading, removing debris, brushing out encroaching vegetation, removing berms, stabilizing failing road shoulders and cleaning out ditch and culvert inlets where needed. Aggregate road surfacing can minimize the amount of fine sediment from road surfaces entering streams following log haul, especially during and following rainfall events.

Some road maintenance activities have the potential to increase short-term road related erosion and sediment during rainfall events. This increase is associated primarily with blading, ditch cleaning and culvert cleaning on aggregate and native surface roads although ditch cleaning and culvert cleaning associated with paved roads is a potential sediment source as well. In order to prevent or reduce sediment delivery to streams, road PDCs were identified to protect existing vegetation in ditch lines hydrologically connected to streams or to require adequate erosion control measures. Most of the road maintenance work would be brushing out existing vegetation, hazard tree removal, cleaning culvert inlets and minor blading and spot rocking of the road surface. Any fine sediment created by road maintenance activities would most likely be washed from the road surface in the first few precipitation events immediately after work has been completed for most of the maintenance activities.

Culvert replacements on hydrologically connected sections of road could contribute short-term sediment delivery to streams until vegetation is re-established. To minimize sediment delivery to streams, PDCs include scheduling soil disturbing road maintenance activities to occur during the dry season. Most road maintenance-related sediment would be trapped and stored in the ditches or on the forest floor below cross drains. Implementation of PDC and BMPs that include installation of erosion control measures to minimize or eliminate sediment introduction into streams would further reduce the risk of sediment introduction. Any sediment delivered to streams during these activities would be minimal, short-term duration, and undetectable at a sub-watershed (6th field) or watershed (5th field) scale. The probability of any degradation to water quality or fisheries resources caused by sedimentation due to road construction, reconstruction and maintenance is extremely low. These activities would provide an overall long-term benefit by restoring proper function of the road drainage which would reduce erosion and sedimentation. Sections of road identified for maintenance are currently rutted and forcing runoff from precipitation to flow down the road surface causing long term erosion and sedimentation from the road. Maintenance would correct these problems.

Fuel treatment activities that utilize fire are not expected to introduce additional sediment into surface water. The fire may back down into the very outer portions of the protection buffer but lighting is not allowed within the protection buffer itself. Additional PDC that limit burn severity in Riparian Reserves

to primarily low severity with some moderate severity and using non-ground disturbing types of fireline such as wet line would minimize the potential for sediment introduction related to burning activities.

Other fuel treatment activities may increase surface erosion in the harvest blocks along temporary roads, landings, skid trails and yarding corridors. The amount of erosion is expected to be low and short lived due to PDCs such as ground based logging restrictions on ground over 30 percent side-slope, ripping and water barring disturbed areas and seeding disturbed areas. It is unlikely that any material would reach the aquatic system due to buffering by the Riparian Reserves and the other required PDCs such as ripping and water barring skid trails and keeping mechanized equipment away from streams.

Water Quantity

Watershed Impact Areas (WIAs) in all four of the four analysis sub-watersheds would not change appreciably. The WIA for the Rock Creek sub-watershed would remain greater than 35 percent due to past wildfire. There would not be any created openings resulting from the proposed treatments. Since nearly all of the treatments are in previously managed or burned over young stands, where crown closure is already less than 70 percent, thinning them would result in little change to the effective canopy. The potential for peak flows to become elevated as a result of vegetation treatments would be low. In the longer-term, thinning would be expected to accelerate growth that has been stagnated by competition so that an effective canopy can develop in a reduced timeframe. Treatments are aimed at reducing the risk of uncharacteristic wildfire that could decimate the forest canopy, and create large openings that would be susceptible to heavy runoff.

The extension of the stream network by roads would not increase after implementation because temporary roads would be rehabilitated after project completion. The 3 temporary stream crossings on former road alignments would potentially extend the percentage of intermittent stream miles by a nominal degree (<5 percent) for the short-term (<5 years) during implementation. The effects of the temporary road mileage proposed would not be expected to increase the potential for heightened peak flows.

Aquatic Conservation Strategy Objectives

The following is a summary the Aquatic Conservation Strategy objectives and how the Rocky Project action alternative would influence them. All changes described below would be evident at the 6th field watershed or smaller (site scale) scale:

1. **Maintain the Distribution, Diversity, and Complexity of Watershed/Landscape-Scale Features**: 100 percent of the primary shade zone in the 6th field sub-watersheds comprising this project would be left untreated so their current condition would be maintained. Stream shade and therefore stream temperature will not be affected since no treatment will occur within the primary shade zones. By not treating the primary shade zone, it would continue to be susceptible to wildfire; however, the surrounding uplands would have fuel reductions lowering wildfire severity in the uplands and reducing the likelihood of spread to the riparian areas. Equipment would not be allowed within the inner Riparian Reserves outside of existing system roads and existing temporary roads, including converted trail temporary roads. Three temporary road crossings would be rehabilitated after use and specific PDCs to minimize their effect would be employed.

2. Maintain Spatial and Temporal Connectivity Within and Between Watersheds: 100 percent of the primary shade zone in the 6th field sub-watersheds comprising the project would be left untreated so their current condition would be maintained.

3. Maintain the Physical Integrity of the Aquatic System, Including Streambanks, Side Channels (Refugia), and Channel Bottom Configurations: This project would meet this objective through project design criteria aimed at reducing soil compaction and erosion, restricting near-stream ground disturbance

and not treating vegetation with the primary shade zone next to perennial, intermittent and ephemeral streams which would maintain current levels of snags and wood input. By not treating within the primary shade zone and the lack of any new road crossings on perennial, intermittent or ephemerals streams would greatly reduce risks of sedimentation, increased peak flow, and resulting bank erosion and channel bed scour. By not treating the primary shade zone; however, they will continue to be susceptible to wildfire though the surrounding uplands will have fuel reductions lowering wildfire severity in the uplands and reducing the likelihood of spread to the riparian areas. Drainage on existing roads and trails will be improved with reconstruction, resulting in reduced sediment delivery overall.

4. Maintain Water Quality Necessary to Support Healthy Ecosystems: This project would meet this objective through project design criteria and by not disturbing the primary shade zone and vegetated buffer along the perennial, intermittent and ephemeral streams in the project area. This Riparian Reserve protection buffer includes the primary shade zone along perennial streams that would maintain stream temperature. The Riparian Reserve protection buffer would also trap any eroded material prior to reaching surface water, thus reducing or eliminating the potential for sediment delivery. The protection buffers in conjunction with project design criteria aimed at reducing erosion would maintain the sediment levels in the long-term. Approximately ten failed culverts are anticipated to be replaced on system roads, which with implementation of PDC will result in minimal sediment delivery to streams in the short-term until vegetation is reestablished; however, drainage on existing roads and trails will improve over the long-term, resulting in reduced sediment delivery overall. These measures are discussed in detail in the Soil Productivity, Water Quality, and Fisheries sections in chapter 3.

5. Maintain Sediment Regimes: Project design criteria aimed at reducing soil compaction, erosion and sediment transport, restricting near stream ground disturbance and establishment of protection buffers next to perennial and intermittent streams would minimize sediment introduction in the short and long-term. Any sedimentation resulting from road maintenance activities would be short term and most evident at the site scale. Overall sediment production from roads is expected to be reduced since most maintenance activities are aimed at correcting areas that have existing erosion problems.

6. Maintain In-Stream Flows that are closer to Natural Regimes: As described in the watershed section of the environmental assessment, this project would maintain the Watershed Impact Area below the 35 percent Management Plan Standard and Guide which shouldn't result in any peak flow increase from this project. In addition, there would be no new road/stream crossings so there would not be any increase in the stream channel network by implementation of the proposed action.

7. Maintain the Timing, Variability, and Duration of Floodplain Inundation: This project would meet this objective through project design criteria such as establishment of protection buffers next to perennial and intermittent streams which would maintain floodplain and channel roughness and ultimately the timing, variability and duration of floodplain inundation. Maintaining the Watershed Impact Area below the 35 percent Management Plan Standard and Guide would protect the integrity of the floodplains while minimizing the potential for increased peak flows. In general, floodplains are limited in this area due to the steep nature of the landscape.

8. Maintain the Species Composition and Structural Diversity of Plant Communities in Riparian Areas and Wetlands: 100 percent of the primary shade zone in the 6th field sub-watersheds comprising this project would be left untreated so their current condition would be maintained. By not treating the primary shade zone, they will continue to be susceptible to wildfire; however, the surrounding uplands will have fuel reductions lowering wildfire severity in the uplands and reducing the likelihood of spread to the riparian areas.

9. Maintain and Restore Habitat to Support Well-Distributed Populations of Native Plant and Riparian Dependent Species: 100 percent of the riparian shade zone in the 6th field sub-watersheds comprising this project would be left untreated so their current condition would be maintained. By not treating the primary shade zone, they will continue to be susceptible to wildfire; however, the surrounding

uplands will have fuel reductions lowering wildfire severity in the uplands and reducing the likelihood of spread to the riparian areas. This project would not restore native plant and riparian dependent species within the Riparian Reserves.

3.7.3 Cumulative Effects

Proposed activities in the Rocky project area are within the Badger/Jordan Creek and White River Major Drainages listed in the LRMP. Their eastern portion is comprised of non-FS ownership, a proportion of which is non-forest. The boundaries for the cumulative effects analysis area should be far enough downstream that direct effects from the Rocky Project would not likely be measurable. Detectable short- and long-term effects to water quality and water quantity would not be expected as a result of implementing the Rocky Proposed Action in the subwatersheds analyzed. Overall, the potential for further cumulative effects to water quality and quantity are concluded to be low.

Water Quality

Buffer PDCs would maintain existing vegetation and primary shade adjacent to perennial and intermittent streams. Water temperature would not be expected to be increased as a result of activities, and existing trends to water temperature variations would be maintained. Other ongoing activities that overlap in time and space are also not expected to have an effect on stream temperatures as they too would be implemented with BMPs to minimize impacts. Sediment from the existing road system, road maintenance activities, grazing, and off-highway vehicle trail within riparian areas would still be likely.

Water Quantity

A peak flow analysis was completed for this project and is displayed in the Effects section above. This project along with other projects on and off National Forest lands were included in the Watershed Impact Area calculation (forest plan standard FW-067, pg. Four-55) and the major drainage area was found to be in compliance with forest plan standard FW-064 so no cumulative effects are anticipated for water quantity. At the sub-watershed scale however, the Rocky sub-watershed was found to have a WIA of 45 percent as a result primarily of the Rocky fire. Most of the young stands being proposed for treatment that are within the old fire scar do not yet have 70 percent canopy closure. For the first decade following the fire, there likely would have been a trend of heightened peak flows from storms or rapid snowmelt. Stream surveys have indicated that degradation of stream banks resulting from greater peak flows has been minor. The existing forest cover is sufficient enough to attenuate peak flows, and they are concluded to be trending within their normal range. The Rocky project would not create any openings nor reduce canopy closure to the extent that peak flows would detectably increase.

3.8 Soils

This section summarizes how soil would be affected by the proposed action. The Mt. Hood Soil Resource Inventory (SRI) was used as an initial broad-scale planning tool to identify and display maps of possible soil concerns or sensitive areas. The SRI map and overlay of proposed treatment areas was taken to the field and validated, and no changes were needed to reflect what was observed on the ground. Field visits, monitoring of activities on these and similar soils, professional observation by a soil scientist, and knowledge of how soils respond to the proposed types of management actions was used to predict impacts.

The following three criteria were used to assess impacts of the alternatives on soil and identify project design features and mitigation measures to prevent or minimize such potential impacts:

1. The risk of erosion and subsequent sedimentation of watercourses

2. The risk of causing detrimental soil conditions such heavy compaction, displacement, and intense burning that could alter water movement through soil thereby reducing site productivity

3. The risk of altering the soil biological ecosystem through insufficient down woody debris or burning high amounts of organic matter

This section summarizes the Soil Report which is incorporated by reference (Project Record, Specialist Reports).

3.8.1 Existing Condition

Soil erosion risk: is determined by erosion hazard. The possible impact of concern stemming directly from soil erosion is runoff from bare areas carrying sediment that could affect watercourses. This hazard rating is based upon a particular soils' texture and slope. Effective groundcover is key to reduce a soils erosion risk. Although surface soils across most of the area where activities are proposed are similar, slopes range from nearly level to greater than 30 percent, thus driving variable risk ratings. No active erosion from previous vegetation management was observed during the field reconnaissance for this project.

Detrimental soil conditions: The risk of causing detrimental soil conditions such as heavy compaction, displacement, and intense burning that alter water movement through the soil and reduce site productivity is determined by detrimental soil condition. The forest plan standard (FW-022, 023) of no more than 15 percent detrimental soil condition in an activity area following project completion would protect site productivity, maintain water movement into and through the soil, reduce erosion risks and associated sedimentation, and protect organic matter. All soils within the planned treatment areas have a low to moderate compaction risk (SRI validated) due to inherent soil properties.

The results of soil quality field surveys performed over several years were reviewed. They are documented in table 4 of the Soil Specialist Report (project record). Monitoring occurred on glacial soil types that exist within the planning area, or on soil types expected to respond in a similar fashion. All areas listed as proposed were either clear-cut many years ago, or have had some kind of on-the-ground impacts from scattered tree removal. All areas monitored post logging were within the 15 percent detrimental soil condition standard. The forest has seen a steady trend of improvement in meeting this standard, which was commonly exceeded from the 1980s through the mid-1990s (Mt. Hood Forest Plan Monitoring Report, 2006). Reduced impacts may be attributed primarily to major changes in practices, such as the elimination of machine (dozer) piling of logging slash; lower ground pressure machinery that reduces compaction; and an awareness that soil damage was exceeding acceptable levels with a conscious effort to reduce damage. The one major change in operations that led to the greatest decrease in soil damage was moving away from dozer piling to more grapple piling of slash.

An additional 30 proposed treatment areas similar to Rocky were evaluated in the previous planning area (CCR) using the Forest Soil Disturbance Monitoring Protocol (Page-Dumroese, D.P., 2009) and outlined by Napper in the Soil Disturbance Field Guide (Napper et al, 2009). The supplemental monitoring report is attached to the soil specialist report (project record) and explains in full the findings on a proposed unit by unit basis. None of the 30 monitored proposed units exceeded 7 percent detrimental soil condition. The summary provided by the field crew is attached at the end of soil specialist report (project record).

Organic matter levels: The risk of altering the soil biological ecosystem due to insufficient amounts of down woody debris to feed forest carbon and nutrient cycles in the less frequent fire plant communities or the burning of uncharacteristically high amount of organic matter in more frequent fire plant communities is determined by soil biology (organic matter levels). Poor or non-functioning soil biological systems

may lead to difficulties in revegetation efforts, or decline in existing desirable vegetation. In and of itself, soil biology is extremely difficult to evaluate because of infinitely complex interactions occurring between organisms and their soil habitats, including physical and chemical characteristics. It is assumed that soil biological systems would properly function given certain habitat components are present, such as non-compacted soils, appropriate levels of organic matter, and types of native vegetation under which the soil developed.

3.8.2 Direct and Indirect Effects

The analysis area for soil resources are the proposed treatment units.

Management actions that displace, severely burn or compact soil or that remove ground cover are considered to result in a greater risk to soil productivity. The analysis considered restorative actions as well as the Project Design Criteria/Mitigation Measures (PDC) and Best Management Practices (BMPs) that minimize impact. These actions would include: landing use (some existing landings would be reused and some new landings would be created); skidding with ground based equipment (some would use existing skid trails and some areas would have new skid trails); the use of low impact (low ground pressure) harvester felling equipment; temporary road use (many roads are existing, some would be built on top of already disturbed ground and some would be on previously undisturbed ground); post-harvest temporary road and landing rehabilitation; post-harvest erosion control activities; post-harvest landing slash burning; and road maintenance activities that reduce erosion risk. Other aspects of the proposed action would not have a meaningful or measurable effect on soil productivity.

The analysis conducted was based on the following assumptions:

- It is assumed damage on skid trails would average 12 feet in width;
- The conceptual layout of logging system patterns have been designed to ensure less than 15 percent of the area is impacted (ground disturbance) within each proposed treatment that uses ground-based equipment;
- This project is designed such that no ground based harvest systems would be used on slopes greater than 30 percent;
- Undisturbed soils meet the forest plan groundcover standards

3.8.2.1 No Action

Soil Erosion Risk: The risk of erosion within the analysis area would remain unchanged because the amount of groundcover protecting the soil surface from erosional influences is common and widespread. The expected effect is the landscape would respond and change proportionate to the severity of natural events, such as storms or wildfire.

Detrimental Soil Conditions: It is assumed that soils damaged by previous activities would continue to recover and change at an unknown rate as roots, animals, and other influences slowly break up existing compaction. The effect of soil recovery is a gradual increase in available soil (therefore nutrients and water) for all normally expected soil biological, chemical, and physical functions to occur.

Organic Matter Levels: Soil organic matter and corresponding soil functions would continue without much change. Similar to erosion risk, the expected effect is that the soils at landscape and site scales would respond and change proportionate to the severity of natural events, such as storms or wildfire. In addition, organic matter decomposition is influenced substantially by temperature, moisture, and fire, thus the rate of decay and cycling would continue accordingly.

It is possible, under certain wildfire scenarios, that erosion risk, soil damage from high intensity burning, and loss of organic matter could be substantial. It is not possible to predict with any certainty however, and taken as a whole in the big picture, the existing condition puts soils at a potentially higher risk overall than the proposed actions that reduce fuels and return the landscape to a fire type and return interval under which they developed prior to fire suppression. This is especially true in the Dry Mixed Conifer and eastward into the Oak, where conifer encroachment is actively occurring.

3.8.2.2 Proposed Action

Soil Erosion Risk: Soil erosion risk would increase slightly with ground impacting activities, but are not expected to impact areas with live water due to more than adequate groundcover protection. The one exception is the wood loading in the Aspen Thinning Enhancement Areas and that is due to the impact of logs in and around the water directly. This impact is expected to be immeasurable and of very short duration (less than a week following the end of the project).

Soil erosion risk would increase with the proposed action because bare soil would be exposed during implementation. As the amount of bare/compacted soil increases, so does the risk of soil movement. Actual resource damage (erosion and/or sedimentation) is dependent on weather events that provide the energy to move soil material from one location to another. In order to diminish this risk while soils are exposed, certain erosion control techniques are practiced to lessen erosive energies. The effectiveness of these Best Management Practices (BMPs) is discussed by Rashin et al. (2006) in an applicable publication of the Journal of the American Water Resources Association. Comparing the proposed action to their application of studied BMPs would indicate that the proposed buffers and logging system design criteria would substantially reduce the risk of resource damage should a storm event occur while the ground is exposed. For example, the study showed an assessment of surface erosion and sediment routing during the first two years following harvest indicated a 10 meter (approximately 30 feet) setback from ground disturbance can be expected to prevent sediment delivery to streams from about 95 percent of harvest related erosion features. The PDCs in this project use setbacks from nearly double to 10 times that distance, in addition to directional felling and hand treatments (for instance, no machinery) that would further reduce erosion features and disturbance. One action that would likely cause some minor amount of ground disturbance in size and duration is the wood placement into live stream courses within the Aspen Thinning Enhancement Areas. Otherwise and in conclusion, by maintaining proper amounts of protective groundcover along with implementing BMPs and PDCs, the risk of erosion and subsequent sediment delivery caused by the proposed action is extremely small.

Detrimental Soil Conditions: Impacts caused by heavy equipment would increase the amount of detrimental soil damage within the treatment areas. This increase is not expected to exceed forest plan standards. Therefore, there would be no accompanying measurable decrease in site productivity in the units. An explanation for how logging systems are expected to impact the ground based treatment areas is provided in the soil erosion risk section above.

Organic Matter Levels: Sufficient tonnage is expected to remain on site to provide for organic matter input to the ecosystem once all activities are complete. In thinning areas there would be substantial future organic matter left standing in addition to material on the ground, although it is likely localized acreage would be lower than forest plan standards for organic matter in the higher fire frequency areas within the proposed units in the Dry Mixed Conifer Ecotypes. When this occurs, it is not expected to be a substantial impact to nutrient cycling because these are ecosystems where fire typically moved through very quickly, thus retaining substantial organic matter reserves in the mineral topsoil due the way in which they have developed.

The same conclusion applies for the under burning treatments.

3.8.3 Cumulative Effects

Potential cumulative effects projects have been reviewed and two activities overlap in either time or space within the soils analysis areas: Rock Creek Off-highway vehicle Trails and grazing. In an effort determine whether these two activities would be additive to the proposed action, some of the 30 supplemental monitoring units were reviewed from the previous planning area (Crystal Clear Restoration). The area where these activities overlap was evaluated to see if that data could be used as a surrogate and extrapolated to the Rocky Planning Area, but none of them exceeded forest plan standards. Therefore, in spite of the existing activities, there was no data or field evidence to indicate that existing, and consequently future detrimental soil conditions, would exceed forest plan standards. Therefore, no adverse cumulative effects are expected. The method of soils analysis is cumulative by nature as explained in the Mt. Hood Forest Plan (specifically FW-22). More clearly stated, an area (proposed unit) is evaluated by considering previous damage (if any) that still meets the detrimental condition definition, plus any expected detrimental soil impacts caused by the proposed action.

3.9 Fisheries

This section of the environmental assessment is a summary of the aquatic species biological evaluation that was conducted for the project. The complete report is incorporated by reference and is available in the project record (specialist reports folder).

3.9.1 Existing Condition

The existing condition is described in terms of the biological requirements for habitat features and processes necessary to support all aquatic life stages of Regional Forester's Special Status Species that are or could be found within the action area. There are four major stream channel elements which do have an impact to all life stages of Regional Forester's Special Status Species. They are water temperature, stream channel fine sediment, in channel large woody debris (LWD), and pools.

The main stream drainages in the action area include portions of Badger Creek (Upper Badger Creek 6th field subwatershed), Threemile Creek (Threemile Creek 6th field subwatershed), Rock Creek and North Fork Rock Creek (Rock Creek 6th field subwatershed), and Gate Creek, South Fork Gate Creek, and Souva Creek (Gate Creek 6th field subwatershed).

3.9.1.1.1 Stream Temperature

Redband trout throughout the Oregon interior basins, which originally derived from the Columbia River system are well known to be hereditary resilient to high water temperatures, and redband trout have been found in water temperatures over 28 C (Behnke R., 1992). Redband trout are located in Badger, Threemile, Rock, North Fork Rock, Gate, South Fork Gate, Souva Creeks, and some unnamed tributaries to those creeks. Spawning occurs for redband trout during the latter half of April. Fry are believed to leave the gravel in late June, depending on water temperatures.

Brazier and Brown (1973) state that, "Direct solar radiation can be transmitted, absorbed, or reflected." Ice (2000) concluded, "Only direct solar radiation (not diffused) can possibly affect stream temperatures." Historic water temperature data has been sporadically collected for their highest 7-day average maximum stream temperatures (unpublished survey data from Barlow Ranger District, Mt. Hood National Forest 1995-2009). Water temperature data for each of these streams is available in the Fisheries Specialist Report (project record).

3.9.1.1.2 Sedimentation

Trout prefer stream channel spawning habitat to be dominated with clean gravels (green pea to baseball size). Pebble counts were used to describe the existing condition. Data from the most recent Level II stream surveys that were conducted for Badger Creek (1992), Threemile Creek (2013), Rock Creek (2013), North Fork Rock Creek (2013), Gate Creek (2012), South Fork Gate Creek (2014), and Souva Creek (2014) is available in the Fisheries Specialist Report (project record).

3.9.1.1.3 Large Woody Debris

Wood plays an important role in forming and maintaining stream channel function and providing spawning, rearing, and refugia habitat for the aquatic species present in the action area. There is a wide range of large woody debris (LWD) loading in the action area riparian reserves, due to both natural loading of fallen conifer and hardwood trees into their adjacent stream channel and floodplains, wildland fires, and past instream and floodplain restoration projects. Information about the LWD within the action area is available in the Fisheries Specialist Report (project record).

3.9.1.1.4 Pools

Salmonids require high quality and quantity pool habitat in streams in order to maintain a healthy population. Quality pools (residual depth > 3 feet deep) create important spawning and rearing habitat for salmonids, including refugia from predators. High quantities of pool habitat (any depth) help create stream channel complexity, which increases micro habitats for all aquatic life in the stream channel. Pools are created and maintained from the geomorphology of the stream channel, such as valley and stream gradient, channel roughness (substrates and LWD), channel sinuosity, and channel confinement. Different stream channel types will naturally have different amounts of pools. Information about the existing pools for each of the streams within the action area is available in the Fisheries Specialist Report (project record).

3.9.2 Direct and Indirect Effects

3.9.2.1 No Action

3.9.2.1.1 Water Temperature, Sediment, Large Woody Debris, and Pools

Short-term direct and indirect effects are those that could occur during project implementation and in five years after projects are completed. Long-term direct and indirect effects are those that could occur between 5 and 50 years after the projects are completed.

There should be no short-term direct or indirect effects to aquatic habitat or individuals by implementing this alternative. There would be no soil disturbance because logging operations, road maintenance, road construction/closing, or prescribed fire activities would not occur. No riparian vegetation would be disturbed. The existing stream channel and aquatic habitat conditions should stay the same until the next large natural disturbance occurred, such as, but not limited to, high flow event or large scale (>100 acre) wildland fire occurs. Stream temperature, fine sediment, LWD, and pool and refugia habitat throughout the action area would be maintained at existing conditions in the short-term.

Long-term effects to aquatic habitat or individuals would be maintained or improved. Stand conditions over the landscape would not be improved, and thus desirable stand conditions mentioned in the purpose and need would not be met. Stream temperature, would be maintained or improve over the long-term as stream side vegetation continues to grow. Fine sediment inputs to the stream channel in the action area and its area of influence would be maintained at existing conditions. Natural tree mortality would increase LWD and move the area towards meeting standards and guidelines for LWD. Pool levels and

refugia would increase and be maintained over the long-term with the increase of LWD into the stream channel. Hydrologic fragmentation at road crossings would not improve in the action area.

3.9.2.1.2 Species Specific Findings

THREATENED, ENDANGERED, AND PROPOSED SPECIES

There would be no effect to any TEP species, and no adverse effect to essential fish habitat.

REGION 6 SENSITIVE AQUATIC SPECIES

Inland Columbia Basin Redband Trout
A "No Impact" (NI) determination is warranted to resident redband trout for the no action, because no ground disturbing activities would take place, and existing conditions would be maintained in the short-term and following natural processes over the long-term in the action area or its area of influence.

3.9.2.2 Proposed Action

3.9.2.2.1 Water Temperature

No short (0-5 years) or long-term (5-50 years) direct or indirect effects to water temperature would occur in the action area or its area of influence, from proposed commercial logging activities. The probability would be negligible of shade loss to any perennial stream channel from commercial logging activities in the action area. Water temperature may decrease over the long-term as stream side shade trees located in the primary shade zone (within 60 feet of the North face slope of the stream channel) continue to grow and produce additional shade to the stream channels. This is due to project design criteria (PDCs) and best management practices (BMPs) in place, as well as no logging activities occurring within the first primary shade zone of any perennial stream channel. See appendix B of the Aquatics BE for all project PDCs and BMPs.

No short or long-term direct effects to water temperature would occur in the action area or its area of influence, from fuel reduction activities by burning hand piles or underburning in some riparian reserves. The probability of stream shade loss to any perennial stream channel is expected to be isolated and short-term. The proposed action would limit over story tree mortality to no more than 10 percent across the underburning action areas (includes both in and out of riparian reserves). Although, some trees and stream side shrubs located in the primary shade zone could have their stream shading branches and stems burnt or removed in the short-term by the burning activities. Any stream channel shade loss from over story tree mortality or stream bank shrubs by burning activities in riparian reserves is expected to be isolated. The loss of isolated temporary (0 to 5 years) shade to the stream channel from underburning activities in riparian reserves should not cause an indirect increase in water temperature for the short or long-term at the site level, action area level, or subwatershed level. See the PDCs and BMPs in the Aquatics BE for additional information of fuels reduction with the use fire activities.

If there is a need to replace culverts (see Transportation Report for additional information) on a haul route road, in the action area. Then stream side vegetation located in the road prism at the road crossing would be removed in order to safely remove and replace the culvert. If any proposed culvert replacement is located on any known fish bearing streams. Then aquatic organism passage (AOP) PDCs would be implemented during replacement. The loss of isolated temporary (0 to 5 years) shade to the stream channel from the replacement of a culvert in the action area should not cause an indirect increase in water temperature for the short or long-term at the site level (culvert replacement site), action area level, or subwatershed level.

Post treatment, water temperature is expected to be maintained or decrease over the long-term at the site level, action area level, and Lower Badger Creek, Threemile Creek, Rock Creek, and Gate Creek 6th field subwatershed level.

3.9.2.2.2 Sediment

Waters (1995), identified 4 effects to fish located in streams from anthropogenic sediments, which are: 1) direct effect of suspended sediment, which includes turbidity; 2) effects on success of fry emergence from salmonid redds; 3) effects on success of fry emergence from non-salmonid redds; and 4) effects of deposited sediment on the all life stages of fish habitat.

Short-term sediment delivery is expected to occur from proposed activities occurring in the two aspen stand units located in the headwater stream reaches of Rock Creek (non-fish bearing stream reach) and North Fork Rock Creek (fish bearing stream reach). Indirect sediment delivery to the stream channel is expected to potentially occur during the falling and removal of conifers from the stream channel, and placement of some of felled conifer logs back into the stream channel during instream restoration work at isolated locations in the two aspen clones. Prior to first snowpack storm event occurring post the aspen release work fine sediment could enter the stream channel during and soon after summer storm freshets. Any increase of fine sediment and increased turbidity levels to the stream channels from aspen rehabilitation activities are expected to be short lived with low intensity (less than 2 hours' time and less than 10 percent increase of turbidity levels after sediment into the stream channel occurs). Any increase of turbidity levels is expected to be highest in the aspen stands, and decrease in intensity to natural background levels less than a 1/4 RM downstream of aspen stand. Any sediment delivery from activities outside of the active stream channel is expected to be negligible due to the relative flat floodplain gradient, abundant amounts of grasses in the understory of the aspen stands, as well as implementing PDCs for BMPs for sediment movement post restoration implementation. See Soil and Hydrology Specialists Reports and Aquatic BE PDCs and BMPs for further information.

No short or long-term direct or indirect sediment delivery to stream channels located in neither plantation and non-plantation logging units are expected to occur. This is due to the PDCs and BMPs being implemented in riparian reserves. See Soil and Hydrology Specialists Reports for further information.

Underburning would occur in some riparian reserves located in the pine oak stands, and in some of the eastern moist mixed conifer stands, too. The western moist mix conifer stands would only pile and jack pot burn. The proposed action in pine oak and the eastern mixed conifer stands is to not actively put fire in riparian reserves, but to allow the fire to creep into the riparian reserves, resulting in a low severity burn. This dominate type of burn would cause a mosaic pattern of burned and unburned areas across the riparian reserve. Low severity burned areas are not expected to transport fine sediment to the stream channel. Moderate severity burns are permitted in no more than 20 percent of Riparian Reserves to invigorate desirable deciduous species. Moderate severity burns are expected to have the potential for fine sediment delivery in isolated locations to the stream channel. Any fine sediment delivery to a stream channel post underburn would be expected to be short-term in time (first year) and quantity (during runoff storm events). No sediment delivery from pile and jack pot burns to stream channels are expected to occur. This is due to PDCs and BMPs in place. The soil erosion and delivery potential is detailed in the Soils and Hydrology Specialist Reports. Any impacts to the stream from sediment produced from underburning activities would be for short-term duration and the effects would not be detectable at the action area, or the 6th field subwatershed level. However, individuals and habitat of aquatic populations, including sensitive redband trout may be impacted by sedimentation. Because none of the sediment inputs are expected to be on-going, little time should elapse before stream conditions return to pre-project conditions.

Road activities in the proposed action could lead to limited mobilization of sediment particles which could be at risk of entering streams and aquatic habitats. Road activities located in riparian reserves that could yield sediments to streams include: log hauling on native and gravel roads (including landing), road maintenance including culvert replacement, and temporary conversion of roads from off-highway vehicle trail construction, which has about 1.0 trail miles located in riparian reverses, and the use of about 0.42 road miles presently located in riparian reserves (between Gate Creek and Rock Creek subwatersheds). The soil erosion and delivery potential is detailed in the Soils and Hydrology Specialist Reports. Erosion and sediment delivery are expected to be limited due to PDCs and BMPs associated with the road activities. Any impacts to the stream from sediment produced from road activities would be for a short-term duration and the effects would not be detectable at the action area, or the 6th field subwatershed level. However, individuals and habitat of aquatic populations, including sensitive redband trout, may be impacted by short-term increases of sedimentation.

Post treatment, sediment inputs from road activities over the short-term should improve as needed road maintenance and culvert replacements are completed and underburn areas reestablish new ground cover. Sediment is expected to be maintained or decrease over the long-term at the site level, action area level, and Lower Badger Creek, Threemile Creek, Rock Creek, and Gate Creek 6th field subwatershed level.

3.9.2.2.3 Large Woody Debris

No short (0- 5 years) or long-term (5-50 years) direct or indirect effects to large woody debris (LWD) levels in fish bearing streams reaches (with the exception of the two aspen release units) would occur from plantation and non-plantation logging activities in the action area or its area of influence. Future LWD recruitment inputs to streams varies with forest conditions and geomorphology. Empirical studies indicate that 95 percent of total instream LWD (from near-stream sources) comes from distances within 82 to 148 feet of a stream. Shorter distances occur in young, shorter stands, while longer distances occur in older and taller stands (Spies et al. 2013). The PDCs and BMPs under the proposed action would have no vegetation removal or mechanical treatments occur within one site potential tree height along fish bearing streams.

There would be both short and long-term decreases of LWD recruitment in both non-fish bearing perennial and non-fish bearing intermittent stream channels. Even with a projected decrease in LWD recruitment these non-fish bearing stream channels will not be void of future recruitment. The majority of the stream reaches in the action area are 1st or 2nd order stream channels, and any LWD recruitment within those stream reaches will most likely stay on site due to tree lengths vs small stream channel size. The PDCs and BMPs under the proposed action would have no vegetation removal or mechanical treatments occur within 60 feet along any non-fish bearing perennial streams, or 30 feet along any non-fish bearing intermittent streams. Large woody debris levels are expected to increase over the long-term as future stream side trees fall into the stream channel in the action area and 6th field subwatershed level.

The LWD levels located in the two aspen release units would have both a short and long-term increase of LWD levels in their respective stream channels. This is due to conifers being felled in the riparian reserves of the two aspen clones would have some of those trees be strategically placed in both the stream channel and floodplain. The instream restoration work located in the aspen clones would improve both fish and riparian dependent wildlife habitat. It is expected that those logs that are placed in the stream and floodplain areas of the aspen clones should be functioning as intended for at least two decades post restoration implementation. It is anticipated that little LWD recruitment is expected until aspen become decant and fall, which could be 80 to 100 years' time.

3.9.2.2.4 Pools

There is no short (0-5 years) or long-term (5-50 years) decline in pool quantity anticipated to occur in fish bearing streams from plantation and non-plantation logging activities in the action area or its area of influence. The majority of the pool formation that occurs in stream reaches in the action area and its area of influence comes from LWD, with beaver dams and boulder having secondary influences to pool habitat formation. No direct or indirect effects to pool quantity would occur due to the PDCs and BMPs being implemented under the proposed action. With no vegetation removal or mechanical treatments occurring within one site potential tree height along fish bearing streams, 60 feet along any non-fish bearing perennial streams, or 30 feet along any non-fish bearing intermittent streams.

Pool quality and aquatic refugia could decrease in the short-term (0-1 years), due to nonpoint increases of fine sediment in the stream channels during activities from road maintenance, culvert replacement, post underburns, and LWD placement in the aspen clone stream channels. Over the long-term (1-5 years) fine sediment from activities proposed in the action area are expected to be negligible to pool quality and aquatic refugia. Over the long-term pool quantities and quality could increase as LWD falls into the stream channels and creates and maintains new pools in the action area.

3.9.2.2.5 Species Specific Findings

THREATENED, ENDANGERED, AND PROPOSED SPECIES

There would be no effect to any TEP species, and no adverse effect to essential fish habitat.

REGION 6 SENSITIVE AQUATIC SPECIES

Inland Columbia Basin Redband Trout

A "May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to the population or species" (MIIH) determination is warranted to resident redband trout for the proposed action. Following design layout and adhering to PDCs and BMPs in the proposed action there would be potential for short-term impacts to spawning and rearing habitat, due to the expected short-term (0 to 1 year) pulses of fine sediment from underburning, road maintenance including culvert replacements, and instream restoration in the aspen clone units, which are located in fish bearing streams in the action area or its area of influence.

3.9.3 Cumulative Effects

The 6th and 5th field watersheds found in the planning area have been heavily managed during the past century for grazing, irrigation, timber harvesting, road building and decommissioning, fires (wild and prescribed), recreational activities, such as off highway vehicles, trails, campgrounds, exotic fish introduction, weed control, and restoration activities. Cumulative effects from these activities in the Tygh Creek and White River 5th Field Watersheds have had both a direct and indirect connection to the level of water quality and quantity, which can influence the health of the native resident interior redband trout populations that are present in the both watersheds. The proposed action would maintain the overall riparian conditions at the 5th and 6th field watershed scale, while maintaining or improving other resource uses in the watershed.

3.10 Wildlife

This section of the environmental assessment is a summary of the Wildlife Specialist Report that was conducted for the Rocky project. The complete report is available in the project record (specialist reports folder) and is incorporated by reference.

Seven species of wildlife and/or critical habitat that are classified as threatened, endangered or proposed may be found on or adjacent to the Hood River and Barlow Ranger Districts. Three may be in the project area (Northern Spotted Owl, Northern Spotted Owl Critical Habitat, and Gray Wolf). There are sixteen U.S. Forest Service Region 6 Sensitive species (2011), four of which there is suitable habitat within the project area (bald eagle, white-headed woodpecker, Lewis's woodpecker, and western bumblebee). There are seven Survey and Manage species (2001) and five Management Indicator species that may also be found on the District. The status of habitat and the presence of species in the project area is available in table 2 of the Wildlife Specialist Report (project record). Species that are not present or do not have habitat within the project area were not discussed further in the wildlife biological evaluation.

3.10.1 Existing Condition

FEDERALLY THREATENED, ENDANGERED OR PROPOSED SPECIES OR CRITICAL HABITAT

Northern Spotted Owl

Generally, suitable habitat is 80 years of age or older, canopy cover exceeds 60 percent, is multi-storied and has sufficient snags and down wood to provide opportunities for nesting, roosting and foraging. Dispersal habitat for spotted owls usually consists of mid-seral stage stands between 40 and 80 years of age of age with a canopy closure of 40 percent or greater and an average diameter of 11-inches. Spotted owls use dispersal habitat to move between blocks of suitable habitat and juveniles use it to disperse from natal territories. Dispersal habitat may have roosting and foraging components, enabling spotted owls to survive, but lack structure suitable for nesting. Recent landscape-level analyses suggest that a mosaic of late-successional habitat interspersed with other vegetation types may benefit spotted owls more than large, homogeneous expanses of older forests (Zabel et al. 2003).

The eastern portion of the planning area is not capable of supporting suitable habitat over the long-term. Most of the existing habitat is the result of fire exclusion, which has allowed development of more closed stands than would have naturally occurred. High stocking levels have created significant moisture stress and increased all trees' susceptibility to insect, disease, drought, and fire-related mortality. The only habitat that would have existed in the eastern portion historically would have been in the moist areas, typically north aspects along perennial streams, and in riparian zones of larger streams. There are three historic home ranges that overlap treatment units in the Project Area.

Northern Spotted Owl Critical Habitat

There are 326 acres of critical habitat within the action area proposed for treatments, however none are providing any physical and biological features (PBFs) for critical habitat. PBFs are the specific characteristics that make habitat areas suitable for nesting, roosting, foraging, and dispersal (USFWS 2012, pp. 71906-71908). This portion of critical habitat is within the Rocky burn and is currently in overstocked young plantations.

Gray Wolf

In March 2015, a male wolf from the Imnaha Pack identified as OR25, moved through the Columbia Basin and southern Blue Mountains before traveling west and spending a number of weeks on the Forest. OR25 then traveled south to Klamath County and continues to remain in that area. In January of 2018, 2 wolves were captured on a remote sensing camera on the southeast portion of the Forest. Because wolves have the ability to disperse over large distances, as in the case of other wolves (OR7 and OR3) that have established territories in southern Oregon, there is the possibility that other undetected wolves have been or may currently be on the Forest.

REGION 6 SENSITIVE SPECIES

Bald Eagle

Bald eagles generally nest near coastlines, rivers, large lakes or streams that support an adequate food supply. They often nest in mature or old-growth trees; snags; cliffs; rarely on the ground; and with increasing frequency on human-made structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds. Nests typically include at least one perch with a clear view of the water where the eagles usually forage. Shoreline trees or snags provide the visibility and accessibility needed to locate aquatic prey.

Breeding bald eagles occupy territories that average 1 to 2 square miles. They will typically defend these territories against intrusion by other eagles. In addition to the active nest, a territory may include one or more alternate nests that are built or maintained by the eagles but not used for nesting in a given year. Bald eagles exhibit high nest site fidelity and nesting territories are often used year after year. There is one bald eagle nesting territory within the project area. This nest has been occupied since 2009 and this pair of eagles has successfully reproduced young six out of nine years.

White-headed Woodpecker

White-headed woodpeckers are cavity nesting birds strongly associated with coniferous forests dominated by pines. In Oregon and Washington, white-headed woodpeckers occur primarily in open ponderosa pine (Pinus ponderosa) or dry mixed-conifer forests dominated by ponderosa pine (Bull et al. 1986, Dixon 1995, Frenzel 2004, Buchanan et al. 2003). They have also been found in moderate densities in dry mixed conifer forests which were dominated by firs but contained both ponderosa pine and sugar pine.

Lewis's Woodpecker

Formerly widespread, this species is common year-round only in the white oak ponderosa pine belt east of Mt. Hood. Habitat for the Lewis's woodpecker includes old-forest, single-storied ponderosa pine, and Oregon white oak. Burned ponderosa pine forests created by stand-replacing fires provide highly productive habitats compared to unburned pine (Wisdom et al. 2000). Lewis's woodpeckers feed on flying insects and are not strong cavity excavators. They require large snags in an advanced state of decay that are easy to excavate, or they use old cavities created by other woodpeckers. Nest trees generally range from 17 to 44 inches in diameter (Saab and Dudley 1998, Wisdom et al. 2000).

Western Bumblebee

Bumblebees visit a range of different plant species and are important generalist pollinators of a wide variety of flowering plants and crops (Goulsen 2003a). Although bumblebees do not depend on a single type of flower, some plants rely solely on bumblebees for pollination. In addition, native bees, such as bumblebees are adapted to local conditions (Goulsen 2003b).

Surveys for Western bumblebees were conducted by the Xerces Society on the Forest in 2013 and by Forest Service biologists in 2015. A total of 34 locations were surveyed in 2013 and Western bumble bees were located at 8 of these locations. In 2015, 24 locations were surveyed and bumble bees were detected at 8 locations, 6 of which were previously unreported locations for this species. In 2016, 23 locations were surveyed and Western bumblebees were documented at 6 of these sites. Five of the six sites were new locations for this species. One of the new locations found was in the meadow adjacent to Bear Springs Campground and previous detections were made adjacent to the project area at Little Crater Lake and Jackpot Meadow.

MANAGEMENT INDICATOR SPECIES

Mule Deer and Elk

The project area supports elk and deer for most of the year although the area is mainly used for over-wintering. A number of deer and elk spend the winter there depending on snow accumulation. Deer are less likely to be there during periods of heavy snowfall as they are less able to move through deep snow. Forage is available in the planning area, but is generally of low or medium quality.

Elk herds within the project area likely exhibit a close association with riparian habitat in areas of gentle terrain and low open road density. Research on elk in this kind of habitat generally shows that elk spend most of their time in close proximity to a stream or wetland. Low quality forage, lack of wetlands and permanent low-gradient streams are considered one of the limiting factors for elk and possibly deer.

Thermal cover for elk is defined as a stand of coniferous trees at least 40-feet tall with an average crown closure of 70 percent or more. Optimal cover is found mainly in multi-storied mature and old-growth stands. The stands adjacent to the planning area provide both thermal and optimal cover but very little of this habitat is within treatment units.

Pileated Woodpecker

The pileated woodpecker was chosen as a management indicator species because of its need for large snags, large amounts of down woody material, and large defective trees for nesting, roosting and foraging. Pileated woodpeckers use mature and older, closed canopy stands (greater than 60 percent canopy cover) for nesting and roosting, but may use younger (40 to 70 years), closed-canopy stands for foraging if large snags are available. Large snags and decadent trees are important habitat components for pileated woodpeckers (Hartwig et al. 2004, Mellen et al. 1992).

The mean home range for pileated woodpeckers is 1,181 acres with approximately a 9-30 percent overlap (about 200 acres) between territories. Therefore an average home range with overlap for pileated woodpeckers would be approximately 970 acres (Mellen et al. 1992).

Range-wide within Canada and the United States, the pileated woodpecker population has steadily increased from 1966 to 2015, according to the North American Breeding Bird Survey. The trend for the pileated woodpecker is increasing at the forest and range-wide scale.

By dividing the acres of pileated woodpecker habitat by the average home range with overlap of 970 acres there are 615 potential home ranges on the Mt Hood National Forest. With an average clutch size of 4 (Marshall, D.B. et al. 2003), this would indicate that the summer population of pileated woodpeckers could be as high as 2,500 birds including adults and fledglings. Given the amount of habitat available, there may only be 2 or 3 home ranges that overlap the project area.

American Marten

American martens are closely associated with forested habitats with complex physical structure near the ground. Structure can include the lower branches of living trees, tree boles in various stages of decomposition, coarse woody debris, shrubs, and rock fields. Martens show a preference for forest canopy cover of greater than 50 percent. Use of non-forested habitats by martens increases in summer and includes meadows and small harvest units near forest edges, as well as areas above the tree line in western mountains (Buskirk and Ruggiero 1994).

Wild Turkey and Gray Squirrel

The wild turkey and gray squirrel are management indicator species for the ponderosa pine-Oregon white oak vegetation association of the Forest. Two subspecies of wild turkeys (Merriam's and Rio Grande) are found on the Forest. Turkeys feed on acorns, conifer seed, insects, and grass/forbs and nest on the ground hidden by grass or shrubs. Turkeys roost on the ground and in large diameter (greater than 14 inch dbh) ponderosa pine and Douglas fir generally on slopes greater than 30 percent and within 0.5 miles of a food source.

Wild turkey generally prefer dense ground vegetation (14 to 16 inches in height) next to nesting cover. Open riparian woodlands and forest openings of one to three acres provides good brood habitat. These open areas need to provide for a multitude of forage that supports insects, allows for foraging, and also provides cover in order to avoid predators. Turkeys are present within the eastern portion of the planning area and there is nesting, roosting, foraging, and brood-rearing habitat within the project area.

Western gray squirrels need a mix of mast-producing trees to provide food, cover, and nesting sites in their habitat. The ecological range of the western gray squirrel includes a variety of habitat types within mixed conifer and oak forests. High tree species diversity is a common component of western gray squirrel habitat and contributes to habitat quality (Linders, 2000). Gray squirrel have been documented in the planning area and there is both wintering and nesting habitat.

SNAG AND DOWN LOG ASSOCIATED SPECIES

The project area contains stands of immature plantations less than 80 years old and recently unmanaged stands over 80 years old in the wildlife habitat type (WHT) of Eastside Mixed Conifer as defined in DecAID. Many wildlife species evolved to use large snags and logs that were historically more abundant on the landscape. The loss of large snags and logs from managed stands affects biodiversity and these large snags and down wood are often missing from managed stands across the Forest. Currently, there are roughly 1 snags per acre in the moist mix conifer and less than 1 snag per acre in the dry mix conifer 24 inches DBH and larger and an average of 5 snags per acre in the moist mix conifer and 2 snags per acre in the dry mix conifer 12 inch DBH and larger. The current condition of the stands in the project area is below the 30 percent tolerance levels as identified in DecAID.

Currently, 81.4 percent of the Middle Deschutes 5th field watershed contains no large snags in eastside mixed conifer compared to the historic condition of 34.6 percent. Currently, 4.6 percent of the watershed has between 2 and 6 snags per acre and historically that number was 29.2. This watershed is also deficient in high concentrations of snags with 8.1 percent of the area with 10 or more snags per acre historically and 0.0 percent currently.

For small snags in eastside mixed conifer, 68.8 percent of the watershed contains no snags compared to the historic condition of 20.1 percent. There are no categories where current levels exceed historical conditions in small snags densities. As is with the large snags, this watershed is deficient in high concentrations of small snags with 9.2 percent of the area with 30 or more snags per acre historically and 0.0 percent currently.

While current and reference conditions of large down logs in eastside mixed conifer are comparable, there are some notable differences. Historically, 64.2 percent of the Watershed had no cover of large down logs and currently 81.4 percent has no large log cover. Under historic conditions, 14.6 percent of the watershed had up to 4 percent cover and currently 3.5 percent of the watershed has up to 4 percent cover.

A similar comparison can be made for small logs in eastside mixed conifer. Historically, 64.2 percent of the watershed had no cover of small down logs and currently, 68.8 percent has no small log cover. Under historic conditions, 10.6 percent of the watershed had up to 2 percent cover and currently 23.0 percent of

the watershed has up to 2 percent cover of small logs. In this wildlife habitat type, frequent fires would have consumed much of the down wood which may account for the difference in current vs. reference conditions.

NEOTROPICAL MIGRATORY BIRDS

Close to 30 species of migratory birds occur on the Barlow and Hood River Districts, some of which are present within the project area during the breeding season. Some species favor habitat with late-successional characteristics, such as the hermit thrush and brown creeper, while others favor early-successional habitat such as the Nashville warbler or the Williamson's sapsucker. Other species like the white headed woodpecker and pygmy nuthatch utilize open ponderosa pine habitat. Sandhill crane nest in Camas Prairie in the open meadow when it is flooded in the spring and early summer. A list of focal migratory bird species potentially (positively or negatively) affected by changes in habitat in the Cascade Mountains Physiographic Province, and the forest conditions and habitat attributes they represent, is available in the Wildlife Specialist report (project record).

3.10.2 Direct and Indirect Effects

3.10.2.1 No Action

FEDERALLY THREATENED, ENDANGERED, OR PROPOSED SPECIES OR CRITICAL HABITAT

Northern Spotted Owl

There would be no short-term effects to northern spotted owls under this alternative. In the short-term, the units that are providing dispersal habitat would continue to function as dispersal habitat and snag levels would remain essentially unchanged. In 20 to 30 years, the stands could start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood.

In the long-term, the stands that are currently considered non-habitat for northern spotted owls would likely become dispersal habitat. Some of the stands may eventually develop nesting habitat characteristics and become suitable spotted owl habitat. However, with no action, it could take as much as 60 to150 years for these stands to develop into suitable habitat.

Northern Spotted Owl Critical Habitat

There would be no short-term effects to northern spotted owl critical habitat under this alternative. In the short-term, the units that are providing dispersal habitat (PBF 4) would continue to function as dispersal habitat and snag levels would remain essentially unchanged. In 20 to 30 years, the stands could start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood. The quality of dispersal habitat (PBF 4) would improve only slightly in some stands while degrading in others depending on site conditions. Stands that are functioning as suitable habitat (PBF 2 and 3) would continue to function as suitable habitat.

In the long-term, the stands that are currently considered non-habitat for spotted owls would likely become dispersal habitat (PBF 4). Some of the stands may eventually develop nesting characteristics and become suitable spotted owl habitat (PBF 2). However, with no action, it could take as much as 60 to150 years for these stands to develop into suitable habitat.

Gray Wolf

There would be no increase in human activities in the area under the no-action alternative.

REGION 6 SENSITIVE SPECIES

Bald Eagle

Under this alternative, there would be no potential for disrupting eagle foraging or nesting behaviors. No trees would be removed, therefore no perch trees or nesting stands would be impacted.

White-headed Woodpecker

Under the no-action alternative, open large ponderosa pine habitat would remain limited, which is important nesting habitat for this species. In the short-term, the analysis area would not provide snags at the 30 and 50 percent tolerance levels for large and small snags for white-headed woodpeckers. The 80 percent tolerance level for large snags (3.5 snags per acre) would not be achieved within 80 years under this alternative nor within 10 years for small snag (4.3 snags per acre) because the proposed treated stands within the burn are too young and currently have little if any snags and down wood.

High densities of trees and shrubs would continue to alter what once provided open habitats when fire was more prevalent on the landscape. White-headed woodpeckers prefer to nest lower on large diameter trees and favor open conditions to be able to escape predators and defend their young, and this habitat would not be provided under current conditions. The number of white-headed woodpeckers in the analysis area would continue to be lower than historic levels.

Lewis's Woodpecker

Under the no-action alternative, high densities of large snags suitable for nesting habitat would remain limited. In the short-term, the analysis area would not provide snags at the 30 and 50 percent tolerance levels for large and small snags for Lewis's woodpeckers. The 80 percent tolerance level for large snags (16.1 snags per acre) would not be achieved within 80 years under this alternative nor within 10 years for small snag (71.0 snags per acre) because the proposed treated stands within the burn are too young and currently have little if any snags and down wood.

High densities of trees and shrubs would continue to alter what once provided open habitats when fire was more prevalent on the landscape. Lewis's woodpeckers prefer large diameter trees and favor open conditions with high densities of snags, and this habitat would not be provided under current conditions. The number of Lewis's woodpeckers in the analysis area would continue to be lower than historic levels.

Western Bumblebee

Under the no-action alternative, there would be no direct impacts to bumble bee nesting, foraging, and over-wintering habitat. There would be fewer flowering plants for foraging under this alternative in the long-term since canopies would remain closed and less sunlight would reach the forest floor which is required for the growth of most nectar plants.

MANAGEMENT INDICATOR SPECIES

Mule Deer and Elk

Disturbance from human presence and activities within the planning area would remain the same as the current levels. Stand structural development would remain unchanged over the short-term; no forage habitat would be created; and thermal and hiding cover for deer and elk would remain the same. In the long-term, forage habitat would be reduced within the watershed as open areas are overgrown with tree species. Road densities would remained unchanged at 2.7 miles of road per square mile.

Pileated Woodpecker

There would be no short-term effects to pileated woodpecker habitat under this alternative. In the short-term, the units that are not providing habitat would continue to function as non-habitat and snag levels would remain essentially unchanged. In 20 to 30 years, the stands could start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood. Stands that are functioning as suitable habitat would continue to function as suitable habitat.

American Marten

There would be no short-term effects to American marten under this alternative. In the short-term, habitat and snag levels would remain essentially unchanged. In 20 to 30 years, the plantation and sapling stands would start to differentiate to varying degrees and show an increase in the levels of small snags and small down wood. Some of the stands may eventually become suitable habitat. However, with no action, it could take as long as 60 to150 years for these stands to develop into suitable marten habitat.

Wild Turkey and Gray Squirrel

Under the no-action alternative, there would be less forage and hiding cover available for wild turkey compared to the proposed action. As stands continue to grow, this habitat would further be reduced. Western gray squirrel do not currently have an abundance of nesting habitat and mycorrhizal fungi for foraging because of the Rocky burn. Without thinning, the more open conditions required for large pine and seed production would not increase and these would continue to be limited for gray squirrel.

SNAG AND DOWN LOG ASSOCIATED SPECIES

In the short-term, plantations would provide low amounts of down wood cover. Most areas would be below 6.5 percent cover of down wood and therefore be below the 30 percent tolerance level for wildlife habitat. Some of the older harvest units would likely have at least 3 percent of down wood comprised of classes 1 thru 4 and therefore would meet the 30 percent tolerance level for natural down wood conditions, as indicated by DecAID inventory data from unharvested plots.

In the next 20 to 30 years, these stands would begin to experience increased stand density and start to become increasingly more susceptible to damaging agents such as insects and diseases. These natural processes would recruit new snags and down logs, mainly from the smaller intermediate and suppressed trees. Trees would take more than 70 years to reach the 24-inch size class.

NEOTROPICAL MIGRATORY BIRDS

There would be no habitat alteration under this alternative. Stand conditions and the composition of migratory bird species dependent on these stands would remain unchanged.

3.10.2.2 Proposed Action

FEDERALLY THREATENED, ENDANGERED, OR PROPOSED SPECIES OR ESSENTIAL HABITAT

Northern Spotted Owls

The proposed harvest treatments would temporarily impact approximately 393 acres of dispersal habitat. This habitat would be impacted by reducing the canopy cover from approximately 70 percent to 40 percent or greater. Although the dispersal habitat within these units would be reduced in quality, they

would still function as dispersal habitat. It is estimated that these units would again provide quality dispersal habitat approximately 15 to 25 years after harvest.

There are 3 home ranges that overlap with the proposed treatment units. The proposed treatments would not reduce the amount of suitable habitat within either the core areas or home ranges.

The impacts to dispersal habitat would not affect the ability of owls to move through these stands. Dispersal habitat would be maintained and the use of this habitat by spotted owls in or near the proposed treatment areas would not change. Because there would be no suitable habitat impacted by project activities and because dispersal habitat would be maintained at current levels, it is unlikely that the proposed harvest activities would impact the health or survival of any birds within or adjacent to the project area and is therefore, not likely to adversely affect spotted owls. A letter of concurrence was received from the USFWS for this call (USFWS, 2016). The effects are also captured in a programmatic Biological Assessment (WPPTL1, 2016).

Northern Spotted Owl Critical Habitat

All of the stands in critical habitat under the proposed action are currently highly stocked even-aged stands and do not provide any PBFs. The proposed treatments include a thinning prescription on 326 acres of critical habitat that would improve the growth rate of the stands. Larger trees would eventually be provided in the second-growth stands in a faster timeframe than they would with no thinning. Structural diversity would be improved by initiating a new age class and by creating openings. Thinning would also have an indirect impact by releasing the green retention trees. These retention trees would later become large diameter snag and downed wood. Treatments would increase the rate that PBFs 2 through 4 would be available for spotted owls. Because treatments are located in non-habitat and there would be no impacts to PBFs, the proposed action would have no effect to spotted owl critical habitat.

Gray Wolf

No dens or rendezvous sites have been detected on the Forest or within the project area. The possibility of a wolf den or rendezvous site remaining undetected in the vicinity of the project area is extremely unlikely because of the vocal nature of wolf packs and the amount of human activity that takes place on this part of the Forest. Project related activities would increase human presence during implementation and this may cause wolves to temporarily avoid the area. These activities would only be taking place in isolated locations in the Rocky project area. Because there are no known den or rendezvous sites within one mile, the proposed action would have “no effect” to gray wolves.

REGION 6 SENSITIVE SPECIES

Bald Eagle

There are some proposed treatments directly adjacent to Rock Creek Reservoir but no suitable perch trees would be removed. No activities, including burning, would take place between January 1 and August 15 within 0.25 miles of the nest in order to reduce the impacts from disturbance to the bald eagles in this territory. This timing restriction would reduce the possibility of disrupting the nesting eagles which would in turn reduce the chance of nest abandonment or exposure of the eaglets to extreme weather or predation.

The proposed project may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species. Because of the timing restriction adjacent to any nest found, foraging would not be disrupted during a critical time when adults could abandon the nest or expose the young to predation. This project would not preclude this pair from utilizing this nest and foraging area after treatment is complete.

White-headed Woodpecker

Vegetative and fuel treatments on 8,461 acres under the proposed action would benefit white-headed woodpeckers by opening the stand and reducing the amount of understory and shrubs on the forest floor. Areas of no treatment adjacent to treated stands would provide a mosaic of open habitat for nesting in close proximity to closed-canopy forests which provide foraging habitat for this species. Fuels treatments that reduce the amount of shrubs would also reduce habitat for golden-mantled ground squirrels and yellow pine chipmunk, which are known nest predators of white-headed woodpeckers. The number of white-headed woodpeckers in the analysis area would be expected to increase over time under the proposed action as habitat conditions for this species improve. The analysis area currently provides marginal habitat for 2 to 3 pairs of white-headed woodpeckers. Under the proposed action, some treatment areas would go from marginally suitable to suitable after 50 or 60 years and the number of nesting pairs that could be supported would increase to 8 to 10 nesting pairs. Because habitat would be improved for white-headed woodpeckers, the proposed action may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Lewis's Woodpecker

Vegetative and fuel treatments on 8,461 acres under the proposed action would benefit Lewis's woodpeckers by opening the stand, reducing the amount of understory and shrubs on the forest floor, and reducing competition in these stands which would result in recruiting larger trees on the landscape more quickly than with no treatments. Areas of no treatment adjacent to treated stands would provide a mosaic of open habitat for nesting in close proximity to closed-canopy forests which provide foraging habitat for this species. The number of Lewis's woodpeckers in the analysis area would be expected to increase over time under the proposed action as habitat conditions for this species improve. The analysis area currently provides marginal habitat for 5 to 6 pairs of Lewis's woodpeckers. Under the proposed action, some treatment areas would go from marginally suitable to suitable after 50 or 60 years and the number of nesting pairs that could be supported would increase to 10 to 15 nesting pairs. Without snag creation once these trees are 17 to 44 inches DBH, nesting habitat would still be limited. Because habitat would be improved for Lewis's woodpeckers, the proposed action may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species. Large snags and large down wood would not be impacted by the proposed action.

Western Bumblebee

The proposed project may temporarily impact flowering plants during road maintenance, fuels treatments, and timber harvest activities. Reducing this food source would reduce the ability of foraging bees to find nectar at these sites which is a required food source for young bees. It is expected that these shrubs would regenerate within a few years and that the bumblebees would have other nectar plants available within the untreated open portions of the project area.

The proposed project may temporarily impact nest sites if these nests are located within abandoned bird nests or other structures above ground. Tree harvest and associated activities could reduce the number of nests available in the short-term and therefore reduce the number of bumblebees that this area could support. Nest sites would increase within a few years after treatment. The temporary reduction in flowering shrubs and nesting sites may impact individuals, but will not likely contribute to a trend towards federal listing or cause a loss of viability of the population or species.

MANAGEMENT INDICATOR SPECIES

Mule Deer and Elk

The proposed treatments would temporarily remove thermal cover from portions of stands where canopy cover is reduced to below 50 percent. While there would be a loss of low-moderate quality thermal cover, there would be an increase in forage within these same stands.

Timber removal, road maintenance, sale area preparation activities could potentially disturb animals in the area at the time of implementation. Disturbance that occurs during their respective seasons could temporarily displace animals, and have the potential to affect the health of individuals if the disturbance occurs near wintering sites.

The project area falls within inventoried deer and elk winter range and the open road density is currently 2.7 miles of road per square mile, which is above the 2.0 miles per square mile standard for inventoried winter range under the forest plan. The proposed action would reduce the open road density for the project area to 1.7 per square mile which is below the forest plan standard of 2.0 miles per square mile.

Pileated Woodpecker

Sapling and plantation stands do not provide habitat for this species, therefore there would be no direct impacts from treatments in these units. In the long-term, habitat for pileated woodpecker would be improved in these stands because larger trees would be recruited onto the landscape more quickly in thinned stands.

The number of large diameter snags and down logs that are currently in these treatment units would not be impacted. Snags would only be felled for safety reasons. Fuels treatments that target small diameter down wood are not expected to remove a substantial amount of large down wood.

American Marten

Sapling and plantation stands do not provide habitat for this species, therefore there would be no direct impacts from treatments in these units. In the long-term, habitat for marten would be improved in these stands because larger trees would be recruited onto the landscape more quickly in thinned stands.

Treatments in the oak restoration stands would reduce canopy cover in portions of the units. This impact to marten habitat would last for 60 to 80 years until the remaining trees grow and conditions will again support large enough trees with greater than 50 percent canopy cover.

There are no large diameter snags and down logs in the plantation treatment units. Snags would only be felled for safety reasons. Fuels treatments that target small diameter down wood are not anticipated to remove a substantial amount of large down wood.

Wild Turkey and Gray Squirrel

The proposed action would benefit wild turkey by opening ponderosa pine stands and providing suitable foraging, nesting, brood-rearing, and roosting cover. Thinning activities would open the forest canopy in places and provide a combination of open, mature, mast-producing forests and shrubs, and species of varying ages and sizes that would create a mix of habitats and would increase the number of turkeys that the planning area could support. Mast-producing trees such as oaks would not be removed during treatments and some treatments would benefit oak habitats by thinning around oaks. Fuels treatments including burning would promote new growth of shrub and forb species. Untreated and adjacent stands would maintain patches of forested habitat that would serve as travel corridors.

Treatments under the proposed action would have both negative and beneficial impacts to western gray squirrels. Reduction of canopy cover and disturbance of the litter layer during harvest may reduce soil moisture resulting in lower mycorrhizal fungi production, which is an important food source for this species. At the same time, thinning activities would provide more open conditions that would increase acorn and pine seed production which is also a food source for gray squirrels. Western gray squirrels would forage in the thinned stands that provide seasonal or an occasional abundance of food, while nesting in adjacent conifer stands with higher canopy cover. The proposed action would not be expected to reduce the number of Western gray squirrels that the planning area could support because thinning and fuels treatments adjacent to untreated stands would continue to provide conditions suitable for both foraging and nesting.

Snag and Downed Log Associated Species

Under the proposed action, the current conditions would remain unchanged. While some snags may be more prone to falling after thinning activities, the amount of snags lost would not be measurable at the watershed scale. Skips and streamside protection buffers would provide short and mid-term recruitment of snags similar to the level described under the no-action alternative. Over the next 50 years, an increased number of snags would be recruited under the proposed action as the stands age and current snag levels would be again be achieved and then exceeded in both habitat types. Some snags may be created during underburning activities. Tree mortality would be limited to 10 percent of the burned units which would increase the number of snags in these units.

Large logs (> 20 inches) existing on the forest floor would be retained and few that size are expected to be consumed during underburning activities. Prior to harvest, sale administrators would approve skid trail and skyline locations in areas that would avoid disturbing key concentrations of down logs or large individual down logs when possible. Snags or green trees that fall after thinning and fuels treatments would contribute to down wood.

Neotropical Migratory Birds

The effects of thinning in mid-successional stands would most likely have a combination of positive, neutral, and negative impacts on migratory bird use within the stands depending on which species are present. The species that may benefit from thinning in the analysis area include the olive-sided flycatcher, white-headed woodpecker, Williamson's sapsucker, and chipping sparrow. The species that may be negatively impacted by thinning in the oak restoration units include the brown creeper, Swainson's thrush, and hermit warbler. These species would be minimally impacted since treatments would be in patches around oak or large pine and would not impact the entire unit.

3.10.3 Cumulative Effects

FEDERALLY THREATENED, ENDANGERED, OR PROPOSED SPECIES OR CRITICAL HABITAT

Northern Spotted Owl

The Rocky burn, utility corridor operations and maintenance, and timber harvest on federal lands in the past, present, and foreseeable future overlap the analysis area in time and space and were considered in this cumulative effects analysis. Past timber harvest in the analysis area has reduced the amount of dispersal and nesting habitat. The proposed action would not impact nesting habitat and dispersal habitat would be degraded but maintained within the treatment units and analysis area.

Spotted owl dispersal needs are better assessed at the landscape scale than at the stand- or habitat-patch scale (Thomas et al. 1990). While the stand-level and landscape-level attributes of forests needed to

facilitate successful dispersal have not been thoroughly evaluated, an attempt to describe dispersal conditions in the Interagency Scientific Committee (ISC) Report (Thomas et al. 1990) recommended managing the forested landscape so that 50 percent of each quarter-township has a mean dbh of at least 11 inches and a canopy closure of at least 40 percent (the 50-11-40 rule).

Approximately 24 percent of the analysis area is providing dispersal habitat, which includes suitable habitat, but this habitat is not evenly distributed. Most of the dispersal habitat is located within the historic territories that overlap the planning area but not within the planning area itself. Because of the Rocky burn, there is very little dispersal habitat remaining. Past timber harvest on federal lands has reduced the amount of dispersal habitat but does not prevent spotted owls from continuing to forage or disperse where these activities have taken place outside of the burn.

Northern Spotted Owl Critical Habitat and Gray Wolf

There can be no cumulative effects because no direct or indirect effects would occur.

REGION 6 SENSITIVE SPECIES

Bald Eagle

The following list of projects in the past, present, and foreseeable future overlap the analysis area in time and space and were considered in this cumulative effects analysis: Timber harvest on federal lands and developed and dispersed campsites operations and maintenance.

Timber harvest has the potential to reduce the amount of nesting stands available for bald eagles. If a stand is too open, eagles may not utilize the area because the birds often prefer less open conditions which prevent a direct line of sight from the nest to adjacent activities. Developed and dispersed campsites reduce the possibility of eagles nesting in a given area. The presence of humans often deters eagles from utilizing an area for nesting. Depending on the sensitivity of the nesting eagles to human activities, the cumulative effects may reduce the chances of bald eagles nesting in the area.

White-headed and Lewis's Woodpeckers

Timber harvest on federal land in the past, present, and foreseeable future overlap the analysis area in time and space and were considered in this cumulative effects analysis. Pre-commercial thinning that treated overstocked stands has benefited Lewis's woodpeckers by increasing the potential for larger trees on the landscape which provide large snags for nesting habitat, and by temporarily reducing the shrub layer, which in turn, reduces nest predation. Past timber harvest on federal land that targeted large ponderosa pine has contributed to declines in habitat. Fire suppression has led to changes in forest tree species composition and structure with the development of true fir in the understory which has changed the habitat from highly suitable to marginally suitable or non-habitat for White-headed and Lewis's woodpeckers.

Western Bumblebee

Timber harvest on federal land, off-highway vehicles trail construction, pre-commercial thinning, and noxious weed treatment in the past, present, and foreseeable future overlap the analysis area in time and space and were considered in this cumulative effects analysis.

Projects that may increase or improve foraging habitat in the long-term include road closures, pre-commercial thinning, and noxious weed treatments. While weed treatments may benefit bumblebees by improving habitat for native flowering plants, bees can be indirectly harmed when the flowers that they

normally use for foraging are removed by the application of broad-spectrum herbicides. Depending on the prescription and the condition of the stand before treatments, timber harvest may increase or decrease the amount of foraging habitat available. Off-highway vehicle trail construction and maintenance reduces the amount of foraging and nesting habitat.

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. Large scale ground disturbing activities alter landscapes and habitat required by bumble bees by removing flowering food sources, disturbing nest sites and altering the vegetation community. The size of bumble bee 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.

While the projects analyzed under cumulative effects may have impacts to individual bumble bees, the main threats to this species are agriculture and urban development, livestock grazing, and broad scale insecticide application (Thorp et al. 2008). These kinds of activities are not included in the proposed action and are not part of the cumulative effects analysis. Because some of the proposed activities increase or improve habitat while others may decrease it, the impacts would likely be beneficial and detrimental at the same time, and populations of this species would still persist in the analysis area.

MANAGEMENT INDICATOR SPECIES

Deer and Elk

The following list of projects in the past, present, and foreseeable future overlap the analysis area in time and space and were considered in this cumulative effects analysis: timber harvest on federal and private lands, road decommissioning and road closures, off-highway vehicle trail construction and use, and developed and dispersed campsites.

It is assumed that at least 50 percent of the private land would not provide thermal cover at any given time. However, cover is not considered a limiting factor for deer and elk in the analysis area because much of the Forest's lands are providing cover and very little forage opportunities. The optimum cover forage ratio is 60 percent forage and 40 percent cover (Thomas, 1979). Forage availability is more of a limiting factor on the Forest, but is more available off-Forest as a result of regeneration harvest on private lands. Cumulatively, there would be a small increase in forage and a small decrease in cover which would move the forage to cover ratio towards the optimum ratio.

The increase in human presence from off-highway vehicle trails and developed and dispersed campsites would modify behaviors and may cause some avoidance behaviors by both deer and elk. Deer are expected to be more tolerant of recreation, while elk are less, and may move out of areas at certain times of the year. However, seasonal closures on roads and trails would be implemented in the areas for winter range.

Pileated Woodpecker, American Marten,

Timber harvest in the past, present, and foreseeable future overlap the analysis area in time and space and were considered in this cumulative effects analysis.

Past timber harvest on federal lands has reduced the amount of habitat in the analysis area. Habitat for these species has continued to increase over time across the Forest but the analysis area would likely provide less habitat than other areas of the Forest due to the Rocky burn.

Wild Turkey and Gray Squirrel

Timber harvest on private and federal land in the past, present, and foreseeable future overlap the analysis area in time and space and were considered in this cumulative effects analysis. Thinning would have a combination of beneficial and negative impacts to wild turkey and western gray squirrel.

Timber harvest and thinning have opened the forest canopy and increased forage and nesting habitat for turkeys. Reducing the canopy cover also reduces nesting habitat for western gray squirrel but may also increase pine seed production for foraging.

SNAG AND DOWN LOG ASSOCIATED SPECIES

Timber harvest on federal lands in the past, present, and foreseeable future overlap the analysis area in time and space and were considered in this cumulative effects analysis. It is not likely that private lands would provide snags and downed wood in the foreseeable future. Other timber harvest activities on Forest Service land would have similar impacts as the proposed action. Structural diversity would be improved by initiating a new age class and by creating openings. Thinning would also have an indirect impact by releasing the green retention trees. These retention trees would later become the large diameter snags and downed wood. The blocks of unharvested habitat would provide large snags and down wood while the treated areas of the watershed move toward the mature forest state. The adjacent untreated areas would allow for snag and down wood-dependent species to recolonize habitat as snags and down wood increase in the treated areas.

NEOTROPICAL BIRDS

The following list of projects in the past, present, and foreseeable future overlap the analysis area in time and space and were considered in this cumulative effects analysis: timber harvest on Federal lands, road decommissioning and road closures, and pre-commercial thinning.

The cumulative effects of timber harvest activities are similar to the effects of the proposed action and would have a combination of positive, neutral, and negative impacts on migratory birds. Open habitat that would be created could be beneficial for early seral species like the olive-sided flycatcher, chipping sparrow, and Williamson's sapsucker. The Swainson's thrush and brown creeper would be negatively impacted by habitat removal.

3.11 Recreation

This section of the environmental assessment summarizes the Recreation Analysis Report that is incorporated by reference (project record).

The factors that were analyzed for project related impacts on recreation include developed recreation facilities, dispersed recreation, trails, wilderness, and the Recreation Opportunity Spectrum (ROS). Recreation was also examined in the context of the prescribed management allocations, standards and guidelines under the forest plan.

3.11.1 Existing Condition

A variety of recreation activities occur within the planning area. Two popular campgrounds are located within the planning area as well as the Rock Creek Off-Highway Vehicle (OHV) area, which is one of three OHV trail systems on the forest. The eastern portion of the project area is adjacent to private land making this area accessible to numerous land owners who utilize the area for dispersed recreation. The

majority of recreation activity takes place during the spring, summer and fall, however there is some use during the winter.

Developed Recreation Facilities

Developed recreation facilities within and directly adjacent to the planning area include Bonney Crossing campground, Rock Creek campground and Gate Creek staging area. Bonney Crossing and Rock Creek campgrounds are operated by a concessionaire. Rock Creek campground is very popular. It opens in mid-April each year, and is adjacent to Rock Creek reservoir. Early season campers enjoy this location because of its proximity to Rock Creek reservoir, which is popular for fishing. Bonney Crossing opens near Memorial Day each year and is popular for horseback riders because it provides corrals. This campground is close to the Badger Creek Trail which accesses the Badger Creek Wilderness. Both Campgrounds close in early September each year.

Gate Creek staging area is the OHV staging area accessing the east side of Rock Creek OHV area. The gravel staging area includes parking for vehicles trailering OHVs as well as an outhouse, an information board and several non-pay campsites. Two OHV trails exit the staging area – 921 and 916.

Dispersed Recreation

Dispersed recreation occurs throughout the planning area, and common activities include: driving for pleasure, hunting, special forest products collection, and camping.

Driving for pleasure is most heavily concentrated along Forest Service Road 48, locally referred to as the White River Road. The road offers views of Mount Hood, Badger Creek Wilderness and transitioning forest types. This is a secondary route connecting Highway 35 to Highway 197.

Hunting and special forest collection occurs throughout the planning area.

Dispersed camping occurs in various locations throughout the planning area. There are no amenities such as toilets and picnic tables, but visitor-created developments such as vehicle pullouts and rock fire rings may exist. The Forest does not have a complete inventory of dispersed campsites within the planning area, but local manager experience suggests that there are numerous dispersed campsites. Some campsites are well developed with a long history of use whereas others might consist of little more than a fire ring. Known concentrations of dispersed campsites can be found throughout the western portion of the planning area where several miles of OHV trail are concentrated. These dispersed camps are often used to provide easy access to the Rock Creek OHV area.

Trails

OHV and Snowmobile trails are the only system trails within the planning area as shown in table 9. These trails are maintained in partnership with multiple volunteer groups.

Table 9. Trails within the planning area

Trail Number	Permitted Uses	Mileage within planning area
475	OHV	1.8
822	OHV	2.1
900	OHV	1.0
903	OHV	1.0
904	OHV	4.4

905	OHV	2.4
906	OHV	0.6
907	OHV	1.2
908	OHV	0.7
909	OHV	2.3
911	OHV	0.98
913	OHV	0.0008
914	OHV	0.002
915	OHV	0.16
916	OHV	1.3
SNO-823	Snowmobile/Tracked Vehicles	1.04

Recreation Opportunity Spectrum (ROS)

The Roaded Modified ROS covers the majority of the planning area. These areas are meant to provide for a range of recreation experiences that are consistent with substantially modified, motorized settings in which the sights and sounds of humans are readily evident and the interaction between users can be from low to high. Recreation experiences and opportunities in these areas often depend on vehicular access off the primary routes via secondary roads. Camping experiences are relatively primitive, with few on-site facilities provided, requiring some self-reliance and use of primitive outdoor skills.

Approximately 359 acres of Rural ROS is located within the southeastern portion of the planning area. A Rural area is characterized by a natural environment that has been substantially modified by development of structures, vegetative manipulation, or pastoral agricultural development. Resource modification and utilization practices may be used to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate user densities are present away from developed sites. Facilities for intensified motorized use and parking are available.

Wilderness

The Badger Creek Wilderness is a congressionally designated wilderness area. The planning area is adjacent to the wilderness, however no activities are proposed within this wilderness area.

3.11.2 Direct and Indirect Effects

The geographical analysis boundary for the determination of direct, indirect, and cumulative effects is comprised of the project area and the Badger Creek Wilderness, which lies adjacent to the northwest corner of the project area. The temporal boundaries used for analyzing the direct and indirect effects were 1-10 years (short term) and 10 – 50 years (long term).

3.11.2.1 No Action

There would be no direct effects as a result of selecting the no-action alternative. An indirect effect of implementing the proposed action would be the loss of a potential opportunity to bring the trail tread and experience closer to the designed use for the Rock Creek OHV trails authorized under the 2010 OHV Management Plan. Timber sales typically generate funding which could be used on impacted and nearby trails. With the no-action alternative, no timber sale funds would be generated and this work would be less

likely to occur in the short term. In the long term, roads and existing trails which were recently converted from roads would continue to naturalize and provide a more desirable trail experience.

3.11.2.2 Proposed Action

Developed Recreation Facilities

Activities are proposed adjacent to both campgrounds located within the planning area. The area adjacent to Bonney Crossing campground is identified for oak restoration. Oak restoration activities include conifer harvest around legacy ponderosa, aspen and Oregon white oak as well as brush piling treatments. Prescribed burning or mechanical fuels treatment may be used as well. Rock Creek campground is located in an area that has also been identified for an under-burn treatment. These activities could impact campers if they occur when the campgrounds are open. There would need to be coordination with recreation staff to ensure that campers are made aware when treatment activities are going to occur. It is unlikely that the campgrounds would need to be closed unless the spring burning window occurs in April after Rock Creek is open. If this occurs, efforts would be made to let potential campers know ahead of time. This campground is on the national reservation system, so it would be important to coordinate closures as early as possible so reservations can be canceled if necessary.

Under-burn treatments are also proposed adjacent to Gate Creek Staging Area. This could have an impact to OHV users if the treatments occur when the area is open between April 1 and November 30. Coordination would be needed with recreation specialists to ensure that there is adequate communication and signage making riders aware of proposed activities.

During implementation, logging trucks and other equipment would use the roads that provide access to the developed recreation sites within and adjoining the project area. Visitor safety along these roadways would be a concern, and the proposed alternative includes mitigations for road safety.

Dispersed Recreation

The proposed activities would affect dispersed recreation within the planning area. The proposed alternative closes approximately 38 miles of road to public traffic. These roads would not be accessible to motor vehicles which could have a negative impact on driving for pleasure, although the main route utilized for this activity is Forest Road 48, which is not proposed for closure. A positive effect of the road closures would be that non-motorized access along these roads would remain for hunters as well as individuals interested in special forest products. Road closures could also prevent some access to dispersed campsites which have been accessed in the past with vehicles. If individuals wanted to walk into sites they would still have access, however, individuals who need access with a vehicle would no longer have that access to camp.

Other impacts to dispersed recreation include short term effects to visitor use of dispersed campsites. Sites would not be safe or feasible to access during implementation of the proposed action. Situationally appropriate temporary closure areas, as well as road and trail signage would mitigate the safety concern, although short term inconveniences would be unavoidable. Overall, there could be localized affects to dispersed campsites as a result of the proposed action, but the magnitude of the effect would be nominal. There are a large number of dispersed campsites on the Forest and many opportunities would continue to be available for recreationists seeking campsites both inside and outside the project area. A likely short-term effect to dispersed recreationists would be the avoidance of areas where logging is occurring due to noise and equipment.

The overall effect to dispersed recreation activities would be nominal as these types of activities are very adaptive to changes in the landscape as they are generally not dependent on specific sites at the scale of this project.

Trails

Proposed thinning activities would overlap with approximately 20.9 miles of OHV trail and 1.04 miles of snowmobile trail. It is important to note that not all of the combined trail miles would be directly affected by planned activities. Affected trails may be used as temporary roads for timber haul and for equipment transport. After implementation of project activities, trail tread would be re-established, and in some locations, trails might be realigned to avoid future conflicts.

During implementation, affected trails would need to be closed to provide for public safety during harvest and haul of materials. Rock Creek does not have a large system of trails, so closures would impact trail users. The project area includes several interconnected trails which are commonly used as loops, so closures on the 20.9 miles of affected trail are likely to close larger portions of the trail system. While trail closures are typically less than a season in duration, proposed actions of this nature are typically overtaken across a several-year time period with some stands being treated one year, while other stands are treated in other years. Thus, the magnitude of the effect to recreationists could be significant if trail closures were not coordinated. It would be important to communicate closures and alternative routes and areas for OHV recreation prior to the implementation of closures so that individuals can plan accordingly. Professional experience also suggests that the magnitude of this impact is greater if recreationists discover that a trail is closed upon arrival at the trailhead. The proposed action includes PDC for coordination of activities to minimize the effect to recreationists to the degree practicable. This would ensure that while there may be closures there would continue to be trail opportunities within the planning area, and that the public would receive ample notice prior to closures.

The magnitude of the impact of the proposed action would be greater to trails with established and designed tread that are meeting the desired trail conditions. A particular concern is the potential disturbance of the trail tread, as a result of road use, timber harvest equipment, or skidding. Another effect would be that of vegetative treatments to the experiential and visual component of the recreationist's experience. Particularly large numbers of cut stumps and trees marked with paint as well as vegetation that has grown in around trails creating shade and visually pleasing screening. Many of the trails are old roads which were converted to trail. It generally takes some time, and vegetative growth, for these conversions to develop into the desired trail condition. Any use of these trails for roads or equipment would be a setback to the development of these trails.

In the long term proposed activities would present opportunities to move the trail tread towards desired conditions. An indirect effect of implementing the proposed action would be the opportunity to improve trail tread and functionality to ensure trails function appropriately over the long term both ecologically and socially using stewardship funding. This would bring the trail tread and experience closer do the designed use for the Rock Creek OHV trails that do not currently meet the desired trail conditions for OHV trails. Indirectly, temporary roads and skid trails have the potential to be converted to non-system OHV trails by visitors. Creation and use of these non-system trails is prohibited, and non-system trails often have associated resource issues. The proposed action includes PDC that would close and rehabilitate any temporary roads or skid trails that were created as a result of implementing the proposed alternative. This would limit the potential for creation of non-system OHV trails.

The proposed action does not include winter operations; however, it is not uncommon to receive waiver requests for winter operations during implementation. Should a waiver request be received it would be important to consider potential recreation effects in the decision to issue or not issue a waiver.

Recreation Opportunity Spectrum (ROS)

The proposed action would be consistent with the recreation opportunity spectrum (ROS) classifications for the planning area.

Wilderness

Activities are not proposed within wilderness areas. Boundaries would be clearly marked where units are adjacent to the Wilderness boundary. In the long term, preventing the establishment of non-native and invasive species is a desirable method of preserving wilderness character. PDC to treat equipment prior to operation in units that are adjacent to wilderness would reduce the risk of introducing invasive species to these areas.

3.11.3 Cumulative Effects

The geographical boundary analysis boundary for cumulative effects is the area of overlap of past, present, and foreseeable future projects with the Rocky project area and Badger Creek Wilderness adjacent to the northwest side of the project area. The temporal scale of this cumulative effects analysis is 1-10 years (short term) and 10 – 50 years (long term).

3.11.3.1 No Action

There would be no cumulative effects because there would be no direct effects, and there is no overlap with the indirect effects identified.

3.11.3.2 Proposed Action

No cumulative impacts would occur as a result of ongoing trail maintenance because trails would be closed during implementation of the Rocky activities, and project design criteria would mitigate any long term impacts after completion of the project. Road decommissioning and road closures would affect motorized access to dispersed recreation such as for camping and hunting. However, there are many locations across the forest where these opportunities are preserved. Additionally, road closures can be a benefit to hunters and other recreationists seeking roads that are easy to walk along but do not allow motorized vehicles. Overlapping timber harvest on federal, county and private lands may lead to trail and site closures, making it more difficult for individuals to find locations to recreate; especially OHV users, as there are limited locations where this activity is currently allowed. Over time, potential hazard tree harvest along roads and trails would continue. The level of hazard tree removal needed within treated units is expected to decrease in the short to midterm. Crystal Clear Restoration project impacts to FS system trails, developed recreation sites and dispersed recreation is expected to overlap with the Rocky project. A large portion of the OHV trail system located in the Rock Creek and McCubbins Gulch area has the potential to be affected by vegetation projects occurring on similar time frames. This would limit opportunities for OHV users on the Mt. Hood National Forest displacing some users to the limited open OHV areas. Illegal OHV use may increase in the short to mid-term as a result. There should be no impact to snowmobile trails unless a waiver is considered for winter use. Impacts would be nominal in this case due to the limited overlap in trail mileage with the project area. Activities occurring adjacent to and within recreation sites has the potential to affect visitors, however, there are many developed and dispersed sites that would not be impacted by operations so impacts would be nominal.

3.12 Visuals

This section of the environmental assessment summarizes the Scenery Analysis Report that is incorporated by reference (project record).

The Visual Management System (USDA 1974) and the Scenery Management System provided the primary framework and criteria used for the visuals analysis. Particular attention was given to the "seen area" of the landscape which is defined as the portion of the landscape visible from a viewer position on a travel route, water body or recreation use area. Initial seen area analysis was completed using Google Earth software.

The current Forest Plan Land and Resource Management Plan (LMRP) was developed under the Visual Management System (VMS). The forest plan assigns each management area a Visual Quality Objective (VQO). On the ground determination of the visual quality objectives is driven by viewpoint of the observer. The foremost consideration is the designated travel routes within viewshed corridors identified by the LMRP. The relation of the view from a visual corridor travel route is based on the following classifications.

The forest plan was completed using the Visual Management System (VMS), however there is more recent direction to use the Scenery Management System (SMS) which focuses on landscape character, scenic attractiveness, and scenic stability. Policy dictates that any future updates to the forest plan will use the Scenery Management System. Scenic integrity is a measure which provides a rough comparison between Visual Quality Objective definitions and Scenic Integrity.

Visual Management System Definitions

- Immediate foreground – 0’ to 300’
- Foreground – 300’ to ½ Mile
- Middle ground – ½ Mile to 4 Miles
- Background – 4 Miles to Horizon

The following visual quality objectives are applicable to the project area (LMRP, IV-22):

- Retention – Human activities are not evident to the casual forest visitor. These are landscapes with high scenic integrity.
- Partial Retention – Human activities may be evident, but remain subordinate to the characteristic landscape. These are landscapes with medium scenic integrity.
- Modification – Human activities may dominate the characteristic landscape, but must at the same time utilize natural form, line, color, and texture. These are landscapes with low scenic integrity.

Information gathered from various information sources, seen area analysis, and field visits was used to determine the existing condition of scenic resources. Proposed actions were analyzed for possible changes and effects to VQOs. The project area was used to determine direct, indirect and cumulative scenic effects. The temporal boundaries for analyzing the direct and indirect effects are 1 year (short-term) and 10 – 50 years (long-term). Particular attention was given to stands immediately adjacent to or visible from Highway 26 and OR-216.

3.12.1 Existing Condition

In 1974, the Rocky Wildfire burned over 6500 acres of Forest Service and private lands and the Rocky Restoration project overlaps with a significant portion of the historic burn area. Responding to the wildfire the project area has experienced significant management activity including widespread and repeated salvage logging, grass seeding, grazing and tree sapling planting and more. In recent years,

recreation use has also increased and has resulted in ground disturbance through the development of the Rock Creek Off-Highway Vehicle (off-highway vehicle) trail system, informal trail heads and dispersed campsites along Forest Service roads. The Rocky Restoration project area shows significant evidence of human activity which affects the scenic integrity of the landscape.

The majority of the Rocky Restoration project area is categorized as management area C1 (wood product emphasis). The C1 management areas is intended to provide lumber and wood products and when possible enhance other resource objectives compatible with timber production. C1 management areas have a prescribed VQO of modification allows for a maximum of 25 percent of the area that can be visually disturbed at one time. There has been a significant amount of past timber harvest activity, off-highway vehicle use, and trail use within these management areas; and the effects of harvest activity are often visually evident. The combination of forest type, wildfire burn areas, timber harvest and other vegetation management activities have created opportunities for viewing distant peaks in some places, which is noted as a desired condition in the forest plan. Mount Hood and Badger Creek Wilderness can be seen from the White River Road (Forest Service Road 48) Scenic Viewshed (B2). When they are visible, they are typically located in the middleground or background. While human modifications are present within this management area they remain visually subordinate to the natural landscape, and these areas currently meet the prescribed modification VQO.

Forest Service Road 48 (FSR 48), locally referred to as the White River Road (WRR) was identified as an important scenic roadway in the Mount Hood National Forest Land and Resource Management Plan (LRMP). The WRR has been assigned as B2, management area (scenic viewshed) and contours the southeastern boundary of the Rocky Restoration project area. The WRR has associated human modifications which are visually evident and detract from the VQO. The most noticeable contrasts to the natural setting are the occasional road signs, guardrails and cattle guards within the right of way. Some maintenance adjacent to WRR such as brushing, tree felling and other work may be seen. The casual observer may focus on the natural setting, and at the normal rate of travel (45 mph or less), the magnitude of these effects is minor.

Overall, the views from WRR are of a scenically attractive landscape dominated by natural line, colors, textures and forms. The forest transitions from a more arid ponderosa pine and western white oak forest type to the more thickly forested landscape punctuated by changing topography, rock outcroppings, rocky road cuts, and occasional views of Mount Hood and Badger Creek Wilderness. These elements combine to create a sense of place, unique to this portion of the Cascade Range. Some short portions of the road where previous harvest occurred, sapling stands in particular, meet a partial retention VQO and not the prescribed retention VQO. However, the majority of the road meets the prescribed retention VQO for the foreground, and partial retention VQO for the mid-ground and background.

The trails that are located entirely within the planning area or intersect with the planning area include: All but one (914) that cross the planning area are classified as sensitivity level III and their prescribed VQO's for foreground, far foreground, and middleground are all modification. Trail 914 has a sensitivity level of II, and foreground, far foreground, and middleground VQO classification of partial retention, modification, and modification respectively.

3.12.2 Direct and Indirect Effects

3.12.2.1 No Action

There would be no direct effects as a result of implementing the no-action alternative. An indirect effect of taking no action would include a missed opportunity to complete several sections of road to off-highway vehicle trail conversion utilizing a variety of funding sources. This would improve the visual

quality objective of the off-highway vehicle trails which, in part, currently look like roads. With the no-action alternative, no timber sale funds would be generated and this work would be less likely to occur.

Portions of the landscape within Scenic Viewshed (B2) management area are not meeting their desired visual condition. With the No Action, these areas would continue to be a visible detraction from the scenic integrity of the landscape in the mid-term. In the very long term (50+ years), these stands would eventually begin to take on the desired VQOs.

With the no-action alternative fuels treatments would not occur and there would be greater risk of wildfire which would reduce the scenic attractiveness of the landscape due to the use of heavy equipment for suppression efforts which can result in long-lasting visual effects to the landscape.

3.12.2.2 Proposed Action

The proposed action includes mitigations to address the visual effects of actions associated with commercial thinning, sapling treatments, and fuels treatments. These mitigations would reduce the magnitude of effects to VQOs and ensure that the proposed actions do not result in areas dropping below its existing condition VQO. Mitigations are included in the full Scenery Analysis Report which is incorporated by reference for additional information.

The proposed action would apply variable density thinning (VDT), which allows flexible local density levels to achieve overall treatment objectives, and allows emphasis to be placed on reducing stand density around legacy ponderosa pine trees, aspen, Oregon white oak and leaving vigorous trees of all sizes without concern for spacing. Thinning below a 50 ft2 basal area for stands visible from Forest Service Road 48 would not align with the prescribed retention VQO (Ribe 2009). Mitigations keeping these stands above 50 ft2 basal area would ensure that their VQO is not lowered as a result of this element of the Proposed Alternative. The proposed treatments directly adjacent to Forest Service Road 48 are primarily prescribed underburning. Units 65 and 66 are designated as B4/modification and are directly adjacent to Forest Service Road 48. In this instance, the prescriptions for these units would better align with the standards described for the B2 VQO if VDT stayed at or above 50 ft2 basal area. Any areas which dropped below would be small in scale and would result in natural appearing openings. In this regard, the proposed action would be consistent with prescribed VQOs for the broader planning area.

Variable density thinning would also involve other associated actions with the potential to directly affect scenic resources. Specific actions which would result in visible evidence of human modifications to the landscape include:

- Cutting trees which leave visible stumps.
- Tree marking paint, flagging and boundary tags are visible human modifications which can detract from scenic integrity.
- Construction of temporary roads and skid trails, and temporary landings.
- Thinning, as it is likely to produce of slash or other debris, which may be removed or scattered. Evidence of thinning may also subsequently be treated by piling and burning. If left on the landscape in large quantities, it would detract from VQOs.

In the short term, the proposed action would not change the VQO of these stands, however in the long term, the proposed action would be likely to improve VQOs. The overall intent for these treatments would be to move the stands toward better forest health, improve wildlife habitat and reduced wildfire risk. This would result in conditions with scenic benefits as well. Older stands are more likely to contain a mosaic

of species and age classes distributed in natural-appearing patterns. A diversity of tree and shrub species of various sizes and ages which adds color contrast and texture. These stands would be more likely to contain target tree diameters for mature trees as prescribed in the forest plan. With mitigations to the direct effects of the proposed action (for instance, temp roads, landings, stumps) the result is likely to be a natural-appearing forest landscape.

The majority of the treatment units within the planning area generally meet a modification or partial retention VQO. The proposed sapling thinning would have the following visual effects:

- Thinning saplings would allow viewers to see further into stands which would allow for greater ability to see any objects of visual interest which might be present (for example, rock outcroppings, remaining large trees, etc.). This is generally a positive effect to VQOs.
- Saplings are typically thinned to a relatively even spacing. This would continue to contrast to the typical pattern of the characteristic natural landscape in the short term, but would not result in a change from existing conditions.
- Effects from past management activities, such as stumps, would continue to be visible on the landscape. Additional stumps from small diameter saplings cut as a part of these treatments would also be visible, although these typically decompose relatively quickly.
- Tree marking paint, flagging and boundary tags are visible human modifications which can detract from scenic integrity.
- Sapling thinning is likely to produce slash or other debris, which may be removed or scattered. It may also subsequently be treated by piling and burning. If left on the landscape in large quantities it would detract from VQOs.

Post treatment, these stands would continue to exhibit a visible human modification to the landscape in the short and midterm. This modification would still be visually subordinate within the natural setting of the landscape, and these stands would retain their current VQO. For stands within the project area, the current condition is either a partial retention or modification VQO, depending on the mitigations that were implemented with the past treatment. In the long term (10+ years), these stands would have lower risk of wildfire and improved stand health. In the long term, the remaining trees would be quicker to develop into larger trees, and spacing would allow for the establishment of greater diversity of species and tree age class. This would better align with the natural line, form and pattern of the characteristic landscape and meet a retention or partial retention VQO.

An element of the purpose and need for the project is the reduction of the fuel loadings within the project area. This would be accomplished by treating residual fuels after treatments. Research has shown that high levels of down wood and debris are visually unappealing (Ryan 2005). Treating residual debris would be a positive effect to the scenery of the project area. However, the methods used to accomplish this can have their own visual effects. These methods and their effects include:

- Debris may be piled by hand or by machine and subsequently burned. There is a short-term visual effect due to the presence of the piles on the landscape while fuels cure. These piles are typically burned in the late fall when conditions prevent the spread of wildfire. Consumption of materials is based on weather and fuel moisture and is challenging to predict. Any machine piles which fail to burn completely could leave a ring of unburned fuels, which could have a long-lasting visual effect. The magnitude of this effect would depend on the frequency and number of piles which did not completely burn.

- Low intensity underburning and jackpot burning typically results in a natural-appearing effect. This occasionally necessitates the creation of handline to prevent the spread of fire. Handline would be a minor negative effect to VQOs if not rehabilitated.
- Lopping and scattering is a method used when fuel concentrations are low, and is typically not a noticeable effect beyond one year.
- Biomass collection removes the fuels and has a natural-appearing result. The collection itself can have visual effects, typically as a result of equipment operation (for example, landings, skid trails and temp roads).
- Mastication (and/or chipping) involves reducing the size of forest vegetation and downed material by grinding, shredding, chunking or chopping material. The visual effects of this depend on the size and quantity of the remaining debris. Smaller debris tends to be less visually apparent and tends to decompose quickly. The tons per acre of desired fuel loading (for instance, debris from mastication) in the prescribed action would necessitate small-sized residual debris at low densities. The visual effect from this would be a low magnitude. The proposed action includes mitigations to address the visual effects of actions associated with particularly visually-sensitive stands along Forest Service Road 48.

Fire is a natural feature of the characteristic landscape and can have a mixed affect to scenery. Large, high-intensity, stand-replacing fires have the potential to reduce scenic attractiveness (USDA 1995b). Low-intensity, small-scale fires can open up views to the broader landscape and reveal interesting topography and geology. Many vegetative species require disturbance, thus, fire can result in greater vegetative diversity. Fire can also obscure some of the visible evidence of past human effects on the landscape (for example, cut logs or stumps). The proposed action would reduce the risk of catastrophic wildfire with negative affects to scenery, and the small-scale, managed fire in the proposed action would facilitate some of the scenic benefits which can result from fire.

The proposed action overlaps with approximately 20.9 miles of existing off-highway vehicle trail. The desired visual qualities associated with trails would be impacted in cases where trail was used for temporary roads, timber haul, and equipment transport. To mitigate this the trail tread would be re-established upon completion of project activities, or in other locations, trails might be realigned to avoid future conflicts. This work would be accomplished using Knutson-Vandenberg Act or stewardship funding as a result of implementation of the proposed action.

Many of the off-highway vehicle trails within the project area were never actively converted to trail and still have all of the physical and visual characteristics of a road. Project implementation would not result in any significant change to the existing visual condition of these trails. Post project mitigations would provide an opportunity to actively complete many of these roads to trails conversions. This would result in these trails having the visual characteristics of a trail, and may improve the VQO for the trail.

3.12.3 Cumulative Effects

3.12.3.1 No Action

The same effects as described for direct and indirect would apply to cumulative effects.

3.12.3.2 Proposed Action

Portions of the project area are part of the background distance zone for other scenic viewsheds, and areas outside of the project area also form the background for views within the project area. In many locations inside and outside of the planning area, views would be screened by mountain topography and forest vegetation. The spatial context of the cumulative effects analysis considered the potential for visual effects to travel commensurate to their distance zone. Reduction of canopy cover is the only element of the proposed action which is likely to be seen from a background distance zone, however it would retain a natural color, texture, and form.

The proposed action Alternative would include immediate effects as a result of implementation, however many of the indirect effects would occur in the long term (10+ years). For example, vegetative growth, forest health, and naturally-occurring events such as wildfire, are natural processes which influence scenic resources in the long term. For the remainder of the proposed actions, the potential for cumulative effects was limited to the project area. Table 10 displays the applicable past, present, or reasonably foreseeable activities and the associated cumulative effects.

Table 10. Cumulative Effects to Scenic Resources

Activity	Affected element of recreation	Time overlap	Space overlap	Measureable	Effect description
Ongoing trail maintenance	FS system trails VQO and Land Allocation VQO	No	Yes	No	No measureable cumulative effects would occur
Road decommissioning and closures	Land Allocation VQO	No	Yes	Yes	This project would bring the project area into better alignment with the 2010 Off-highway Vehicle Decision. It would likely reduce the number of non-system roads and be a positive effect to VQOs.
Future hazard tree harvest along roads, trails, and developed recreation sites	Land Allocation VQO	No	Yes	No	Over time, potential hazard tree harvest along roads and trails could open up scenic views within the project area. This could improve views of Mount Hood as well as other unique natural features within the planning area. This is unlikely to be a measurable effect.
Past vegetation treatments	Land Allocation VQO	No	Yes	Yes	As mentioned in the existing condition section, clearcutting which occurred prior to the mid-1990s altered both the project area and the surrounding landscape. Proposed vegetative treatments would have a lower magnitude effect to scenic resources than past practices. In the long term, the visible effects from past clearcutting should continue to diminish.

3.13 Heritage Resources

3.13.1 Existing Condition

Portions of the project area are generally level, gently undulating lands that probably once contained numerous small pluvial ponds and seeps. Large upland meadows to the south of the project area contain camas, grasses and forbes that may have supported considerable numbers of ungulates. Nearby sites containing desert side-notch and Cascade Phase projectile points indicate that Early Archaic prehistoric groups were utilizing the region as early as 8,000 years ago. These sites generally seem to be small and scattered within diverse environmental zones. One site in particular (661NA0131) exhibits only Cascade Phase tools, suggesting that utilization of the area may have quickly tapered off with the changing climate and availability of resources. Tools excavated at the site indicate that the area was used for subsistence hunting, fishing, gathering, and plant processing. There is also some evidence that nearby areas were used specifically for camas. Peeled western cedar trees indicate that the west portion of the project area was used for huckleberry gathering.

Within the proposed project area, Native American sites may have centered around the confluence of Rock Creek and Wildcat Creek with other unnamed ephemeral drainages in the location of the present Rock Creek Reservoir. Construction of the reservoir in 1939/1940 probably obliterated any indication of occupation by Native American groups. A cursory walkover survey of the emptied dam in 2002 by East Zone Archaeologist Michael D. Dryden was negative for cultural materials; however, silty deposits ranged from 24 inches to 30 inches in depth throughout the area.

3.13.2 Direct and Indirect Effects

The analysis area for heritage resources in this environmental assessment is the area of ground disturbance as proposed for all alternatives. Ground disturbance includes treatments using heavy machinery associated with logging, burning, and temporary road construction.

3.13.2.1 No Action

Under the no-action alternative, Heritage Resources would only be affected by decay and other natural and physical forces that are already occurring. This alternative would have no effect on heritage resources.

3.13.2.2 Proposed Action

The Gate Creek Ditch (661EA0334), the Threemile Creek Ditch (661EA329), and the Highland Ditch (661EA279) are linear features that travel across areas proposed for thinning and prescribed burning. A buffer zone designated 50 feet from the center line on both sides of the ditches would be flagged through the treatment units. Heavy machinery would be excluded from the buffer zones. Any trees harvested within the buffer zones would be felled directionally away from the ditches. Hand bucking and piling of slash would be the only method used within the buffer zones. Slash may be piled immediately adjacent to, but not within the ditches. Skidding across the ditches would be restricted to previously disrupted crossings as determined by an archaeologist. With these stipulations, the project can proceed with no effect to the historic ditches.

The lithic scatters consist of tools and waste materials from stone tool manufacturing, re-sharpening, and use. Lithic scatter sites (661NA282 and 661NA131) are situated in areas proposed for under burning only. No fire control lines are proposed in the vicinity of either site. Low-temperature broadcast under burns are generally considered to have no effect on lithic scatters. Under burning would have no effect on the lithic scatter sites.

Wooden culvert (661EA243) is situated to the northwest of an area proposed for thinning and prescribed burning. The culvert is situated beneath an abandoned roadbed and should be outside of any activities associated with this project; however, as a precautionary measure, a 100-foot buffer zone for the exclusion of heavy machinery would be flagged around the site. Any trees harvested near the buffer zone should be felled directionally away from the buffer zone. The project can proceed with no effect to the wooden culvert.

The Rock Creek Guard Station telephone line (661EA330) consists of ceramic split-tree insulators mounted to trees. The telephone line is situated within an area scheduled for prescribed burning. The insulator trees have diameters over 12 inches and would be unaffected by low-temperature underburning. All surface duff would be scraped away from the base of each tree with an insulator. With these stipulations, the project can proceed with no effect to the telephone line.

The Lazy Bend Campsite (661EA244) is situated to the northwest of an area proposed for thinning and prescribed burning. A 100-foot buffer zone for the exclusion of heavy machinery would be flagged around the site. Any trees harvested near the buffer zone should be felled directionally away from the buffer zone. A fire control line will be constructed around the site. The project can proceed with no effect to the historic campsite.

The Rock Creek Campground (661EA336) is situated in an area proposed for underburning only.

The project would not impact any significant heritage resources. Based on the proposed protective measures, the project meets the criteria in the Programmatic Agreement for "No Historic Properties Adversely Affected" determination (Stipulation III (B) 4).

This action is consistent with forest plan goals to protect important heritage resources. Heritage resource inventories were conducted in compliance with the 2004 PA during the project planning stage (FW-598, FW-600, FW-610, FW-602 and FW-606), the field survey results were fully documented (FS-608), and the potential effects to heritage resources from the proposed projects were assessed (FW-609, FW-610). Heritage resources potentially affected by project activities were evaluated as ineligible for inclusion on the NRHP (FW-612). All records and documents concerning heritage resources for the project are kept on file at the Hood River Ranger District, Mt. Hood National Forest (FW-626).

3.13.3 Cumulative Effects

Because this project would have no direct or indirect effects on heritage resources eligible for the NRHP and none of the projects considered for potential cumulative effects overlap the affected area, there would be no cumulative effects to heritage resources as a result of implementing any of the action alternatives.

3.14 Climate Change

This proposed action alternative would affect approximately 7,200 acres of forest by commercially thinning smaller trees from the stand, retaining a residual stand of about 40-120 ft2 basal area in dry mixed-conifer forests. This scope and degree of change would be minor relative to the approximately 1,000,000 acres that make up the forest.

Climate change is a global phenomenon because major greenhouse gases (GHG) mix well throughout the planet's lower atmosphere (IPCC 2013). Considering emissions of GHG in 2010 was estimated at 49 ± 4.5 gigatonnes globally (IPCC 2014) and 6.9 gigatonnes nationally (US EPA, 2015), a project of this magnitude makes an infinitesimal contribution to overall emissions. Therefore, at the global and national scales, this proposed action's direct and indirect contribution to greenhouse gases and climate change would be negligible. In addition, because the direct and indirect effects would be negligible, the proposed

action's contribution to cumulative effects on global greenhouse gases and climate change would also be negligible.

The Intergovernmental Panel on Climate Change has summarized the contributions to climate change of global human activity sectors in its Fifth Assessment Report (IPCC 2014). In 2010, anthropogenic (human-caused) contributors to greenhouse gas emissions came from several sectors:

- Industry, transportation, and building – 41 percent
- Energy production – 35 percent
- Agriculture – 12 percent.
- Forestry and other land uses – 12 percent

There is agreement that the forestry sector contribution has declined over the last decade (IPCC, 2014; Smith et al., 2014; FAOSTAT, 2013). The main activity in this sector associated with GHG emissions is deforestation, which is defined as removal of all trees, most notably the conversion of forest and grassland into agricultural land or developed landscapes (IPCC 2000).

This project does not fall within any of these main contributors of greenhouse gas emissions. Forested land would not be converted into a developed or agricultural condition. In fact, forest stands are being retained and thinned to maintain a vigorous condition that supports trees, and sequesters carbon long term. US forests sequestered 757.1 megatonnes of carbon dioxide after accounting for emissions from fires and soils in 2010 (US EPA, 2015).

However, there is growing concern over the impacts of climate change on US forests and their current status as a carbon sink. There is strong evidence of a relationship between increasing temperatures and large tree mortality events in forests of the western US. There is widespread recognition that climate change is increasing the size and frequency of droughts, fires, and insect/disease outbreaks, which would have major effect on these forests' role in the carbon cycle (Joyce et al. 2014).

The project is in line with the suggested practice of reducing forest disturbance effects found in the National Climate Assessment for public and private forests (Joyce et al. 2014). Here specifically, the project proposes to conduct thinning and follow-up with prescribed fire where appropriate to reduce the fuel loading and restore forest resiliency that is adapted to climate change. The release of carbon associated with this project is justified given the overall change in condition increases forest resistance to release of much greater quantities of carbon from wildfire, drought, insects/disease, or a combination of these disturbance types (Millar et al. 2007).

This project falls within the types of options presented by the IPCC for minimizing the impacts of climate change on forest carbon, and represents a potential synergy between adaptation measures and mitigation. Actions aimed at enhancing forest resilience to climate change by reducing the potential for large-scale, catastrophic disturbances such as wildfire also prevents release of GHG, and enhances carbon stocks (Smith et al. 2014). The proposed action reflects the rationale behind these recommendations because there exists the threat of a large-scale disturbance outside of the range that historically occurred on the landscape that could threaten both NFS land and adjacent privately-owned lands. There is a need to reduce the fire hazard in order to protect life and property and to restore forest to conditions that are more resilient to wildfire on NFS lands. This project contains the Pine Hollow WUI and is adjacent to the Juniper Flats WUI.

Timber management projects can influence carbon dioxide sequestration in four main ways: (1) by increasing new forests (afforestation), (2) by avoiding their damage or destruction (avoided deforestation), (3) by manipulating existing forest cover (managed forests), and (4) through transferring carbon from the live biomass to the harvested wood product carbon pool. Land-use changes, specifically deforestation and regrowth, are by far the biggest factors on a global scale in forests' role as sources or sinks of carbon dioxide, respectively (IPCC, Intergovernmental Panel on Climate Change, 2000). Projects like the proposed action that create forests or improve forest conditions and capacity to grow trees are positive factors in carbon sequestration.

Chapter 4. Agencies and Persons Consulted

The Forest Service consulted with the following individuals, Federal, state, Tribal, and local agencies during the development of this environmental assessment:

Federal, State, and Local Agencies:

- Hood River County
- Hood River Soil and Water Conservation District
- Natural Resources Conservation Service (NRCS)
- Oregon Department of Fish and Wildlife
- Oregon Department of Forestry
- Oregon State Historic Preservation Office (SHPO)
- US Fish and Wildlife Service
- Wasco County
- Wasco County Soil and Water Conservation District

Tribes:

- Confederated Tribes of Warm Springs

Others:

- American Forest Resource Council
- BARK
- Mt Hood Forest Study Group
- Oregon Wild
- Other interested individuals
- Wasco County Forest Collaborative Group
- White River Watershed Council

References

Agee, J.K. 1993. Fire Ecology of Pacific Northwest forests. Washington, DC: Island Press.

BEHAVEplus, Fire Behavior Modeling program, www.firelab.org.

Behnke, R.J. 1992. Native trout of western North America. American Fisheries Society Monograph 6. American Fisheries Society, Bethesda, Maryland.

Boutcher, Steven. 1994. USDA Forest Service Pacific Northwest Region. Visual Air Quality in the Pacific Northwest (An Analysis of Camera Data 1983-1992).

Brazier, J.R., and G.W. Brown. 1973. Buffer strips for the stream temperature control. Oreg. State. Univ. For. Res. Lab. Res. Pap. 15. 9p. Corvallis.

Buchanan, Joseph B., Russell E. Rogers, D. John Pierce, and John E. Jacobson. 2003. Nest-site habitat use by white-headed woodpeckers in the eastern Cascades Mountains, Washington. Northwestern Naturalist 84:119-128.

Bull et al. 1986 – in birds of Oregon.

Buskirk, S.W. and L.F. Ruggiero. 1994. Marten. Pages 7-37 in L.F. Ruggiero, K.B. Aubry, S.W. Buskirk, L. Jack Lyon, and W.J. Zielinski, eds. The scientific basis for conserving forest carnivores. Gen. Tech. Rep. RM-254. Ft. Collins, CO: USDA, Forest Service, Rocky Mountain Forest and Range Experiment Station. 184 p.

Dixon, Rita D. 1995. Ecology of white-headed woodpeckers in the central Oregon Cascades. M.S. Thesis, University of Idaho, Moscow. 148 pp.

FAOSTAT (2013), FAOSTAT database. Food and Agriculture Organization of the United Nations. http://faostat.fao.org/.

Frenzel, Richard W. 2004. Nest-site occupancy, nesting success, and turnover-rates of white-headed woodpeckers in the Oregon Cascade Mountains in 2004. Unpublished Report, submitted to Audubon Society of Portland, Oregon Department Fish and Wildlife, Bureau of Land Management, and U.S. Forest Service. 35 pp.

Goulsen, D. 2003a. Bumblebees: their behaviour and ecology. Oxford University Press, Oxford, England.

Goulsen, D. 2003b. Conserving wild bees for crop pollination. Food, Agriculture and Environment 1(1): 142-144.

Hann, W., Havlina, D. and Shlisky, A., 2010. Interagency Fire Regime Condition Class (FRCC) Guidebook Version 3. National Interagency Fuels Technology Team. Accessed May 14, 2014.Brown, J.K. 1995. Fire regimes and their relevance to ecosystem management. In: Proceedings of Society of American Foresters National Convention; 1994 Sept. 18-22; Anchorage, AK. Washington D.C.: Society of American Foresters: 171-178.

Hartwig, C.L., D.S. Eastman, and A.S. Harestad. 2004. Characteristics of foraging sites and the use of structural elements by the pileated woodpecker (*Dryocopus pileatus*) on southeastern Vancouver Island, British Columbia, Canada.

Hessburg, P.F.; Agee, J.K. 2003. An environmental narrative of Inland Northwest United States forests, 1800–2000. Forest Ecology and Management. 178:23–59.

Hessburg, P.F.; Agee, J.K.; Franklin, J.F. 2005. Dry mixed-conifer forests and wildland fires of the Inland Northwest: contrasting the landscape ecology of the pre-settlement and modern eras. Forest Ecology and Management. 211: 117–139.

IPCC 2000. Intergovernmental Panel on Climate Change (IPCC), Special Report on Land Use, Land Use Change and Forestry, Summary for Policy Makers, 2000. IPCC, Geneva, Switzerland. 20 pp IPPC Special Report on Land Use, 2000

IPCC 2013. Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp. The Physical Science Basis.

IPCC, 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.). IPCC, Geneva, Switzerland, 151 pp. Climate Change 2014 Synthesis Report.

Joyce, Linda A.; Running, Steven W.; Breshears, David D.; Dale, Virginia H.; Malmsheimer, Robert W.; Sampson, R. Neil; Sohngen, Brent; Woodall, Christopher W. 2014. chapter 7: Forests. In: Melillo, Jerry; Richmond, Terese (T.C.); Yohe, Gary, eds. Climate change impacts in the United States: The third national climate assessment. U.S. Global Change Research Program: 176–194. http://nca2014.globalchange.gov/report/sectors/forests.

Linders, M. J. 2000. Spatial ecology of the western gray squirrel, (*Sciurus griseus*) in Washington: The interaction of season, habitat and home range. M.S. Thesis. University of Washington, Seattle, WA. 99 pp.

Marshal, D. B., M. G. Hunter, A. L.Contreras, Eds. 2003. Birds of Oregon: A General Reverence. Oregon State University Press, Corvallis, OR. 768 p.

Mellen, T. Kim, E. Charles Meslow, R. William Mannan Source Summertime Home Range and Habitat Use of Pileated Woodpeckers in Western: The Journal of Wildlife Management, Vol. 56, No. 1 (Jan., 1992), pp. 96-103.

Millar, Constance I; Stephenson, Nathan L.; Stephens, Scott L. 2007. Climate change and forests of the future: Managing in the face of uncertainty. Ecological Applications. 17(8): 2145-2151. Climate Change and the Forests of the Future.

Napper, C., Howes, S., and Page-Dumroese, D. 2009. Soil Disturbance Field Guide. USDA Forest Service, San Dimas Technology and Development Center. Pub 0819 0815 under 1940, Inventory and Monitoring.

Oregon Department of Forestry. 2000. State Forests Program, Forest Roads Manuel.

Page-Dumroese, D., Abbott, A., and Rice, T. 2009. Forest Soil Disturbance Monitoring Protocol. Volume II: Supplementary Methods, Statistics, and Data Collection. USDA Forest Service General Technical Report WO-82b.

Powell, David C. 1999. Suggested Stocking Levels for Forest Stands in Northeastern Oregon and Southeastern Washington: An Implementation Guide for the Umatilla National Forest. Technical Publication F14-SO-TP-03-99 USDA Forest Service.

Rashin, E. B., C. J. Clishe, A. T. Loch, J. M Bell. 2006. Effectiveness of Timber Harvest Practices for Controlling Sediment Related Water Quality Impacts. Journal- American Water Resources Association, Vol. 42 (5): 1307-1328.

Ribe, R.G. 2009. In-stand scenic beauty of variable retention harvests and mature forests in the U.S. Pacific Northwest: the effects of basal area, density, retention pattern and down wood. Journal of Environmental Management. 91: 245-260.

Ryan, R.L. 2005. Social Science to Improve Fuels Management: a Synthesis of Research on Aesthetics and Fuels Management. General Technical Report NC-261, USDA Forest Service.

Saab, Victoria, and Jonathan Dudley. 1998. Responses of cavity-nesting birds to stand-replacement fire and salvage logging in ponderosa pine/Douglas-fir forests of southwestern Idaho. USDA Forest Service, Rocky Mnt. Research Sta., Ogden, UT. Research Paper RMRS-RP-11. 17 p.

Smith P., M. Bustamante, H. Ahammad, H. Clark, H. Dong, E. A. Elsiddig, H. Haberl, R. Harper, J. House, M. Jafari, O. Masera, C. Mbow, N. H. Ravindranath, C. W. Rice, C. Robledo Abad, A. Romanovskaya, F. Sperling, and F. Tubiello, 2014. Agriculture, Forestry and Other Land Use (AFOLU). In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. 121 pp.

http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_chapter11.pdf.

Spies, Thomas, Michael Pollock, Gordon Reeves, and Time Beechie. 2013. Effects of riparian thinning on wood recruitment subgroup. 1Forest Sciences Laboratory Corvallis, OR and 2Northwest Fisheries Science Center Seattle, WA.

Stine, Peter; Hessburg, Paul; Spies, Thomas; Kramer, Marc; Fettig, Christopher J.; Hansen, Andrew; Lehmkuhl, John; O'Hara, Kevin; Polivka, Karl; Singleton, Peter; Charnley, Susan; Merschel, Andrew; White, Rachel. 2014. The ecology and management of moist mixed-conifer forests in eastern Oregon and Washington: a synthesis of the relevant biophysical science and implications for future land management. Gen. Tech. Rep. PNW-GTR-897. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 254 p.

Thomas, J.W., R.G. Anderson, C. Maser, and E.L. Bull. 1979. Snags. Pages 60-77 in J.W. Thomas, editor. Wildlife habitats in managed forests: Agriculture handbook No. 553. USDA Forest Service, Washington, D.C.

Thomas, J.W., E.D. Forsman, J.B. Lint, E.C. Meslow, B.R. Noon, and J. Verner. 1990. A conservation strategy for the northern spotted owl. Report of the Interagency Scientific Committee to address

the conservation of the northern spotted owl. Unpublished interagency document. 458 pages. USDA Forest Service.1974. National Forest Landscape Management Volume 2.

Thorp, R.W., E. Evans and S.H. Black. 2008. Status review of three formerly common species of bumblebee in the subgenus Bombus. 63 pp.

USDA Forest Service. 1982. Recreation Opportunity Spectrum (ROS) Users Guide. Washington D.C.: U.S. Department of Agriculture, Forest Service, 1982.

USDA Forest Service. 1990a. Mt. Hood National Forest Land and Resource Management Plan (LRMP). Sandy, OR.

USDA Forest Service. 1990b. Mt. Hood National Forest Land and Resource Management Plan (LRMP), Final Environmental Impact Statement (FEIS). Sandy, OR.

USDA Forest Service. 1990c. Mt. Hood National Forest Land and Resource Management Plan (LRMP), Record of Decision (record of decision). Sandy, OR.

USDA Forest Service and USDI Bureau of Land Management. 1994. Record of Decision for amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl, and Standards and Guidelines for Management of Habitat for Late Successional and Old-Growth Forest Related Species within the Range of the Northern Spotted Owl. Portland, OR.

USDA Forest Service. 1995a. White River Watershed Analysis. Mt. Hood National Forest. Hood River, OR.

USDA Forest Service. 1995b. "Landscape Aesthetics; A Handbook for Scenery Management.

USDA Forest Service and USDI Bureau of Land Management. 1996. Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins. General Technical Report. PNW-GTR-382.

USDA Forest Service and USDI Bureau of Land Management. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (January 2001). Portland, OR.

USDA Forest Service. 2003. Mt. Hood National Forest Roads Analysis. Pacific Northwest Region.

USDA Forest Service and USDI Bureau of Land Management. 2004. Record of Decision to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines (January 2001). Portland, OR. USDA Forest Service. 2005. Pacific Northwest Region Invasive Plant Program. Preventing and Managing Invasive Plants Record of Decision. R6-NR-FHP-PR-02-05.

USDA Forest Service. 2008a. Forest Service Specifications for Maintenance of Roads in Timber Sales. Portland, OR: U.S.D.A. Forest Service.

USDA Forest Service. 2008b. Final Environmental Impact Statement. Site-Specific Invasive Plant Treatments for Mt. Hood National Forest and Columbia River Gorge National Scenic Area in Oregon, including forest plan amendment #16.

USDA Forest Service 2010. Off -highway Vehicle (OHV) Management Plan. Mount Hood National Forest.

USDA Forest Service. 2012. National Best Management Practices for Water Quality Management on National Forest System Lands – Volume 1: National Core BMP Technical Guide. FS-990a. 165pp.

USDA Forest Service. 2015. Mt Hood National Forest Travel Analysis Report, Sandy, OR.

US EPA 2015. US Inventory of Greenhouse Gas Emissions and Sinks: 1990 – 2013. Executive Summary. EPA 430-R15-004 United States Environmental Protection Agency. Washington, D.C. 27 pp.

http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html.

USFWS. 2012. Final Rule, Endangered and Threatened Wildlife and Plants; Designation of Revised Critical Habitat for the Northern Spotted Owl.

USFWS. 2016. Letter of Concurrence regarding the effects of habitat modification activities within the Willamette Province, FY 2017-2018, proposed by the Eugene District, Bureau of Land Management; Salem District, Bureau of Land Management; Mt Hood National Forest; Willamette National Forest; and the Columbia River Gorge National Scenic Area on the northern spotted owl and its' designated critical habitat and conference confirmation for Oregon spotted frog critical habitat.

Willamette Planning Province Terrestrial Level 1 (WPPTL1) Team, 2016. Biological Assessment of NLAA Projects with the Potential to Modify the Habitat or Critical Habitat of Northern Spotted Owls.

Van Norman, K. and R. Huff. 2012. Survey and Manage category B Fungi Equivalent-Effort Survey Protocol, Version 1.0. Portland, OR. U.S. Department of Interior, Bureau of Land Management, Oregon/Washington and U.S. Department of Agriculture, Forest Service, Region 6. 22 pp.

Waters, T. F. 1995. Sediment in Streams: sources, biological effects, and control. American Fisheries Society Monograph 7: 79-96, 174-175 pp.

Wisdom, Michael J., Richard S. Holthausen, Barbara C. Wales, Christina D. Hargis, Victoria A. Saab, Danny C. Lee, Wendel J. Hann, Terrell D. Rich, Mary M. Rowland, Wally J. Murphy, and Michelle R. Eames. 2000. Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-Scale Trends and Management Implications. General Technical Report, PNW-GTR-485, Portland, OR.

Xerces Society. 2009. Bumblebees: western bumblebee (*Bombus occidentalis*). Profile prepared by R. W. Thorp, E. Evans and S. H. Black.

Zabel, C. J., J.R. Dunk, H.B. Stauffer, L.M. Roberts, B.S. Mulder, and A. Wright. 2003. Northern spotted owl habitat models for research and management application in California (USA). Ecological Applications 13(4): 1027-1040.